

3rd International Scientific-Practical Conference



Innovative Information Technologies

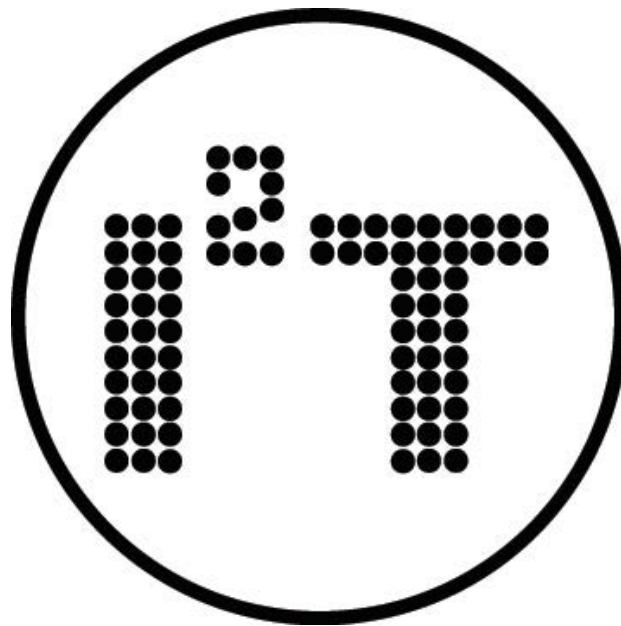
Part I



PRAGUE - 2014

APRIL 21-25

**International Scientific – Practical Conference
«INNOVATIVE INFORMATION
TECHNOLOGIES»**



**PART 1
INNOVATIVE INFORMATION TECHNOLOGIES
IN EDUCATION**

**Prague – 2014
April 21-25**

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The materials of The Third International Scientific – Practical Conference is presented below. The Conference reflects the modern state of innovation in education, science, industry and social-economic sphere, from the standpoint of introducing new information technologies.

Digest of Conference materials is presented in 3 parts. It is interesting for a wide range of researchers, teachers, graduate students and professionals in the field of innovation and information technologies.

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The collection contains

- information about the organizers;
- materials of the conference.

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**Organizing Committee: 109028, Moscow, B. Trehsvyatitelsky per., 3, HSE, RT.
E-mail: i2t@diag.ru, i2t.conf@gmail.com**

Contact information:

- **General questions - Ilya A. Ivanov, tel.: +7 (926) -3830740**
- **Chairman of the organizing committee - Saygid U. Uvaysov, tel.: +7 (926) -8080190**

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**Welcoming word to the participants of the International scientific-practical conference "Innovative Information Technologies" from the professor, doctor of Technical Sciences, academician, laureate of the Russian Federation Government, director and supervisor MIEM HSE
Tikhonov Alexander Nikolaevich.**



Dear participants of the 3rd international scientific and practical conference "Innovative Information Technologies"!

I am very pleased to welcome all of you in our key working session, which brings together professionals in the field of innovation and information technology - so important base for the development of scientific and industrial potential in all spheres of human activity.

Today, a new generation of IT solutions converts the information into a strategic asset, allowing reduction of costs without sacrificing quality of service, and without stifling creativity and efficiency of the workforce. These technologies help organizations to reduce risks, improve safety and reduce transaction costs of business development. Implementation of these solutions has become an important foundation for the development of science and technology, education and the economy in general.

In this context, the 3rd international scientific and practical conference "Innovative Information Technology" is an important working tool for solving the problems faced by a variety of industries. It means, first and foremost, the acceleration of innovation processes in accordance with the objectives of the "Strategy of the Development of Education, Science and Technology in the Russian Federation", the development of intelligent process control systems, and ensuring the implementation of modern information systems. The comprehensive conference program provides Russian and foreign participants with the ample opportunity for mutual information and experience exchange, professional communication and stronger business cooperation.

I sincerely wish the organizers, participants and guests of the 3rd international scientific and practical conference "Innovative Information Technology" the great success on the way of finding innovative solutions facing new challenges, and good luck in establishing productive business contacts!

A handwritten signature in blue ink, which appears to read "A. Tikhonov". The signature is fluid and cursive.

Tikhonov A. N.

Welcoming word to the participants
of the 3rd international scientific and practical conference
"Innovative Information Technologies"

Leonid Anatoljevich Gamza

Director of the Russian Center for Science and Culture in Prague



Dear Organizers, Dear Participants, and Dear Guests of the 3rd international scientific and practical conference "Innovative Information Technologies"!

Thank you very much for the opportunity to join the conference, which has been dedicated to innovative information technologies and their exploitation for building an educational platform in Russia and abroad.

We are all aware that improvement in management education using advanced information technology is one of the most important factors in the progressive development of sustainable economy and society as a whole.

Co-operation between governments and research, innovation and education institutions in different countries of the world has been developing differently and depends on variety of factors. Major achievement of this conference, held in Prague for the third time, consists in the fact that it puts together Russian government and municipal authorities, Russian public organizations, and Russian higher educational institutions with the same ones coming from different foreign countries. I believe that together we will be able to share experience, develop and deepen the theoretical foundations of research in order to harmonize various scientific approaches, and we will overcome so far fragmented scientific knowledge in the field of innovative information technology.

The new recommendations for further educational reforms based on extensive exploitation of information technology innovations, are going to be the most important outcome of the conference.

I wish the organizers and participants of the scientific and practical conference "Innovative Information Technologies" a lot of success and enjoyment from their fruitful work.

L. A. Gamza

Dear participants of the conference "Innovative Information Technologies" (I2T)!



The current information society has been characterized by high level of information and innovation technologies that are being intensively used by people, businesses, and governments. The economic development has been more and more conditioned by intellectual activity, higher technological level of production and by implementation of new innovation information technologies.

The international experience clearly shows that innovation information technologies have become an engine to the socio-economic development of many countries, and that free access of people to information is a top priority of the governments.

Without comprehensive and coordinated activity of the government agencies, education institutions, commercial enterprises and citizen's initiatives, it would not be possible to reach a high level of innovation and information platforms in Russia nowadays.

Wide development and implementation of innovation information technologies is not only a major task of these days, but it has become a necessity for the development of modern manufacturing, that would be able to meet new market challenges.

It becomes a top priority, in the medium term perspective, to take advantage of the existing scientific and technical potential, and secure a dignified position of Russian Federation within leaders of global information society.

I wish all participants of the conference "Innovative Information Technologies" great success and a lot of productive work.

A handwritten signature in blue ink, consisting of several fluid, overlapping loops and strokes, positioned above the printed name.

V. N. Vasiliyev

Rector of St. Petersburg National Research University of Information, Technologies,
Mechanics and Optics
Vice-President of Russian Rector Association
Vice-Chair of The Higher Education Attestation Commission
Corresponding Member of Russian Academy of Sciences and Russian Authors' Society
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Agilent Technologies - the world's premier measurement company, working in the area of communications, electronics, biotechnology, diagnostics and chemical analysis.

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The year 2014 will become an important milestone in the history of Agilent Technologies. In November, the Electronic Measurement Agilent - founded in 1939 by B.Hyulettom and D.Pakkardom - will transform into an independent company Keysight Technologies. The main idea of the founders, however, will remain unchanged - our commitment to the product quality, our commitment to be the first in the development of advanced technologies and solutions, and our commitment to you, our customers.

Having established an independent company, we are going to concentrate on electronic measurements and we will grow even more rapidly as the needs and key market trends of electronic measurements will be the key priority. Our plans and product range will remain the same, we will retain our intellectual property, patents and specialized chips based on our own design. Our research laboratories will continue in research and development of advanced tools and testing methods.

We will continue our work on the certification of equipment, on translation of user manuals, user interfaces and other information materials. In 2014, in Russia, in addition to the Moscow branch will open 4 regional offices - in Siberia, Volga, Southern and North- West Federal District. We will extend our capacities in the service center providing the repair, inspection and calibration of instruments.

My colleagues and I thank you for choosing our products, and we will be always happy to assist you in finding the optimal solutions and reaching your goals.

Sincerely,

Galina Smirnova
General Director of the Russian branch Agilent Technologies



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Alexander Skvortsov (Russia), Oleg Artemyev and Steven Swanson (USA), Mikhail Tyurin (Russia), Koichi Wakata (Koichi Wakata) (Japan), Rick Mastracchio (USA)

Dear participants of the 3rd international scientific and practical conference "Innovation Information Technologies" (I2T)!

On behalf of the crew of the International Space Station we warmly welcome all of you!

The innovative information technologies have become very attractive over last several years. This industry has been developing very rapidly, its growth outstrips the most courageous expectations. Producing innovative products in the area of information technologies does not only create a huge space for research and discovery of new ideas, but also stimulates progress in other areas.

Introduction of modern IT in education, science, industry, economy and social sphere provides unprecedented opportunity for their development.

We wish the conference participants very interesting and productive work, fruitful discussions, mutual understanding and success in achieving their goals!

Section 1
INNOVATIVE INFORMATION TECHNOLOGIES IN EDUCATION

**THE INFORMATION SYSTEM STRUCTURE OF MONITORING AND DECISION-
MAKING SUPPORT FOR STUDENTS' RESEARCH AND INNOVATIVE
ACTIVITIES MANAGEMENT AT HIGHER SCHOOLS**

Andreyeva, T.V., Chulkov, V.A.
Penza, Penza State Technological University

The approach to information system development of monitoring and decision-making support for students' research and innovative activities management at higher professional education institutions is considered in the article. Some structural components and functional capabilities of the information system functioning successfully at Penza State Technological University are under discussion.

Keywords: research activities, innovative activities, higher professional education, information system, management.

The state policy of the country's transition toward innovative development involves significant changes in the higher professional education system, qualitatively different level of training specialists creating opportunities for the maximum personality's development. Under the circumstances of transition to two-level higher education system and introduction of the third generation federal state education standards the increasing significance is given to the organization of students' self-training work at higher educational institutions.

One of the effective instruments of mastering skills of self-training work is students' participation in research and innovative (R&I) activities. At the all-Russian level the considerable attention is recently paid to issues concerning the students' R&I activities organization and management; the state policy, standard and legal regulation of this sphere are improved; new regulations of the students' R&I activities results accounting in higher education institutions [1] are accepted.

The timely and qualitative problems solution of students' R&I activities management accounting in higher education institutions requires the introduction of modern information technologies. Existing information systems of higher education institutions activity management, such as "Galaktika Upravlenie vuzom", "Sistema upravleniya vuzom 1C vuz "Pervyi BIT", "Naumen University" [2–4] and others, are generally focused on educational process ensuring, students' educational activity monitoring, faculty research work indicators accounting, personnel and economic information updating, electronic document flow support. Questions concerning monitoring results and decision-making support for students' R&I activities organization, management analytical algorithms realization for research competences development are leaving outside the information systems. Consequently, the problem of information support development for students' R&I activities management process at higher education institutions becomes important and actual.

The information system developed at Penza State Technological University includes a subsystem of monitoring and accounting of students' R&I activities results and a subsystem of administrative decision-making support. The process of students' R&I activities management by using the information system corresponds to normative documents requirements of the Ministry of Education and Science of the Russian Federation, university local standard acts.

The information system aims at solving the following tasks:

- planning, organization and control of students' R&I activities at a higher education institution and in its structural departments;
- maintaining uniform electronic archive of data on themes, competitions and contests and students' individual achievements;
- data extraction of current state of students' R&I activities according to query criteria;
- forming the operational and analytical reports of students' R&I activities results in higher education institutions according to requirements of the overhead organizations;
- support of administrative decision-making on students' R&I activities organization at a higher education institution and its departments.

The considerable part of students, teachers, scientific and pedagogical, administrative and managerial personnel participates in the organization and implementation of students' R&I activities of higher education institutions. Collegiate management structures including university academic council, university scientific and technical council, institutes and faculties academic councils, young scientists and specialists council of a higher education institution or students' R&I activities council solve issues of scientific activities organization of students, postgraduate students and young scientists. Officials such as the rector, the vice rector for scientific work and innovative activities, faculty deans and their deputies for scientific work, chair heads and their deputies for scientific work supervise students' R&I activities. Besides, there are specialized departments in higher education institutions being responsible for students' R&I activities organization and carrying out scientific and innovative competitions and contests for students, such as students' R&I activities organization department, youth innovative center and others.

As a result of the analysis of information processes in the students' R&I activities management system at a university the interaction model of students' R&I activities department organization with structural departments of a higher education institution and with its external organizations (figure 1) has been developed.

The creation of the students' R&I activities information management system required the subject domain analysis and modeling with the help of structural approach that allowed to develop functional and information models of the system [5–6]. The system provides interaction of the automated workplaces of the university administration, of those being responsible for the students' R&I activities organization in a higher education institution, the dean of the faculty, the head of the chair, the student. It includes the following subsystems in the structure: "Planning", "Organization of Competitions and Contests", "Accounting", "Reports", "Analytics", "Student's Private Cabinet", "Teacher's Private Cabinet", "Inspection", "Financing", "Rating Calculation", "Web Portal", "Integration".

The system is developed according to the multiplayer option, access rights to the information are differentiated depending on the user's role in the structure of processes investigated. The categories of the system users: students, teachers, employees of departments being responsible for students' R&I activities organization (chair / faculty), the officials generally supervising students' R&I activities (those being responsible for the students' R&I activities organization of a higher education institution, the vice rector for scientific work and innovative activities, the rector).

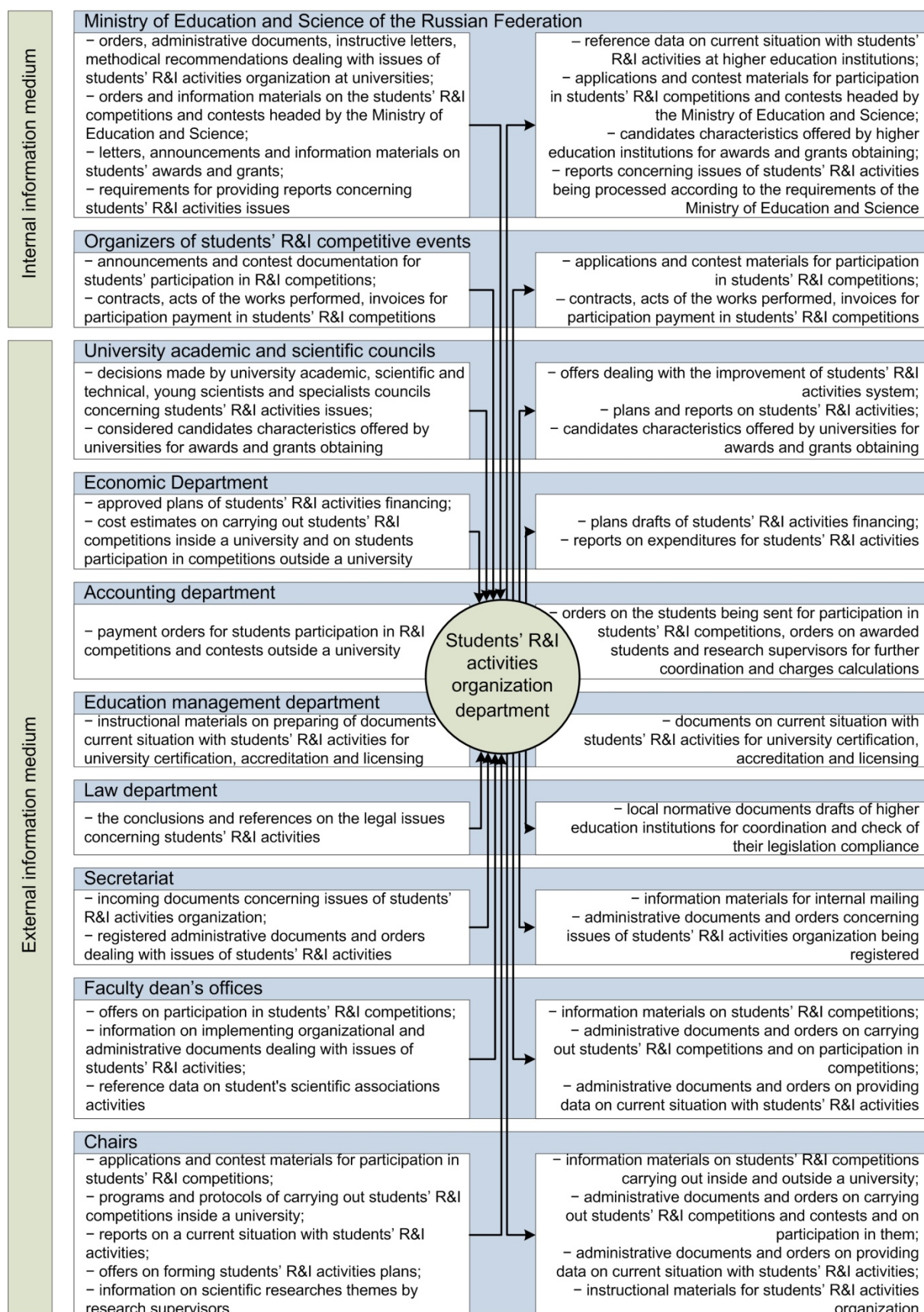


Figure 1 – Interaction Model of Students' R&I Activities Organization Department at Higher Education Institutions

The purpose of each subsystem is specified and their short characteristics of functional capabilities are given in table 1.

Table 1 – Subsystems Characteristics of Information System

Name	Purpose	Functional Capabilities
Planning	Students' R&I activities planning in a higher education institution and its departments	<ul style="list-style-type: none"> – forming the annual plan of students' R&I activities at a chair, faculty, higher education institution; – forming the list of students' R&I competitions and contests headed by the overhead organizations.
Organization of Competitions and Contests	Ensuring carrying out scientific and innovative competitive events for students	<ul style="list-style-type: none"> – forming the data on held competitive scientific and innovative events for students (conferences, competitions, exhibitions, tournaments); – forming the documents packages (orders, regulations, cost estimates) on the organization of participation in various students' R&I competitions and contests.
Accounting	Automation of management accounting process of students' R&I activities indicators at higher education institutions; providing the users with information on its current state	Forming and providing data: <ul style="list-style-type: none"> – on scientific researches themes carrying out at departments of a higher education institution and being offered to students for participation; – on activities of students' scientific associations functioning in higher education institutions; – on students' participation in research works performance and innovative projects development; – on students' scientific publications and security documents on intellectual ownership objects; – on students' scientific achievements.
Reports	Ensuring the work on providing all necessary reporting documentation to the higher organizations	<ul style="list-style-type: none"> – forming reports in the regulated form according to the students' R&I activities results for giving them to the Ministry of Education and Science of the Russian Federation, to the National Accreditation Agency in Education and other organizations; – reports checking and coordinating.

Analytics	Analytical information processing of student's R&I activities	<ul style="list-style-type: none"> – forming proposals on the undergraduates and postgraduate students contingent and recommendations on the nomination of the most talented students for various scholarships; – evaluating the effectiveness of students' R&I activities management; – administrative decision-making support on students' R&I activities improvement; – forecasting of students' R&I activities development.
Student's Private Cabinet	Automation of preparatory process of students' applications on participation in competitions; student's portfolio formation	<ul style="list-style-type: none"> – information support of registration, preparation and submission of applications for participation in competitions and contests; – providing student's with information on all competitions he took part in, and on all his achievements in R&I activities; – providing the student with the information on his current rating.
Teacher's Private Cabinet	Automation of preparatory process of scientific works and innovative projects for participation in students' R&I competitions; teacher's portfolio formation	<ul style="list-style-type: none"> – information support of the student's scientific works prepared and innovative projects performed under the teacher's supervision; – providing the teacher with the information on all student's scientific works and innovative projects performed under his supervision; – providing the teacher with information on his current rating in terms of the students' R&I activities supervision.
Inspection	Providing expert's quality evaluation of students' scientific research works and innovative projects	<ul style="list-style-type: none"> – information support of activities of experts' councils of competitive events held in higher education institutions; – compiling evaluation sheets of student's scientific works and protocols of carrying out scientific competitions and contests.
Financing	Planning and accounting the funds supplied by higher education institutions for students' R&I activities financing	<ul style="list-style-type: none"> – forming the annual plan of students' R&I activities financing at chairs, faculties, a university; – forming the financial reports on carrying out students' competitions and contests; – forming the annual reports on supplied financing for students' R&I activities at a higher education institution and its departments.

Rating Calculation	Calculation of rating of students, teachers – research supervisors, departments, higher education institution	<ul style="list-style-type: none"> – forming the criteria list for evaluation of R&I activities of the student, the teacher – the research supervisor, the department, the higher education institution; – calculating students' rating by results of participation in R&I activities; – calculating teachers' rating of performing the students' R&I activities supervision; – calculating department rating (faculty, chair, laboratory) for the students' R&I activities organization; – determining the integral index value characterizing the state of students' R&I activities at higher education institutions.
Web Portal	Providing all participants of students' R&I activities organization process with actual information	Providing with information about themes of the scientific researches carried out in higher education institutions, about actual scientific and innovative competitions and contests for students.
Integration	Ensuring communication with other systems for providing a common information space of a university	Data exchange with the following systems: "Dean's Office", "Human Resources Department", "Electronic Document Flow", etc.

The automation of management accounting process of students' R&I activities results:

- provides efficient decision-making support for the administration of a higher education institution and its structural departments;
- allows to optimize and coordinate plans of students' R&I activities at a higher education institution and its departments;
- provides with the capabilities for evaluating the effectiveness of financial investments to students' R&I activities in a higher education institution and its departments.

The application of the developed information system of monitoring and decision-making support allows to increase the students' R&I activities effectiveness at universities, labor productivity of those being responsible for the students' R&I activities organization at a higher education institution and its departments, quality and reliability of input and output information.

Thus, the information technologies application to the sphere of the organization and management of students' research and innovative activities is an important aspect for increasing the efficiency of higher education institution activities.

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CAD/CAM/CAE-TEHNOLOGII IN MODELLING OF TECHNICAL OBJECTS

Erokhin, V.V., Eliseeva, E.V.

Bryansk state university of a name of the academician I.G.Petrovsky

The technique of application of CAD/CAM/CAE technology in modeling of technical objects is considered. Examples of use of engineering calculations are reviewed at creation of products and their working off on working capacity with use of CAE systems.

Keywords: solid-state modeling, CAD/CAM/CAE technology, quality.

The industrial enterprises saved up considerable experience of automation of local services of design and technological divisions. Despite limited application of means of SAPR in real work, the result is obvious – level of proficiency in new technologies, knowledge of various applied systems, the gained real experience plus of one hundred (thousands) of the developed drawings, operating programs, models, etc. Practically at each enterprise infocommunication networks are used, application of the telecommunication technologies spreads, the automated systems of design gradually become the ordinary and habitual tool of the designer and the technologist. In conditions when terms of performance of a task are the main requirement of the customer, the competitive enterprise is impossible without appropriate means of automation. Therefore use of modern systems of modeling (CAD/CAM/CAE technology) of various machine-building objects, processes of their production and technical calculations allows to approach at higher level to processes of formation of designs of industrial equipment.

Use of CAD-systems of average and high level, such as CIMATRON, SolidWorks, TflexCAD, allows quickly and to construct visually solid-state model of technical object of any degree of complexity with its dimensional parametrization and parametrization of mechanical, physical and chemical properties. Use of parametrization allows to create one basic design in which at change of certain sizes and properties the constructive form, the sizes and properties changes. In this regard there is no need to create big electronic databases of all nomenclature of technical objects. Creation of hybrid models, performance of Boolean operations over solid-state objects and surfaces is possible. Models of details and assembly units can be united in assembly. Any changes executed over edited model (detail), will be reflected in all assemblies containing this object. It allows quickly and to make qualitatively selection of certain configurations of technical objects with the smallest expenses of time and losses of data, and also to simplify algorithms of search of optimum solutions of constructive modeling with certain technical and mechanical parameters.

In modern CAD/CAM/CAE systems it is possible to carry out the following design stages:

- choice of type and location of adjusting elements of the adaptation;
- appointment as the designer of the scheme of fixing;

- choice of types and point of the appendix of elements of the tightening mechanism and points of application of forces of fixing;
- calculation of plastic deformations in a zone of contact of an adjusting element and a basic surface of preparation;
- definition of an error of fixing;
- determination of dimensional wear of adjusting elements;
- formation of a design and configuration of technical object as a whole;
- definition of temperature deformations;
- formation of working drawings;
- realistic modeling of details from the sheet material, including receiving preparation and possibility of designing in a flat state;
- to carry out the modeling of assembly units which is including: possibility of conducting process of design according to goals; dynamism of movement of assembly unit at the expense of unique opportunities of visualization; plausible assembly primitives for creation of an exact design of assembly unit; instruments of management of assembly which improve object representation; possibility of a reuse of already existing designs for the purpose of decrease in the efforts spent for design; presentation and high extent of specification.

The choice of details or models is carried out by import to assembly unit earlier created or standard (from a database) an element. These systems give the chance of creation of a database of solid-state models of details and drawings in which constructive elements of technical object, and also their standard designs can be put. Possibility of creation of solid-state model in a context of assembly allows easily and to create quickly absolutely new non-standard solutions of technical objects and to carry out over them imitating modeling of different function.

Because the main unit design documentation is the drawing, the parametrized drawing of assembly of technical object has to be the output parameter of design. Use of CAM technologies (WorksCAM) allows to receive values of making forces of cutting which by means of macros (or the additional software of communication of CAD with CAM systems) contact the table of parameters of forces of the cutting, being in technical requirements of the drawing of the flood boss. Depending on parameters of components of force of cutting there is a parametrization of designs of flood elements and dish-shaped springs. Parametrization of flood elements and dish-shaped springs can be carried out in two ways. The first, is mathematically formalized dependence of their design data on components of force of cutting. The second, constructive characteristics of projected elements get out of relational databases (in a concrete case Excel-tables are made) depending on the size of force of cutting. The first way more labor-consuming since demands writing of the additional macros which are carrying out calculation of parameters on the equations, but is rational – all constructive, physicomaterial properties of an element are considered. The second way is more convenient, in communication by adaptation of CAD-systems in work with relational databases in which ranks of the standardized elements are presented that raises level of unification not only design, but also technological preparation of production. Further, depending on preparation parameters, there is a parametrization of other components of details of a design of the machine adaptation. The interrelation of changes of the parametrized details is described by means of Boolean functions that prevents crossing of the objects parametrized from two independent characteristics of parametrical transformation – parameters of preparation and parameters of components of force of cutting.

For the automated design of technical objects it is necessary to create additional program modules in CAD-systems on the basis of their internal programming languages. At the first stage specialized databases, for example, park of metal-cutting machines, elements of

machine adaptations, etc. have to be created. The second stage consists in writing of program modules or macroses for realization of the following design stages.

1. Recognition of surfaces of solid-state model of details of technical object on a condition of basing of details on six degrees of freedom. One or several options of sets of surfaces of preparation which include adjusting, directing (double basic) and basic basic surfaces or double directing basic and basic (double directing and directing) basic surfaces get out.

2. For a concrete set of a combination of forms of basic surfaces schemes of installation of details in assembly of technical object get out.

3. Selection of schemes of installation of details in assembly of technical object by the following rules is made: possibility of the guaranteed fixing of a detail; ensuring the demanded accuracy of assembly; the minimum auxiliary time for detail installation in assembly of technical object; the minimum size of an error of basing of details in assembly of technical object; minimum cost of production or assembly of technical object.

4. Calculation of force of fixing for known sizes and locations of forces and cutting moments. Choice like a clutch. Choice like the power mechanism.

5. Configuration of technical object on case details or assembly units, proceeding from observance of conditions of the minimum error of installation and prime cost. Designing is carried out on the basis of databases – clamping details and assembly units; fasteners; assembly units necessary for basing or joint basing and fixing of details.

6. Choice of a basic detail or assembly unit.

7. Implementation of the general configuration of technical object.

8. At configuration of several technical objects of one nomenclature, but with various sizes or physicomachanical properties it is necessary to provide criteria: the minimum quantity of assembly units or details for each group of the details entering assembly; the minimum time spent for assembly of technical object.

CAD-systems on the basis of solid-state modeling provide generation of grids of final elements for the subsequent engineering analysis in CAE systems (CosmosWorks, NASTRAN, Moldflow, etc.). It gives the chance to carry out a number of design and technological calculations: plastic deformations in a zone of contact of details, definition of temperature deformations on the basis of mechanical, thermal and chemical properties of considered system of production and product operation; providing the set requirements to quality of a made product through operational and constructive characteristics of projected equipment.

For example, calculation of the between-repairs period of operation of technical object can be determined by the following technique.

1. In CAM system technological processing of preparation is developed. With use of the middleware connecting CAD and CAM systems, parameters of technological system are transferred to CAD-system: rigidity, vibrostability of the machine, cutting modes, gradients of the direction and size of forces of cutting, basic surfaces of preparation, etc.

2. The CAD-system for considered technological process chooses or designs configuration of technical object in a mode of parametrization of its basic sizes and the properties meeting conditions of processing of preparation.

3. Surfaces of solid-state models of the technical object influencing accuracy and nature of process of a shaping of surfaces of preparation get out.

4. Converting of the chosen surfaces of technical object in CAE system with set their mechanical parameters and parameters of technological system.

5. Breakdown of considered surfaces on elements. At wear of surfaces there is no sense to make bit-by-bit segmentation of all volume of a primitive. Being set by concrete dimensional parameters of admissible wear it is possible to reduce by some orders quantity

and the size (size of an equal roughness of a considered surface) final elements that will allow to increase the accuracy of calculations.

6. Calculation of size of wear of an analyzed surface. Algorithms of calculations and mathematical formalization of process of a shaping of a worn-out surface has to consider surely a probabilistic field of dispersion of a gradient and the direction of action of external forces on a studied surface.

The most optimum values of wear close to experimental data, the final and element analysis on the basis of power balance of brought and spent energy gives [1]. A certain quantity of thermal, mechanical and chemical energy is brought to an interface of two dynamically contacted objects (fig. 1), owing to friction, movement and chemical interaction as among themselves, and intermediate environments (the air, cooling means, etc.) . In casual sequence (Randomize function) a certain energy of a rupture of communication which depends on mechanical, physical, constructional and chemical properties of a considered primitive, and also from their gradient is appropriated to each knot (if it is known) and dispersion fields. All final elements are described by mathematical dependences of transfer and consumption of different types of energiya, their interactions and influences on the above-stated properties. As soon as energy of knot becomes equal or bigger energy of its gap an element leaves knot and remains not closed (fig. 1, b). Dynamic growth of not closed elements in the direction of a surface of contact of two objects can lead to a separation of some volume areas of a contacting surface (fig. 1, c).

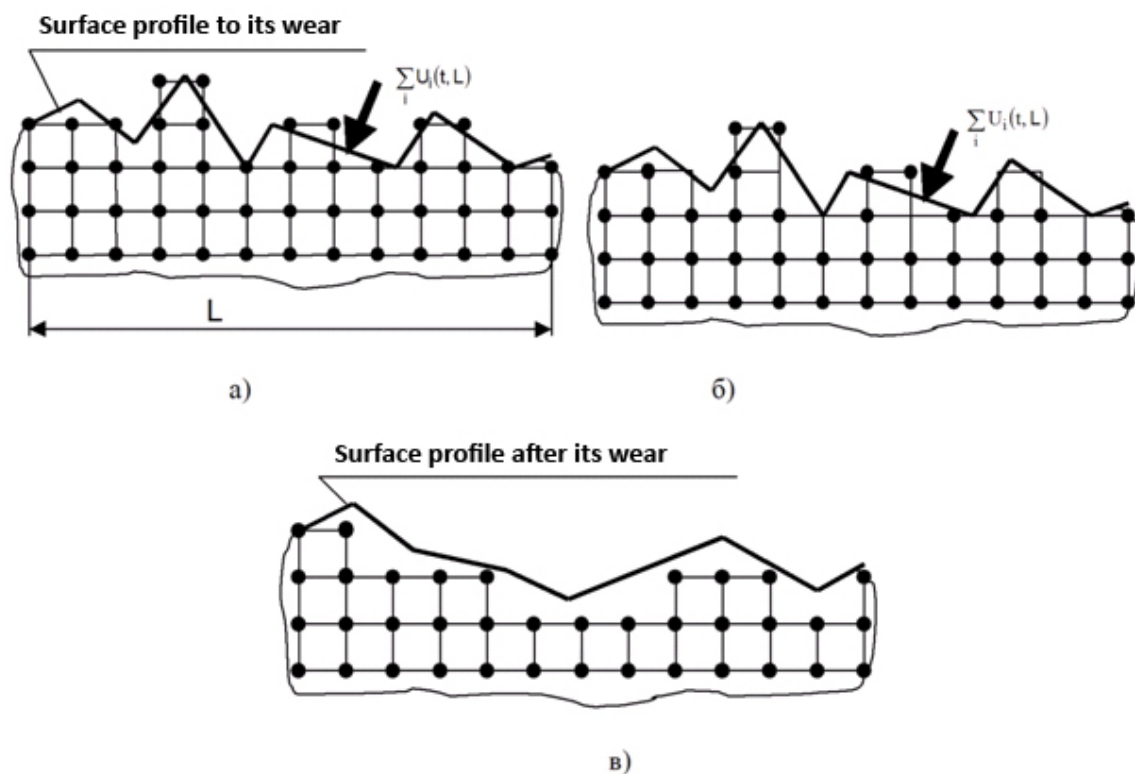


Fig. 1. Scheme of wear of a surface

However in this mathematical formalization of wear of a surface it is difficult to consider repeated stratification of products of wear on a worn-out surface, owing to difficult distribution of external power influence with electrostatic interactions of a surface (roughness) under the influence of variable external forces on contact of considered ph.

On the designed solid-state model of the adaptation the assembly drawing, drawings of details, and specifications is generated. Generation of types, cuts, sections, the sizes, and specifications is carried out automatically from solid-state model.

Most effectively CAD systems can be used for formation and document flow use in design-technology departments. All set of drawings of a product can be presented in the form of electronic solid-state model which is detailed on necessary number of the working drawings which are displaying on the screen of the display according to requirements of ESKD. It allows quickly and to process qualitatively design technological documentation, and also to enable the realization of idea about formation of uniform basic system of document flow on production and in branch.

The technique of solid-state design is successfully realized in the solution of a problem of a choice of the rational scheme of basing of details in assembly of technical object. This complex and multicriteria challenge demanding the automatic analysis of forms of basic surfaces, their spatial arrangement of the relation the friend to the friend, and also data acquisition about the accuracy and quality of basic surfaces of preparation.

The basis of the automated system is made by the scheme systematizing all possible basings meeting in practice of the scheme to destination, to a combination of forms of basic surfaces, geometry of preparation and accuracy of its arrangement in the adaptation. For formation of the list possible basings of preparation by an important point the geometrical analysis of preparation as geometrical features have a great impact on a choice (for example, existence of foundry or forming biases) basic surfaces and their arrangement on the relation to each other is. Its three-dimensional model therefore application of solid-state modeling allows to solve a problem of an automatic choice of schemes of basing proceeding from geometrical features of preparation contains all specified geometrical parameters of preparation. The main criterion of a choice of schemes of basing is the condition of the accuracy connecting the admission on the carried-out size and an error of basing of preparation in the adaptation. At automation of this stage possibility of automatic input of dimensional characteristics of preparation (admissions on the carried-out sizes, the sizes of basic surfaces, and the sizes defining an arrangement of bases relatively each other) is important.

Constructive implementation of the chosen scheme of basing includes a choice of the locations of adjusting elements, definition of their design and the sizes, calculation of reactions of support, sizes of plastic and elastic deformations in a zone of contact of an adjusting element and preparation, dimensional wear of support is thus carried out. For calculation of values of reactions of support it is necessary to appoint the scheme of fixing including an arrangement of adjusting elements, points of the appendix and the direction of forces of a clip and cutting forces. Input by the designer of such data in a dialogue mode or from the flat drawing is a long and complex challenge therefore use of three-dimensional model of orientation of preparation in the adaptation will allow the user to appoint quickly the fixing scheme, and to the automated system automatically to receive necessary data for calculation of forces of a clip and reactions of support.

Appendices of the user completely integrated into CAD system have direct access to all functions of this system on creation, the geometrical and physical and chemical analysis of solid-state models of details and assemblies, and also formation of design and technological documentation. These appendices will allow to solve automatically those problems which considerably influence quality of projected technical object, but can't be solved by standard modules of CAD systems. It is possible to distinguish from these tasks: definition of the rational scheme of basing and fixing; choice of adjusting and tightening elements; calculation of necessary force of fixing; problems of creation of an optimum configuration of a product and processes of assembly, ensuring the set quality of a designed project, etc.

Rational use of such technologies is base of development of scientific and technical culture of the automated designing of various objects.

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COMPLEX OF PROGRAMS FOR WORK WITH ELECTRONIC CONTENT IN LMS MOODLE ENVIRONMENT

Zelenko, L. S., Shumskaya, E.A.
Samara, SSAU

This article describes possibilities of software, which automates work with learning content in LMS Moodle and allows to make control and test tasks' bank creation process easier and more comfortable. Programs developed by authors allow to load questions and tests in the MS Word format in distance educational system on the base of LMS Moodle.

Keywords: E-learning, information technology, systems electronic distance learning, content, LMS Moodle, testing, test, software.

At the present time testing systems are the most convenient and universal method of knowledge control in almost all education programs. Topicality of these systems is obvious not only for preparation level measurement purpose but also for getting students' rating and study process monitoring, particularly in distance education.

Since test is only adequate way of students' knowledge control in distance education systems, its role significantly increases. Most of modern distance education systems is built on the base of dynamic education environment LMS MOODLE [1], which is easily adapted to features of concrete education project and allows to increase the functionality by the inclusion of authors' modules and additional tools. LMS MOODLE includes testing system, which is flexibly configured according to the task and allows to represent test practically in any demanded form. Only but significant testing systems' weakness is laboriousness of test tasks' bank creation process, because questions and answers can include HTML, pictures, formulas, tables and other complex objects.

Currently two electronic distance education systems on the base of LMS MOODLE are developed at the program systems' department of SSAU. These systems provide support of traditional students' and pupils' education with using of blended distance learning:

1. Site of program systems' department, which contains learning courses on several directions (010400 «Fundamental informatics and information technologies » (bachelor and master), 230100 «Informatics and computing technique», 010300 «Applied mathematics and informatics») and specialties (2301002.65 «Automated information processing and management systems», 090303.65 « Information Security of Information Systems»). Website available at <http://do-ps.ssau.ru>.

2. SSAU School of Informatics site, which contains demonstrational materials (tests for USE in informatics) for all years and learning courses in computer science. Website available at <http://distance.itschool.ssau.ru/>.

Learners have access to the electronic content anytime. This helps them to study at a pace, which corresponds to their individual features of perception and assimilation.

Most of didactic materials, which have been developed by teachers of SSAU program systems' department for many years, including tests, is in MS Word format. Test tasks were being oriented at using of “paper” technologies and had comfortable for work unified template.

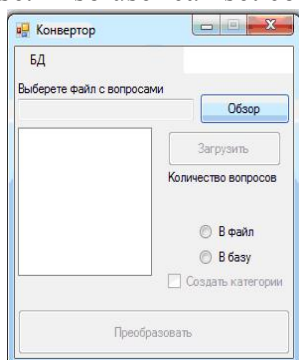
All above conditions become causes for software development, which will allow quick creation of learning content in LMS Moodle environment and will have the most convenient interface for user. Therefore authors of this article developed programs for automated loading of questions and tests, which contains text and other objects, including graphic illustrations, formulas and tables.

Scheme of interaction between user (teacher) and distance learning system with the help of developed software is on picture 1.

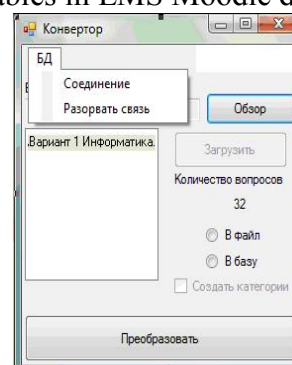


Pict. 1. Scheme of user work with software at loading content in LMS Moodle environment

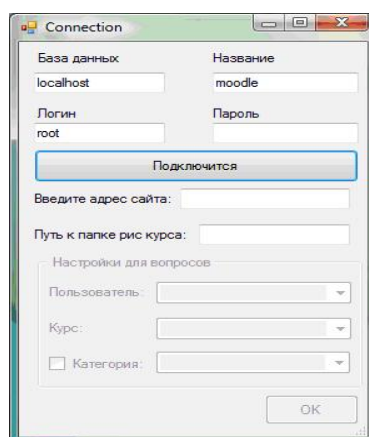
Software for loading questions. Program is client application for Windows, which provides access to remote database on server. This program uses COM-technology, which allows to get access to any object and its properties in document. User loads file with extension .doc or .docx, which contains test questions. After that program analyses document structure, counts questions, converts receive data in matrix of objects and then in strictly definite data structure. After that program forms folder with images, which were found in the file. Then data load on server (Picture 3, 4), is analyzed for correctness and just after that is written in database. Also user can set connections between tables in LMS Moodle database.



Pict. 2. Loading window

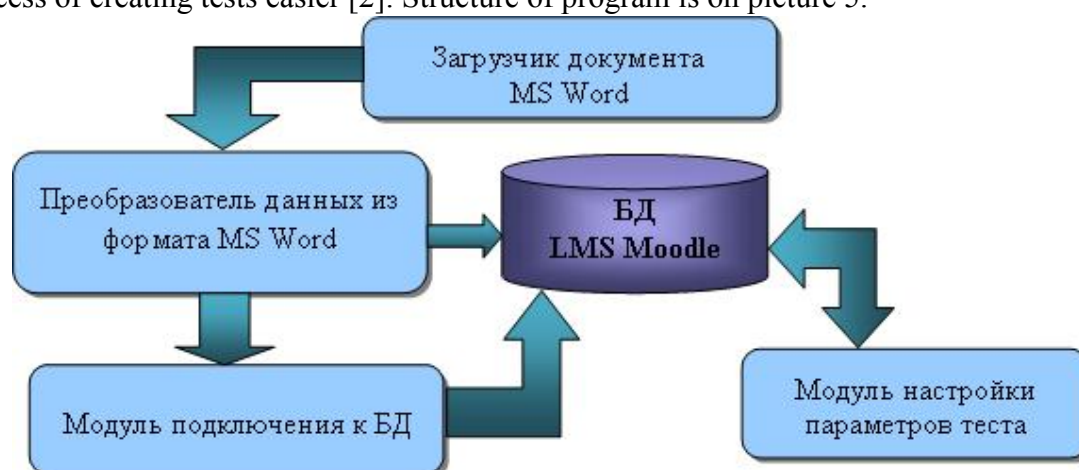


Pict. 3. Connecting with database



Pict. 4. Setting connection with database window

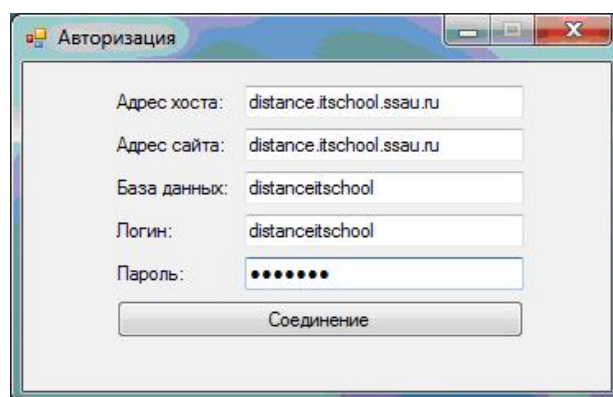
Program for loading tests. This program developed on the base of the program described above. It is extended with additional functions for setting up the test and allows teacher to set parameters similar to those in LMS Moodle but at the same time makes the process of creating tests easier [2]. Structure of program is on picture 5.



Pict. 5. Structure of program for creating tests

For loading data from file COM-technology is also used. Connection module is responsible for setting connection with remote database LMS Moodle. With the help of this module user set database name, password and parameters for conversion (file name, necessity for creation response categories and name of the folder for images).

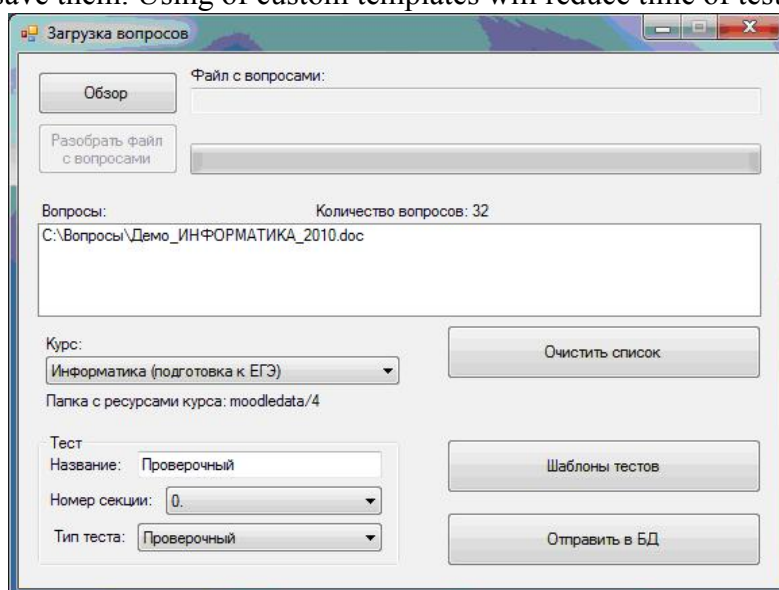
Teacher and administrator can work with the program only if he has the permissions for access to learning content. To get the permissions he need to go authorization procedure: set site address, database name, login and password (Picture 6).



Pict. 6. User authorization window

If authorization passes succeed, a loading questions window is opened. It is necessary to choose course for created test (i.e. “Informatics”) from list in this window. If user presses button “Parse file with questions”, program analyzes document and add questions in list (Picture 7). After choice and succeed loading of questions user can create tests. User should set up test – input test name, choose course and section number in course, and also test settings template. There are two template by default – “Training” (test is in learning mode) and “Control” (test is in control mode).

User can create custom test settings template using form “Detailed settings” (Picture 8) and save them. Using of custom templates will reduce time of test creation.



Pict. 7. Window for question and previous test setting

Teacher (course designer) can define different restrictions for working with test: beginning and ending of test, time delays between attempts, quantity of attempts, password for access, access only from definite net addresses. Teacher can create comments to individual answers and to all test according to different conditions. When student passes the same test again, system can consider his previous answers. Learners can do test in several approaches within one attempt. Test tasks and answers variants can be automatically mixed with every new attempt. If task is changed test can be overestimated.

Pict. 8. Detailed test settings

Software tools used in development of programs' complex for creating content contains the following environments and technologies:

- Microsoft Visual Studio 2010 environment and programming language C# 4.0;
- Technology for data access Microsoft ADO.NET;
- Official libraries MySQL for C# .NET.

In conclusion it is worth noting that applying these programs will allow significantly reduce time, which teacher spends for forming and management of learning content.

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THE APPLICATION OF MULTI-AGENT APPROACH BY THE DEVELOPING OF INTELLIGENT TUTORING SYSTEM

Semenova, N.G., Krylov, I.B.
FSBEI HPE «Orenburg State University», Orenburg

In this work mathematical design methods of individual tutoring route were analyzed which are used by intelligent tutoring systems developing. It's proved the necessity of multi-

agent approach application by intelligent tutoring system developing. The structure of multi-agent system and intelligent agent of individual tutoring route forming is shown.

Key words: intelligent tutoring system, multi-agent approach, intelligent agent.

Modern stage of educational system development is connected with adoption of electronic learning resources into the teaching situation providing adaptive control of teaching cognitive activity. In connection with this, intelligent tutoring systems (ITS) [1] begin to dominate among electronic learning resources.

The key role by ITS developing together with choice and reason of structure plays mathematical method choice and design algorithms developing of individual tutoring route in ITS. In connection with this it's important to analyse the existing methods used by ITS developing. In this work it was tried to classify ITS according to mathematical methods usage and to prove the choice of approach and mathematical method for adoptive control of teaching cognitive activity [1] in ITS of engineering discipline. It's necessary to notice that the choice of mathematical method of ITS is defined by technology organization of trainee's teaching cognitive activity. In this work [2] the ITS was classified according to following types of used technologies:

- sequence of course building;
- intelligent analysis of trainee's answers;
- interactive assistance in problem solving;
- problem solving assistance based on examples.

The use of mixed technologies based on integration of above mentioned becomes more practically important nowadays.

Due to the analyses of mathematical methods [3] used in ITS we pointed out four groups.

To the first group belong mathematical methods used the fuzzy sets and fuzzy logic theory. Intelligent tutoring systems developed with this group mathematical methods appliance use the technology of sequence course building and intelligent analyses of trainee's answers. The key role in realization of described technologies in ITS of this group plays fuzzy control module including rule base and realizing fuzzy inference algorithm. The most popular fuzzy inference algorithms are algorithms Mamdani and Sugeno including stages of fuzzification, logical derivation, composition and defuzzification. As input linguistic variable are used levels of midline rating, total rating, the quantity of provided prompting and other and as output linguistic variable - complexity of information narration, final grade and other. The definition of linguistic variable is realized as:

$$\langle \beta, T, U, G, M \rangle \quad (1)$$

where β - linguistic variable name (noun); T - its range space which are fuzzy variables nouns with U range of definition; G - syntax procedure that can manipulate term range T elements particularly generate new terms; M – semantic procedure allowing to transform every new linguistic variable term made by G procedure into fuzzy variable.

Peculiarity of these ITS is adoptive course building considering linguistically undefined characteristic of trainee's knowledge level. Disadvantages of these ITS is the difficulty of fuzzy logic algorithms parameter selection for teacher who hasn't got enough work experience with such systems. ITS based on mathematical methods used fuzzy sets and fuzzy logic theory is developing by Sarvilina I. Y., Zar Ni Khlaing and others. To this group of ITS is also referred ITS developed by the author of discipline "Basis of Control Theory".

To the second group of mathematical methods realizing ITS work belong methods based on the theory of expert systems realizing technologies of course building sequence and trainee's answers intelligent analyses. Advantages of such ITS is wide choice of explanation

of made decisions and manipulation analyses made by expert systems. Disadvantages of such ITS is complexity of thin intelligent database setup intending high competence of all experts. The most popular model of knowledge representation in such ITS is production model. In general the production model can be represented as:

$$i = \langle S, L, A \rightarrow B, Q \rangle, \quad (2)$$

where S - situation class description; L - condition under which the product is activated; $A \rightarrow B$ - production main body; Q - production rule post condition.

On the basis of expert systems theory following authors ITS were developed: Sukhanova M.V., Petrov K.K., Rybina G. V., Semenov A. V.

The third group of ITS mathematical methods includes mathematical apparatus of image discrimination theory. Third group ITS uses the technologies of interactive support in problem solving and sequence course building. The presented group of mathematical methods solves classification problems in ITS for example the division of trainees into forms according to knowledge level. Following authors are working on developing of such ITS: Zhukovskaya N.K., Karpova I.P., and others.

The fourth group includes mathematical methods based on theory of genetic algorithm or neural networks. The presented class of ITS mostly uses the technology of intelligent analyses of trainee's answers. Among peculiarities of this ITS we can mark its wide usage in problems of adoptive knowledge testing especially generation of test and knowledge evaluation. In case of usage of neural network algorithms the developers of ITS have to solve some choice problems: most optimized types of nets, activation functions, ideal net structure, net teaching method. The most popular type of nets by ITS developing is multilayer perceptron and as teaching method they prefer the easiest method of back propagation of error [5] where minimized object function of error estimated by formula:

$$E = \frac{1}{2} \sum_{j=1}^{k_N} (y_j^{(N)} - d_j)^2, \quad (3)$$

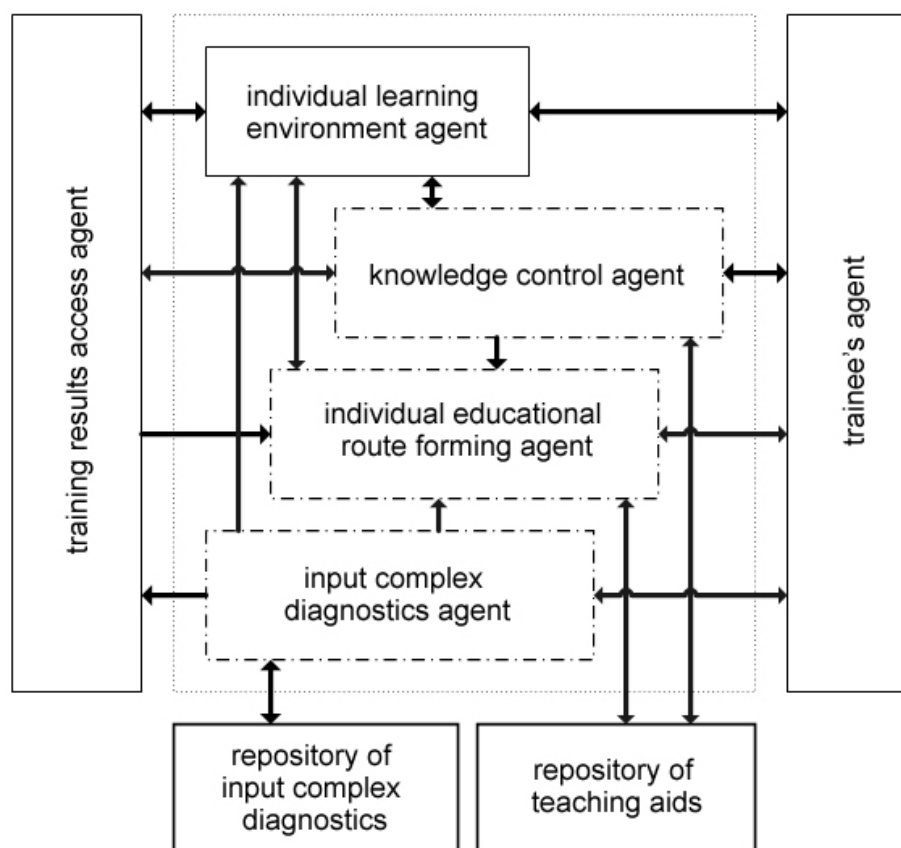
where k_N - number of neurons net output layer; $y_j^{(N)}$ - value of output of neuron with number i in output layer (N); d_j - desired output with number j .

The disadvantages are absence of tried and true method of taken decisions in neural nets explanation and the problem of genetic algorithm convergence. The authors developing ITS on genetic algorithms or neural nets are Zhuykov V.V., Titov A.M., Daragan A.D. and others.

In spite of all above mentioned groups of mathematical methods advantages none of them has possibility to move closer the program realization by ITS to natural learning process excluding subjective mark based on teacher's human factor. To solve this problem it's offered to use multi-agent approach [6] intending the use of complex of intelligent agents for adoptive control of learning cognitive activity in ITS based on integration of above mentioned mathematical methods. Agents – are autonomous objects that can react unassisted on external events and take the appropriate actions. The important character of multi-agent approach is external environment presence where agent can interact but can't control it and that's why the agent must be ready that its taken actions won't take effect. It follows that multi-agent approach is used in such systems where there isn't pointed system operation algorithm but there are work and collaborative mechanisms of separate system components. Following authors worked on developing of teaching systems based on multi-agent approach: Kravchenko Y.A., Udaltsova S.V., Shedrina A.A., Lazyrin E.I., Zaytsev E.I. and others.

As stated before, the prime aim by ITS developing is choice and justification of structure and also selection of mathematical methods and developing of planning algorithms and tutoring process organization in ITS. The ITS structure based on agents use is shown on

picture 1. This structure was developed according to ITS structure reviewed in work [1]. The proposed structure includes 6 agents with different architecture: agent of input complex diagnostics, forming of individual educational path, knowledge control, personal learning environment, access to trainee's learning results.



Pic. 1. ITS structure according to multi-agent approach

The work [7] presents following classification of agents architecture:

- architectures based on principles and methods of artificial intelligence;
- reactive architectures based on behavior and reaction on external world events;
- hybrid multilayer architectures based on behavior and methods of artificial intelligence.

To the agent architectures based on artificial intelligence principles belong architectures built according to production system, classifiers, hierarchic knowledge base and others. The main advantage of listed architectures is intelligent subsystem availability, forming intelligent component of agent. The disadvantage is absence of modeling subsystem allowing the prediction of agent behavior.

Reactive agents and architectures are agents and architectures that don't have detail view about trainee and separate agents and the whole system functioning is made by such rules as situation – action. Under the situation they understand compound combination of internal and external state of ITS. The main advantage of this group of agents' architecture is well-developed analyses subsystem and reactive subsystem that determines agent reaction on trainee's actions and also there is agent collective cooperation subsystem. The disadvantage is the absence of modeling and prediction subsystems.

Hybrid architectures can combine the possibilities of above reviewed architectures joining all their advantages. That's why it's currently traced the tendency of developing of

hybrid agent architectures and systems including in functional structure the modeling subsystem that allows realizing the mechanism of agent behavior prediction. As a result, for the implementation of the agent design individual educational trajectory was chosen InterRRaP-architecture, the intellectual component agent is designed based on fuzzy neural network of Takagi-Sugeno-Kang, learning using genetic algorithm.

As fuzzification functions defining membership of the input value to the corresponding fuzzy set, for all rules of the first layer it's proposed to use the generalized Gauss function:

$$\mu_{A_i}^k(x_i) = \frac{1}{1 + \left(\frac{x_i - c_k^i}{\sigma_k^i} \right)^{2b_k^i}}, \quad (4)$$

where c_k^i , σ_k^i , b_k^i – trained parameters of the generalized Gauss function.

Therefore, this work presents the analyses of mathematical methods and technologies used for developing of ITS algorithms functioning. Proposed: for ITS developing to use multi-agent approach based on hybrid agent InterRRaP architecture; as a subsystem of intelligent agent component projecting the individual educational route of teaching to use fuzzy neural network of Takagi-Sugeno-Kang.

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THE MULTI-LANE SIMULATOR FOR TRAINING OF SPECIALISTS ON CONTROL OVER RADIOACTIVE MATERIALS

Solovev, D. B., Shadrin, A. S.

Far East federal university (FEFU), Vladivostok

This paper shows the potential of using new information technologies for advanced training of customs officials in customs control of fissile and radioactive materials. As a new information technology, author offer a computer simulator emulating operation of fixed customs systems to detect fissile and radioactive materials “Yantar”. The developed concept of such simulator will make it possible to considerably raise the level of practical and laboratory works in customs control of fissile and radioactive materials.

Keywords: computer simulator, information systems, information technologies for advanced training, radiation portal monitors (RPMs).

The training of the customs authorities’ experts in the operation and use of YANTAR radiation portal monitor (RPM) is performed at the Training Centers (TC) for the CCFRM (Customs Control over Fissionable and Radioactive Materials) within the framework of the specialization courses and provides for the various degrees of training, depending on the training program (from those users responsible for the operation and use of the RPM to the ones able to make the malfunction diagnosis). Those training centers holding the courses in question have several copies of different types of such systems. The training groups of such courses usually include 15-24 people and the duration of the practical training with such type of the system is up to 50 hours. To provide every listener with an opportunity for the practical learning of all YANTAR RPM models being used, their number should be increased up to 5-12 units. It is quite difficult to create such conditions, taking into account the high cost of these systems, a diversified model (product) range, a need for the adjustment and maintenance of the complex system to be suitable for each group of listeners.

The best way to solve this problem is to create a computer program able to imitate the operation of the aforesaid systems [1-3]. Such program (hereinafter referred to as the Emulator) would allow a course participant to model various running processes in the course of the YANTAR system operation and to gain knowledge and experience required for working with the real systems under the real conditions.

One of the advantages for the computer implementation of the practical training in YANTAR RPM is an opportunity for holding the workshops according to the frontal method. Usually, the sequence of the practical works performed by the participants (listeners) can hardly coincide with the sequence of laying out the material at the lecture classes. A simultaneous performance of the same work by all listeners requires a great number of the panels or automated workstations connected to the YANTAR system. This cannot be done because the traditional (standard) software of the Automated Complex of Control over Fissionable and Radioactive Materials (ACCFRM) of the YANTAR system is single-user (which complicates the simultaneous work of several listeners), as well as it is impossible to hold practical training in the ACCFRM and Target Indicating Switch-On Panel (TISOP) (as their joint operation is not provided in the YANTAR system). Such problems can easily be solved with the computer emulator – different work can simultaneously be performed on several computers operating independently from each other.

This article regulates the requirements to the hardware and software tool of training the customs authorities’ officials (CAO), i.e., to the full-scale Emulator of the Automated Complex of Control over Fissionable and Radioactive Materials (ACCFRM) of the YANTAR system, subject to introduction into operation at the Training Centers of CCFRM.

The purpose of creation of the Emulator is the obtaining of an opportunity for the efficient training of the customs authorities' officials in working with YANTAR RPM and processing the incoming information with the help of those devices being really used at such checkpoint from where a trainee has come from.

The Emulator is designed for training the groups of the CAO responsible for the use of the ACCFRM to the full extent of their activity or one specialist (expert), whose activity is carried out at a certain checkpoint.

The Emulator must serve as a hardware and software tool for the professional and full-scale training of the CAO, meeting the job requirements to the personnel and the training methodologies serving for the conduct of trainings with a further analysis of the training results, ensuring the control over the trainees' activity and designed for forming their professional skills, ability to make and implement the decisions on management of the ACCFRM on the base of YANTAR RPM in the management online conditions determined by the requirements of the Federal Customs Service of Russia.

The Emulator must, to the full extent, model the operation of the equipment and auxiliary systems of automation of the ACCFRM, the changes of modes related to the actions of the automatics and the Operator of the ACCFRM on the base of YANTAR RPM.

The Emulator must also have an opportunity for being used as a versatile analyzer of the CAO's response in certain cases at the State Border checkpoints.

The final result of work will be an operable full-scale computer Emulator of the ACCFRM on the base of YANTAR RPM.

The following issues must be solved with the Emulator:

1. Training the customs authorities' officials in the information processing with such panel as TISOP-1, YANTAR RPM ACCFRM and the Departmental Automation Management Information System of Quick Response to Detection of FRM (DAMIS);
2. Acquisition of skills for the YANTAR FCFRMDS application in the course of customs control over FRM;
3. Acquisition of skills for the maintenance arrangement and performance, as well as for the detection of potential malfunctions of YANTAR FCFRMDS, elements of the ACCFRM and DAMIS.

In Training Centers for the CCFRM the content of the Emulator package resources was developed and justified. As a basis of the package building ideology, the principle of creation of a system of the emulators was proposed (the Emulator general program DEBLOCKS data from the specific independent applications – see Fig. 1) which are loaded on the server system resources and used in the collective and individual access mode. The functional framing of the Emulator supports the remote access functions and contains the interface modules that ensure an interactive dialogue with a user. Thus, the Emulator package software and hardware resources are being formed, allowing for the arrangement of a set of the electronic training modules. In their turn, the sets of the electronic training modules are the functional basis for forming the information resources in the form of the base of the drawing and text documents containing the theoretical courses, analytical reviews with descriptions of various YANTAR RPMs models, the methodologies of conducting practical and laboratory works, the scenarios of performance of the basic laboratory works, the laboratory courses, etc.

The Emulator should be a program that processes simultaneously the information from several independent modules (the connection between the modules is functional and logical) which would allow to avoid any failures in the program operation and facilitate the management of the Emulator in the course of its use during the training cycle. It is necessary to create 10 (ten) basic electronic training modules that would contain the information

gathered by the logical principle in the form of the distributed database. The structural diagram of the Emulator models is shown in Fig. 1.

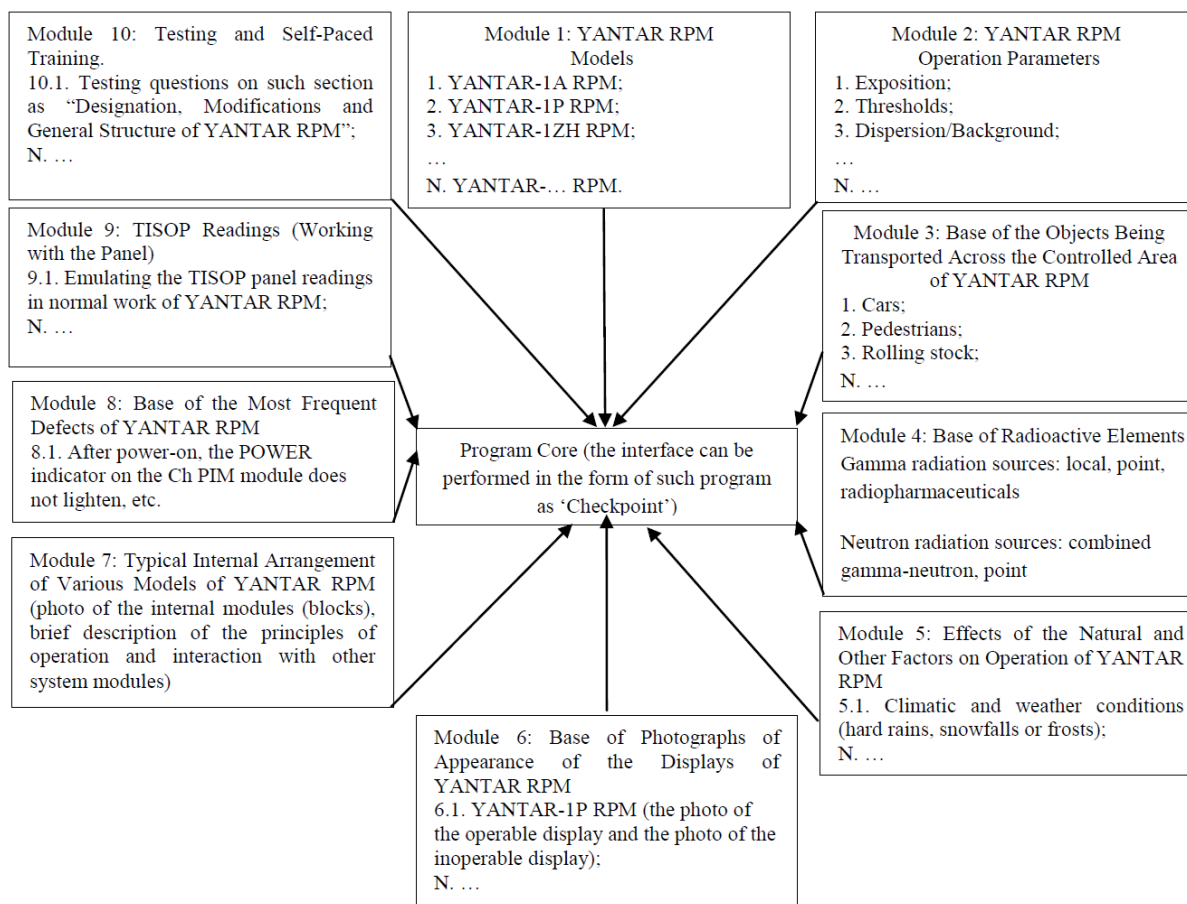


Figure 1: Structural Diagram of the Training Modules of the AWS Emulator of YANTAR RPM

Methodology (Algorithm) of Work with the Emulator

The work with the Operator Workstation Emulator of YANTAR RPM mean the following 4 (four) categories of users: 1) *Start Level Users* (who have no experience in working with YANTAR RPM); 2) *Mid Level Users* (experienced in working with the Operator Workstation and TISOP of YANTAR RPM); 3) *High (Professional) Level Users* (experienced in working with the Operator Workstation and TISOP and basically trained in diagnosing such system as YANTAR RPM); and 4) *Trainer User* (who manages the training process with the Emulator).

The load of each type of users should be determined before startup of the program core itself (randomly or under instruction of a trainer holding a training session with the use of the Emulator), i.e., before the program startup, a dialog window with the user's level request appears.

Depending on a level chosen by the user, the program core loads various modules, adjusting, therefore, the emulated task complexity. The example of the Emulator operation for the first type of users is given below (each operation algorithm for all types of users will be described in detail in the final technical assignment for the Emulator):

1) *Start Level User* – Modules 1, 2, 3, 4 and 9 are to be loaded.

From Module 1, a certain model of YANTAR RPM is to be selected (Let us assume that YANTAR-1A RPM and YANTAR-1P RPM have been selected. Thus, the user will see

the standard interface of such program as ‘Checkpoint’ or the interface analog in the DAMIS (Departmental Automation Management Information System) in which only two displays will be shown (the pedestrian and the automobile ones)). With the help of the Module 2 data, the constants (parameters) of operation of each of YANTAR RPM are to be set (the data of the setting parameters of each YANTAR system are to be extracted by a double click of the right mouse button on the display emblem in the ‘Checkpoint’ program). The object to be transported through the cross-section of the emulated YANTAR-1A and YANTAR-1P RPM will be selected with the help of Module 3 (for example, for the automobile portal display such object as *Light Motor Vehicles* is selected (the photo and video information about the object – a light motor vehicle – is to be randomly selected out of the Module 3 database). For the pedestrian display, such object as *Man with Luggage* is chosen (the photo and video information about the object – the man with luggage – is to be randomly selected out of the Module 3 database). The example of the information about the object being displayed is given in Fig. 2. The source detected with the object is selected out of Module 4 (for example, in a light motor vehicle – Plutonium (Pu) 239, and with the pedestrian – the Calibration Sources (Americium (Am) 241, Barium (Ba) 133, Bismuth (Bi) 207, Californium (Cf) 252, Cesium (Cs) 137 and Cobalt (Co) 60). In case of necessity (or when executing such practice as “Processing and Analysis of the Results of Control by YANTAR RPM” via TISOP), from Module 9, the TISOP readings are to appear, when transporting the objects with the ionizing radiation sources across the controlled space (cross-section) of the YANTAR-1A and YANTAR-1P RPM being emulated (the example of appearance of the panel and its readings is given in Fig. 3.).

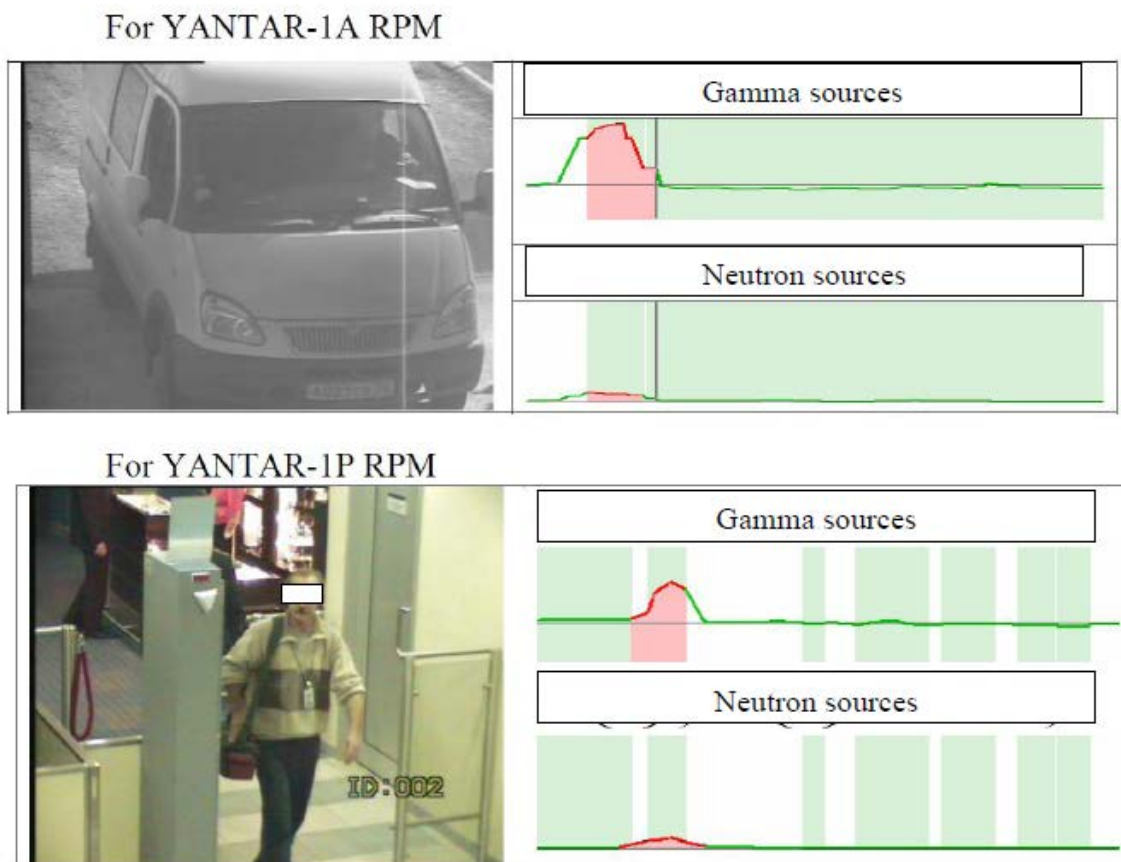
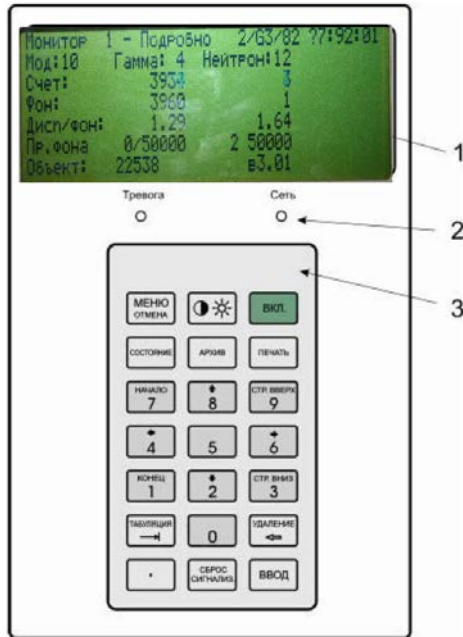


Figure 2: Examples of the Extracted Information about the Objects



1 – LCD; 2 – LED indicators; 3 – functional keyboard block.

Figure 3: Front Panel Appearance TISOP

In the future, a trainee must make the algorithm of actions established by the FCS (Federal Customs Service) of Russia in case of operation (response) of the portal displays (the algorithm is given in Fig. 4.).

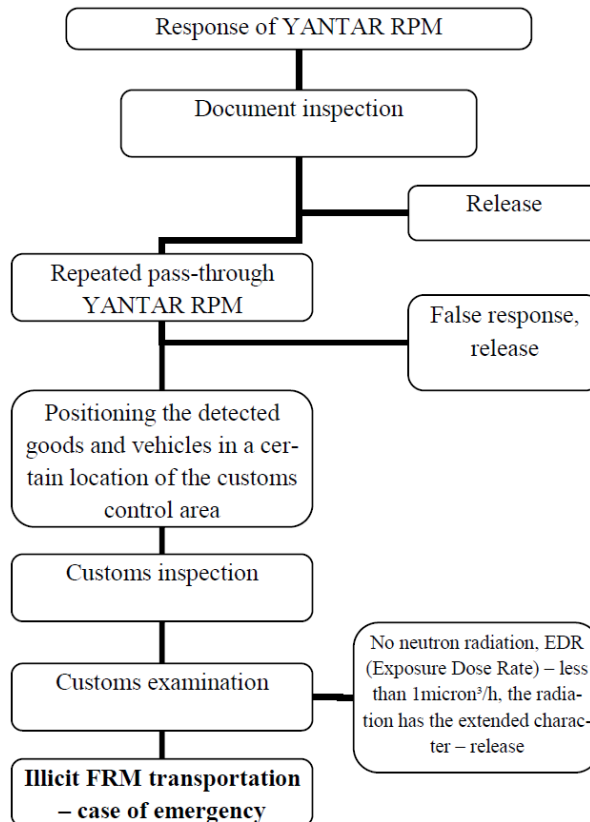


Figure 4: Diagram of Actions of the Officials of the Russia Customs Authorities in Case of the Fixed Radiation Display Response

Such action as ‘Document Inspection’ is to be made under instruction of a trainer holding a training session (the trainer provides the listeners with the samples of documents based on the analysis of which a listener concludes that it is necessary to let the object with the ionizing radiation source go or to proceed with carrying out customs control). Such action as ‘Rescanning’ results in a single-type portal display response (like in the first pass of the object through the cross-section). After that, the listener carries out the complete customs inspection procedure and fills in the electronic protocol.

2) The *Mid Level Users* – Modules 1-6, 8 and 9 are to be loaded (the information about the effect of the natural and other factors on operation of YANTAR RPM and the appearance of the portal displays is to be added).

3) The *High (Diagnostics) Level Users* – Modules 1-9 are to be loaded (the information blocks for the technical diagnostics of YANTAR RPM on various grounds are to be added).

4) The *Trainer User* – Modules 1-10 are to be loaded (an opportunity for loading the individual system of testing every lower level user is to be added).

The modularity of performance of the Operator Workstation Emulator of YANTAR RPM allows for making the practical work performance multi-optional (the options of combinations of various practical works are calculated by hundreds of potential different combinations between the models of YANTAR RPM, constants (parameters) of their operation, the type and activity of transportation of the ionizing radiation source and the object, on whom the portal display has responded). The easiest way to ensure the modularity of performance of the Emulator with the help of such programming language as Delphi combined with the object database programming language.

To facilitate the work with the Emulator, it is necessary to develop a number of the versatile (typical) laboratory and practical works rooted in the form of the formed algorithms (scenarios) of interaction between the modules (different combinations of the parameters included in the Emulator of the modules).

In future, the demonstration of operation of YANTAR RPM, performed with the use of the Emulator, will become one of the highlights of training, the source of knowledge and rich data to the listeners of the CCFRM (Customs Control over Fissionable and Radioactive Materials) requalification courses. The Emulator can either be used as the introduction to the lectures, or an illustration to the new material explanation, or a tool for acquiring the practical listeners’ experience in working with various modifications of YANTAR RPM (through TISOP or the Workstation), or as the control over the acquired knowledge, skills, i.e., at all training process stages. That is why some higher requirements are imposed on the opportunities for implementing various scenarios (laboratory and practical works) with the use of the Emulator.

The Emulator should provide for the following types of application of the scenarios:

Demonstrative: Takes place in the course of explanation (lecture) to illustrate the application of various models of YANTAR RPM, to demonstrate the principles of action of the portal displays, as well as to familiarize listeners (in brief terms) with the forthcoming practical or laboratory training session. To be prepared and implemented by the trainer only.

Frontal laboratory works: To be performed during a training session by all listeners, simultaneously, with the single-type equipment, under direct supervision of the trainer.

Workshop: Is a form of independent listener’s work. To be prepared in advance by listeners and performed under a written instruction (methodological recommendations).

Individual practical work: A kind of frontal laboratory or practical work. To be used for the theoretical knowledge actualization. To be prepared individually by the trainer for every listener (group of listeners), depending on the availability of the certain (specific)

models of YANTAR RPM at the listener's customs terminal (motor vehicle, railway, pedestrian or mixed type of the customs crossing point).

The master list of the scenarios of the frontal (laboratory and practical) works was set:
Start Level:

1. **Modifications of YANTAR RPM;**

The practical study of the features of different types of YANTAR RPM: YANTAR-1SN, YANTAR-2SN, YANTAR-1P, YANTAR-1P3, YANTAR-2P, YANTAR-1A, YANTAR-2A, YANTAR-1ZH, YANTAR-2ZH and YANTAR-1ZH2 installed at various customs entry points.

2. **YANTAR RPM: Work with TISOP;**

The acquisition of the skills in working with TISOP of YANTAR RPM

3. **YANTAR RPM: Work with the Workstation (such programs as 'Checkpoint', 'Management', 'Reports');**

The acquisition of the skills in working with the Workstation software of YANTAR RPM.

4. **YANTAR RPM: Work with the Workstation (the Workstation-DAMIS Programs);**

The acquisition of the skills in working with the DAMIS-Workstation software of YANTAR RPM.

Mid Level:

1. **General Structure of YANTAR RPM. Interaction of the Certain Blocks and Nodes**

The practical study of the blocks and devices of various modifications of YANTAR RPM;

2. **Processing and Analysis of the Results of Control by YANTAR RPM via the Operator Workstation and TISOP;**

The training of skills in working with YANTAR RPM via TISOP and the Workstation with the standard software.

3. **Processing and Analysis of the Results of Control by YANTAR RPM via the Checkpoint Workstation and DAMIS;**

The training of skills in working with the DAMIS software; the features of setting various modes of operation of YANTAR RPM and the primary dialog windows of the program

4. **External Appearances of Malfunctions of YANTAR RPM**

The imitation of various malfunctions of YANTAR RPM and the observation on corresponding signals at the system racks, as well as on TISOP and CCFRM Workstation

High Level:

1. **YANTAR RPM: the Response Verification by the Neutron Channel;**

To study the YANTAR system response features by the neutron channel, using the radioactive isotope emitting the neutron flow, and other materials.

2. **Verification of the Potential Reasons for the False Response;**

To study the potential reasons for the false response of the operable YANTAR RPM, using the radioactive isotopes and other materials

3. **Verification of the Potential Reasons for Malfunction;**

Using various radioactive isotopes, to study the potential reasons for malfunction of the operable YANTAR RPM;

4. **Verification of Sensitivity of the Detectors of YANTAR RPM;**

Using the substitutes-imitators of plutonium and Uranium 235, to verify the system sensitivity to detection of the minimum quantity of U^{235} and Pu^{239}

5. Potential Reasons for Failure in Operation of the Neutron and Gamma Radiation Detecting Blocks;

The execution of the practical tasks on detection of the reasons for failures in operation of the neutron and gamma radiation detecting blocks by an advance replacement of the operable detectors with the inoperable ones; the training in features of diagnostics of malfunctions of the detectors of YANTAR RPM.

6. Diagnostics of Malfunctions of the Automated Complex of Customs Control over FRM on the Base of YANTAR RPM, with the Help of the Workstation Software;

The training in the action algorithms used when testing the operability of YANTAR RPM. The training in search of malfunctions of the communication channels and the video surveillance system

7. Potential Reasons for Failure in Operation of the Electronic Blocks of YANTAR RPM;

The execution of the practical tasks on detection of malfunctions in the electronic blocks and the detection of the reason for such malfunctions

8. Procedure for Diagnosing and Testing YANTAR RPM.

The external inspection of the displays of YANTAR RPM; the verification of the current condition of the YANTAR RPM complex; the verification of registration of responses of YANTAR RPM.

The scenarios of the frontal laboratory work are divided into the following three levels: 1) *Start* (designation: the initial training of listeners, the principles of work with YANTAR RPM); 2) *Mid* (designation: the study of the principles of work with YANTAR RPM, the drawing-up of the electronic protocols, the acquisition of the primary skills in diagnostics of the portal displays; 3) *High* (designation: practical skills in maintenance and diagnostics of serviceability of various modifications of YANTAR RPM).

'Testing and Self-Preparation' Module

The testing module is designed for the integrated control over the listeners' progress. At that, this section of the Emulator must solve the following issues:

1. To take the complexity of the tests into consideration;
2. To form the testing result after holding the testing procedure;
3. To use the technology of creating the database required for the integrated information collection after the testing procedure.

The following subsections should be included in the main menu of the testing module:

1. Program setting;
2. Testing;
3. Log;
4. Exit.

The work with the testing module starts from the determination of settings. The filling of settings can be performed in a dialog window.

In such tab, the settings should be placed, allowing for setting such parameters as:

1. Setting of the testing time – that allows for setting a certain period of time to be provided for the testing process;
2. Number of the questions loaded – A user can set the maximum quantity of the tests (testing tasks) to be loaded and used in the testing process;

• Creation of password – Here a user may create a password to set a limit to the access to the program settings, the log viewing, etc.

To start the testing, it is necessary to make a transition to the form of the initial data input.

Then, it is necessary to enter the input data – the full name, the requalification program name, etc. After that, a test job should be selected out of the job list. The test job list is to be created by adding a test job file to the initial program directory, with the *.rtf extension which contains the test jobs themselves.

When selecting a test job, the answer file with the *.txt extension and containing the correct answers to the test jobs is to be automatically loaded. The answer file is also to be added to the initial program directory and must have the full name of the test file, including its extension. Otherwise, it is impossible to load the test job correctly.

Then, after the test job is loaded, an automatic transition to the form of the testing procedure takes place.

In the course of the testing procedure, a listener has an opportunity for transportation between the job numbers: to the first, previous, next and last one, as well as for transiting to those jobs not answered yet.

The testing results are to be processed with the help of the log.

The testing module log should allow for reviewing the testing results. In case of necessity, a more detailed viewing of a certain record is possible which provides a more complete acquisition of the data on the result of testing a certain one being tested. It should contain such data as:

- Listener's answers (i.e., those answers provided by a listener) (?);
- Correct answers – Here the data on the correct answers only, obtained in the testing process, is shown;
- Answer file – Here the data on the answer file containing the correct answers to those questions raised for the testing is shown;
- Record deletion from the database – Such operation allows for deleting the selected record from the database table;
- Database formatting – Means the complete destruction of the data in the structure of the tables;
- Report is a file containing the data similar to the one obtained as a result of execution of a query to the database.

The testing program being developed should take the complexity of the test jobs into consideration and form the results of the testing held.

All test jobs should be divided by the thematic sense, depending on the subject being studied at the CCFRM requalification courses:

1. Designation and principle of operation of YANTAR RPM;
2. General structure and interaction of the blocks and nodes of YANTAR RPM;
3. Working with TISOP of YANTAR RPM;
4. Working with the Workstation of YANTAR RPM;
5. Working with the DAMIS of YANTAR RPM;
6. Maintenance and external appearance of defects of YANTAR RPM;
7. Diagnostics of malfunctions of YANTAR RPM with TISOP;
8. Diagnostics of malfunctions of YANTAR RPM with the help of the Workstation.

Each of the testing module sections should contain at least 50 test questions.

An extended description of the testing system in the Emulator will be provided in the final technical assignment.

It is obvious that the Workstation Emulator of YANTAR RPM, performed in the form described above, may be a laboratory training and reference complex. Therefore, it is necessary to work out the training instructions on implementing the themes of the frontal

laboratory and practical works, as well as the methodological instructions on working with the exercise constructor. There will be a need in working out an interactive reference system on all models of YANTAR FCFRMDS, prescribed in Module 1 (Fig. 1) and the base of radioactive elements, prescribed in Module 4 (Fig. 1).

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JANUS:LEARN MATHEMATICS ONLINE!

Shagin, V. L.

Higher School of Economics, Moscow

«JANUS » is a training program in mathematics for schoolchildren (8-11 class), worked out by Vadim Shagin (Higher School of Economics, Moscow).

Distance learning program «JANUS» (<http://yanus.net.ua>) is designed to teach schoolchildren at a higher level of educational process and works in two modes: a) self-learning mode, and b) mode of joint teacher - pupils work.

Keywords: distance learning, elementary mathematics, financial mathematics

If you are a pupil, the program will help you to prepare for the exam, and to raise your level of knowledge of the subject. Training program «JANUS» has the original algorithm , which is able to eliminate the knowledge gaps. The program itself will guide pupils, taking into consideration their weak points.

If you're a teacher, you will be able to explain your pupils how to learn faster and better. And they will be happy to do their homework on the computer. You do not need to check their papers - you will monitor pupils work through a computer log that program creates automatically at your request. Submitted variants of tasks of different complexity (and their solutions) are used for conducting tests and examinations.

Distinctive features of «JANUS »:

The program is interactive - it leads pupils in the subject and selects the problems most critical for them. Both correct and incorrect solutions are stored by the system and can be used while repeating the curriculum.

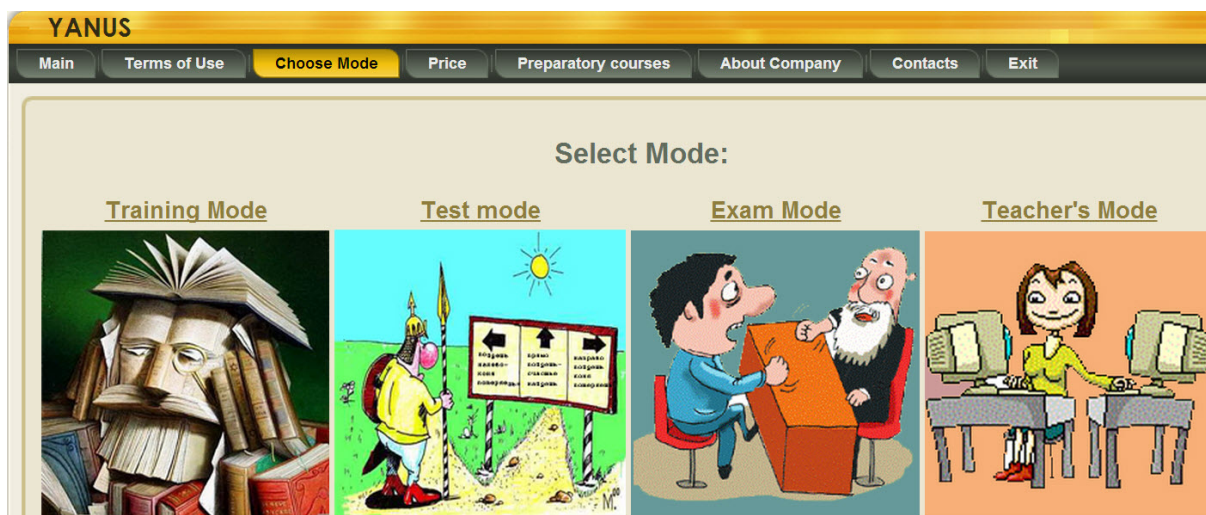
When addressing the problems, the system each time creates a problem with new data so that a pupil cannot "get used" to the problem situation and guess the answer. Each reference to the problem will require a new solution.

The system is aimed at pupils and teachers, facilitating both parties in the learning process.

Program functions by connecting via the Internet that protects it from unauthorized copying.

User-friendly interface (the ability to "spy" solution to a similar problem and turn to the right chapters in a textbook) leads to better understanding of the subject (from practice - to theory).

This program includes four modes:



The first three modes are mostly for pupils but teachers also can use it, the last mode is only for teachers. In the mode of exam teachers and pupils come in different ways: teachers prepare the examination material, and pupils take an examination on the problems given to them.

In our system the problem, as the object of learning is something more global than the problem that you used to see in a textbook. The text of the problem consists of the constant part of - an immutable text, and a variable part - it is a formula (equation, inequality, numbers, etc.) with variable coefficients. Coefficients are formed in accordance with the given algorithm by random-number generator, and will change each time you generate the problem. Thus, one and the same problem, generated twice or on different computers will look different and have completely different answers.

Problem can be represented in the form of a test or a number. The test form suggests choice of the one right answer out of four. Numerical form suggests answer as decimal fraction. Some problems might be presented only in a test form, while others- only in numerical form. At the same time, there are problems that might be represented in both forms. In such problems, one can choose the form of representation by switching in the upper right corner of the page displaying the problem. The display format can be set globally, while choosing topics or problems, as well as preparing of the exam material by the teacher. (Then, the priority will be selected form mapping problems.)

In solving any problems teachers and pupils will face with the concept of the rating task. What is it? Rating task - is the level of knowledge of the given problem that show your pupils. When they have accumulated experience in solving problems of a theme or a variety of topics, you can test them using the test mode. In forming of test the system takes into account the ratings tasks. The lower the rating task, the more frequent this problem will occur in the test. Thus, the system itself is set to teach pupils, identify their weak spots and work over. If a pupil study with a teacher in accordance with our program, the later includes him in

the group and keeps tracking of all rating tasks in the group journal. Thus, the teacher will always see all weak spots and help to eliminate the gaps in the knowledge of the group.

Training Mode

In training mode you can select the section and subsection of the topics that you are interested in.

The screenshot shows the YANUS website interface. At the top, there is a navigation bar with buttons for 'Main', 'Terms of Use', 'Choose Mode', 'Price', 'Preparatory courses', 'About Company', 'Contacts', and 'Exit'. Below this, the 'Choose topic:' section is expanded to show a tree structure of topics. Under 'Algebra', there are several sub-topics, with 'Rational equation' highlighted by a red arrow. To the right, the 'Training Mode Task Format' section shows two radio buttons: 'test' (selected) and 'numeric'.

Following the link you get to the mode of problem selection of different difficulty levels. And finally, you get to the window where you can see the problem solution.

[Back](#) [Back to Themes List](#)

Tasks for levels of complexity, indicating your personal rating:

Theme: Linear and quadratic equations

Level A		Level B			
Task	R	Task	R	Task	R
<u>1</u>	9	<u>1</u>	3	<u>7</u>	4
<u>2</u>	2	<u>2</u>	0		
<u>3</u>	5	<u>3</u>	4		
<u>4</u>	1	<u>4</u>	2		
<u>5</u>	1	<u>5</u>	7		
<u>6</u>	1	<u>6</u>	0		

On the screen you see the text of the problem as a test, where only one answer out of four is correct.

Generate task

Rating Tasks (in database): 9
Rating Tasks (in session): 0

Task complexity level: lev.A


If one of the roots of a quadratic equation $-6x^2+29x+c = 0$ is -5 , the second root is

A	B	C	D
1/6	59/6	-59/6	-1/6

Choose the correct answer:

<input type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C	<input type="radio"/> D
-------------------------	-------------------------	-------------------------	-------------------------

Confirm choice



[Show an example of solving a similar problem](#)

[Theory Link](#)

To solve this problem you need to choose one answer and press button "confirm". The system will notify you if you solved the problem or not. You can solve this problem over and over again by clicking the button to generate a problem. "Each time you'll see the same problem, but with different input data. Accordingly, the answers will also be different. For this reason it will be useless to remember the correct answers. If a pupil needs an example to solve the problem, he will have to click on the link "Show an example of solving the problem," and explanation will follow.

[Hide example of solving similar problems](#)

[Theory Link](#)

One of the roots of a quadratic equation $5x^2 - 9x + a = 0$ is 4. Find the second root.

Solution. By Vieta's theorem: $4 + x_2 = \frac{9}{5} \Leftrightarrow x_2 = \frac{9}{5} - 4 = -\frac{11}{5}$.

If the material is completely unfamiliar, the reference to the "Theory Link" will help:

Vieta's formulas applied to quadratic and cubic polynomial:

For the [second degree polynomial](#) (quadratic) $P(x) = ax^2 + bx + c$, roots x_1, x_2 of the equation $P(x) = 0$ satisfy

$$x_1 + x_2 = -\frac{b}{a}, \quad x_1 x_2 = \frac{c}{a}.$$

The top right of the problem you see data on its ranking in the session and in the database. Let us discuss this in more detail. Rating task - this is the level of knowledge of this problem that show your pupils. It is formed as follows. When you enter into some kind of problem the first time, your score for this problem is zero. In the case of the correct solution at the first attempt rating task increases by 1, and in case of incorrect decisions - reduces by 1. You can generate a problem many times and each correct solution will increase the rating by 1, and incorrect, accordingly, reduce by 1. In this way rating task in the session. will be

formed. You'll see it on your screen. When you are out of the given problem, its rating in the session will be kept in the database. Next time, when you are back to the problem your ranking in the session will be zero, and the rating in the database will be saved from the previous session. Thus, the rating of more than 5 means that you learned to solve this problem. In the context of the problems can be used tables and graphs:

Generate task

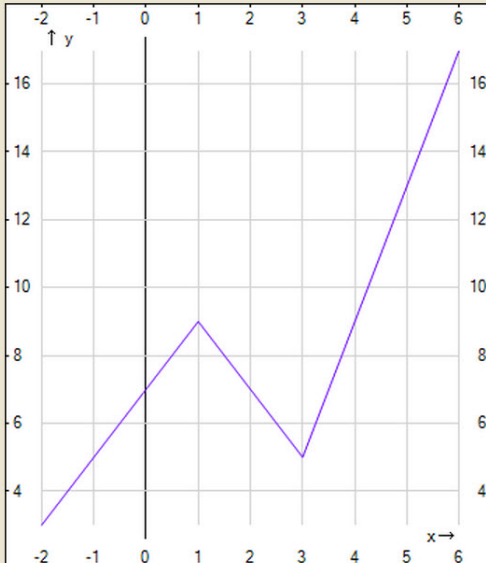
Task complexity level: lev.C Rating Tasks (in database): 4
Rating Tasks (in session): 0

For the function represented on graphic $y = a|x-1|+b|x-m|+cx$ to define parameters a, b, c и m . In reply to write down a remain from dividing by 4 numbers $|3a-2b-3c-3m|$.

A	B	C	D
0	1	2	3

Choose the correct answer:

A B C D



Testing Mode

Test mode is designed for pupils to check up knowledge on their own when they reach a certain level of training of some topic or set of topics. When using this mode they get to a page where they have to choose topics for testing. Each selected topic should contain the number of problems of one (or more) levels of difficulty. The system will select for pupils problems from the chosen topics, taking into consideration their ratings tasks. The lower the rating task, the more frequent it will occur in the test. Thus, the system itself is set to teach, identify weak spots and train pupils.

Select the partitions for testing, and then specify the number of tasks of each group selected partition. Number of tasks section shall not exceed the allowable maximum, shown on the right of number.

Test mode Task Format

test
 numeric

Algebra

Identical transformations of algebraic expressions

Algebraic equations and inequalities

Rational equation

Linear and quadratic equations Gr.A: Gr.B: Gr.C:

Entire rational equation. Multiplier expansion Gr.A: Gr.B: Gr.C:

Entire rational equation. Substitution method Gr.A: Gr.B: Gr.C:

Rational-fractional equations Gr.A: Gr.B: Gr.C:

Irrational equations

Equations with modules Gr.A: Gr.B: Gr.C:

After the selection of problems is made, it remains to click "Generate a test." **You find yourself** in a window of the test. There are a few presets that will help to bring the test to the regime of the exam, as much as possible. Each problem can be estimated in points depending on the level of complexity. You can specify them yourself or leave the default value. Besides, there is an opportunity to test on time or without taking time into account. The first option is to fix time for solving of each problem (depending on the level of complexity) or save the data by default.

So everything is ready for the test. You can press the "Test" button. There are problems of the selected sections.

Task №1(Linear and quadratic equations, A06) Rating Tasks (in database): 0
 Task complexity level: lev.A

Solve the equation $4x^2+24x+39=0$			
A	B	C	D
-3;3/4	1/2;	3;-3/4	∅
Choose the correct answer:			
<input type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C	<input type="radio"/> D

Task №2(Rational-fractional equations, A04) Rating Tasks (in database): 0
 Task complexity level: lev.A

Solve the equation $\frac{-4}{-3x-3} = \frac{3}{4x+5}$			
A	B	C	D
-7/11	-11/7	11/7	29/25
Choose the correct answer:			
<input type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C	<input type="radio"/> D

Task №3(Linear and quadratic equations, B06) Rating Tasks (in database): 0
 Task complexity level: lev.B

Lets x_1 и x_2 - the roots of a quadratic equation $3x^2-4x+1=0$. Write the given quadratic equation $x^2+bx+c=0$ with roots $-x_1-2x_2$ и $-2x_1-x_2$. In reply write number $4b-4c$.			
A	B	C	D

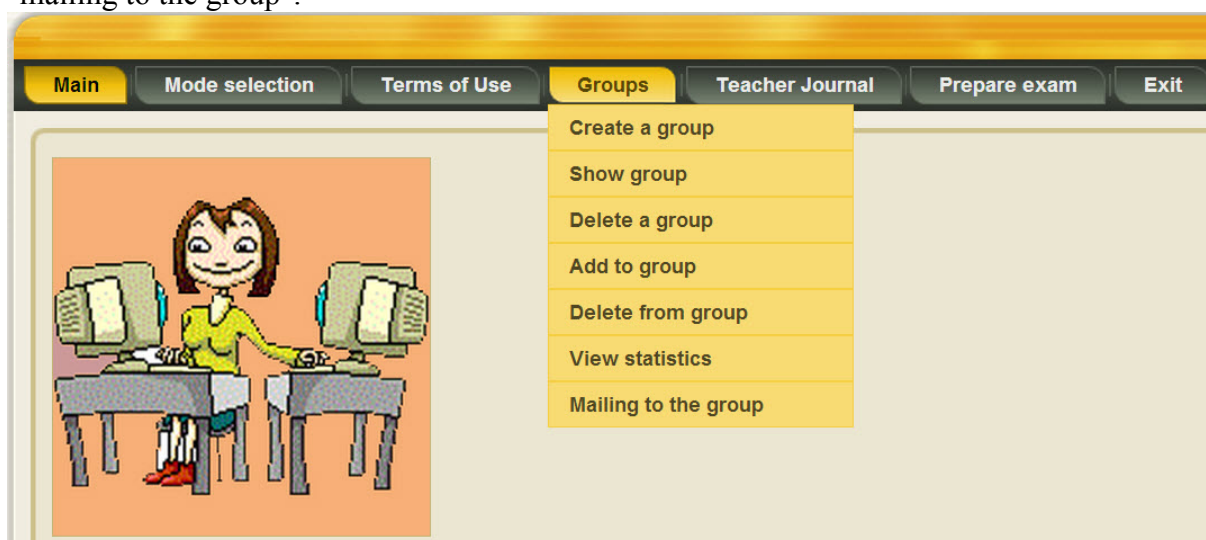
The test results appear in the Scorecard:

The results of the test:			
Task №	Result	Maximum # of points	Scoring points
1	+	1	1
2	+	1	1
3	-	2	0
4	-	2	0
5	+	2	2
6	+	2	2
7	-	2	0
8	+	2	2

Your scores = 8 out of 14 is 57%

The Teacher's Room Mode

This mode is designed for teachers. It allows you to recruit your own class (group) or several classes (groups) of pupils and monitor their learning process. To do this, go to the menu "group" and select one of his points: "a group" (if necessary you can delete the new group using the menu item "delete group"). Once the group has been created, you can add a group of your pupils, but first they should be registered in the system. To achieve this, two points were foreseen in menu: "add to the group" and, accordingly, "remove from the group". If you want to add pupils, you must know their username in the system or email address, which are registered in the system. There is one more point in menu of the "group" - "View Statistics" where teachers can view statistics for all pupils in their groups. They can send letters to all pupils of the group or individually selected pupils by choosing menu point "mailing to the group".



The most convenient and familiar way for teachers to work with the group of pupils - a class journal. For this purpose, a special menu item "journal" in which teachers can view the results of a pupil work or group as a whole, on each problem, topic, or all topics of the subject.

Group - 2013-1. Theme - Linear and quadratic equations

Surname	A01	A02	A03	A04	A05	A06	B01	B02	B03	B04	B05	B06	B07
АЗОВ	5	5	5	5	5	5	5	5	2	0	0	0	1
БРУТЯН	4	4	3	4	4	3	4	3	4	3	4	4	4
ДИСКИН	0	4	0	4	4	4	0	0	0	0	0	0	4
ЛИ	6	4	4	4	4	4	4	4	4	11	4	4	4
ТИХОНОВА	4	4	4	4	4	4	4	4	2	1	1	1	1

When a teacher gives one problem for the whole group of pupils to work at home or in class, everyone will have to solve it with his data and on his own computer, thus pupils will not be able to copy off the correct answer from each other. Computer, instead of a teacher, will check up pupils exercise books and place an assessment (rating tasks) for the work done by every pupil. Taking into consideration the assessment results, mentioned above, a teacher will be able to concentrate on elimination of knowledge gaps in the group of pupils.

This mode of operation in the classroom allows the teacher to determine how available, he outlined the theoretical material. One has only to give the whole class a practical problem on a new topic, and he can instantly see the percentage of pupils understanding of the material. And if it turns out that this understanding at the level of 50% or even less, the teacher will have to represent the material in accessible form.

The system JANUS we tried as much as possible to cover all stages of training and aims to facilitate this process as much as possible for both: pupils and teachers. The system allows different content items from any field of knowledge (economics, physics, foreign languages, history, etc.). And if you wish to advance the program with your own interesting ideas - we are eager to consider your suggestions and incorporate them into the appropriate section. Thus, the training program "JANUS" is constantly updated and improved.

ELECTROTECHNICAL LABORATORY

Kamaev, V.A, Isaev, A.V, *Mironov, A.Y.

*Volgograd, Volgograd State Technical University; *Light Yar, Branch of the Moscow State University of Technology and Management of Razumovsky K.G.*

The article describes the main provisions of construction and operation of modern electrical laboratory, presented the experience of its development and implementation. The variants of the expansion of its functional properties of the laboratory and into the use of its opportunities in distance education.

Keywords: electrotechnical laboratory, educational trajectory, an interactive educational platform, profile educational course, cognitive modeling.

One of the essential components of the training process, especially in the electricity sector is the opportunity to develop their practical skills with power and measuring equipment. The ability to "recognize" adverse operating conditions and electrical equipment, professionally respond to emerging threats are thus a requirement for professional portrait of modern energy. These characteristics of the modern professional competency can not be formed without mining practice techniques for working with real electrical equipment.

The presence in the higher school, in which trained specialists for operation and maintenance of electrical equipment, specialists in process automation and production, or

providing training in different directions, one way or another connected with the operation of electrical equipment, modern electrical laboratory is one of the criteria of the quality of training.

This article describes the experience of design and implementation of electrical training and laboratory complex (complex) based on cognitive and multi-agent simulation of technical systems [1] and its validation in the learning process.

The complex includes: a training laboratory stands designed for them technical documentation, instructional materials (textbook, a training wall charts, set educational presentations, mock workbook on laboratory work), power supply system with a control panel lab, complete set of multimedia equipment presentations.

Currently, the project is implemented by the Company is an innovative SME "Modern technology and management" based on the branch of the Moscow State University of Technology and Management of Razumovsky K.G. in rp Light Yar Volgograd region (Figure 1) [2, 3].

In developing the project were analyzed features of modern laboratory equipment supplied to the domestic market organizations. Performed an analysis of the functional properties of the equipment, the spectrum realized laboratory work and the specifics of their implementation, as well as performed a comparative evaluation of their price criteria.

In developing the project were analyzed features of modern laboratory equipment supplied to the domestic market organizations. Performed an analysis of the functional properties of the equipment, the spectrum realized laboratory work and the specifics of their implementation, as well as performed a comparative evaluation of their price criteria.



Figure 1 - Study Electrotechnical Laboratory: design jobs

Laboratory meets all requirements of the educational process implemented in the present form. However, the implementation of asynchronous learning, this laboratory loses its advantages and can no longer be used in distance learning.

The authors consider the possibility of retrofitting the laboratory training stands with the remote control functions. At present, these blocks for modeling certain modes of electrical and electronic circuits have already found their way into the educational process. However, a

significant drawback of these laboratory units is that in the process of circuit simulation and research in the student located remote from the block there is no psychological effect on the presence of laboratory work and his communion management process by various processes in a laboratory unit. Psychologically, the process of working on a remote electrical effect and work with software simulator of these processes are very close.

A concept of integration into a single electrical device visualize the effects of his work, as well as with the possibility of remote control of his regime. An example of such a device is being developed by the authors elevator installation (Figure 2).

Its functionality allows to implement remote control modes starting and braking when going up and down load positioning cargo at a given point. At the same time on video monitors remote users will have a real picture of what is happening in the laboratory and simulated devices recruiting software analysis of electrical and mechanical parameters of the laboratory setup.

The power part of the stand (Figure 2) is implemented as a lifting device and consists of a frame (1), drive (2), winch (3) and hanging on a rope with further placed on it by an elastic member (4) container load (5) adjustable weight feature (hereinafter, weight) and equipped with an acceleration sensor.

The entire work area (lift height of the weight) is divided into three work stations. The transition from one load to another working area secured by two photo sensors, hairline (6) which is conventionally represented by lines b, c, and two limit switches, a, d (7, 8).

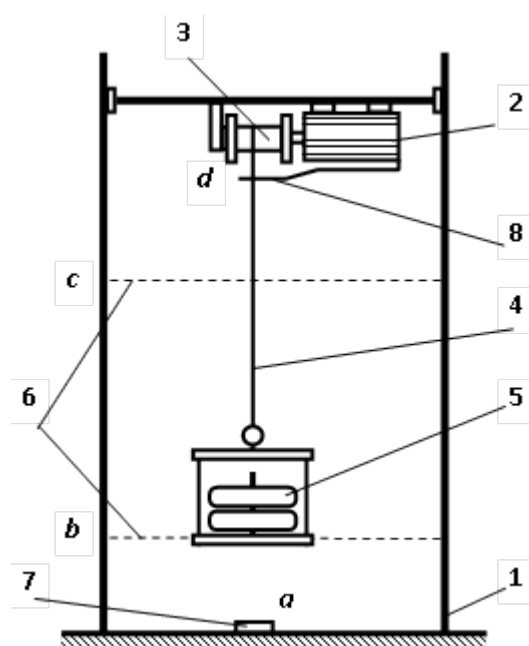


Figure 2 - Power of the laboratory setup

Figure 3 schematically shows the control panel - the panel operator. Inclusion stand performed keypad station with light display of voltage (1). Manage stand involves several modes of operation: manual operation, implemented on the button station (2) (control - up, down, stop), software and manual control of the motor by the inverter (3) and control software lifting mechanism with a programmable logic controller (4). The electrical parameters of the main circuit of the motor runs on a personal computer, however, to visualize these quantities provided turnouts electrical appliances (5).

Camcorders supposed to be placed in such a way that would provide the visualization of the entire system as a whole, and from different points of observation.

Such an organization of remote lab course will improve students academic activity by adding to the educational process of game elements.

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DEVELOPMENT OF REGIONAL INFORMATION-EDUCATIONAL RESOURCE CENTRE: PROJECT «INTEGRAL»

Isaev, A.V., *Posdnyakov, A.P., **Novochadov, V.V.
*Volgograd, Volgograd state technical university; *Volgograd, Volgograd state university of architecture and building; **Volgograd, Volgograd state university*

There are given the main ideas and the results of the project «Integral». «Integral» - is a profile session arranged for gifted children in children's educational and health camps. Target group is senior schoolchildren. Members of teaching staff of the leading higher schools of Moscow and Volgograd region are taking part in the project. The main idea of the project is considered in the development of intellectual potential of the project's participants and in the creation of favourable conditions for social growth («lifting») in the field of research activity.

Keywords: educational trajectory, interactive educational area, profile educational course, intellectual potential, social growth («lifting»), project «Integral».

Today the interaction of different social groups is unavoidably involved in the process of their competitive confrontation in the struggle for one or another vitally important for them resources. The arranged system of social hierarchy establishes unequal streams of resources both at an external level of interaction of a social group and at a level of its internal organization, providing the latter with any competitive advantages. Meanwhile, every person as a participant of the social group is inevitably involved in the process of this competitive opposition, trying to choose the main fixed points of his life and trying to answer the questions: where to study; how to choose the profession; where to live; in what direction to develop further and many other questions determining his social status. Many parents are

trying to help their children to make their choice. They ask a question if it is possible for their child to change a social class position and to come up in the world. They ask many other questions concerning the mechanisms of the possible change. They do not know the principal steps their child has to make and do not know the «guide» who can extend a helping hand to the child and help to make the first important steps [1, 2].

Answers for the questions are not so simple. It is doubtful whether there is a universal formula for success. However, understanding of the main principles of formation and competitive interaction of the social group, the person belongs to, will help him to pick his way to success and to choose the right way for further development.

One of illustrations of creating the discussed social growth («lifting») is the project of profile sessions arranged in Volgograd region for gifted children in a children's health camp «Integral».

The project is aimed at creation of successful social image, including intelligence, social culture, leadership qualities in professional activity, lofty spiritual and moral criteria, permanent aspiration for self-perfection through the continuing process of acquiring knowledge [3].

The project has already been working for 40 years. The camp «Integral» was established in 1971 at the initiative of the Moscow state university in honour of M.V. Lomonosov, as a profile camp for intellectually gifted children and young people. At the present time the project is being reorganized. It is achieving status of regional information-educational resource centre. It will help to solve the problems of organization of educational profile sessions at a higher informational, material and technical level.

The foundation of regional information-educational resource centre requires consolidation of efforts of different educational programmes of supplementary secondary school education. The resource center will permit to solve problems dealing with organizational, material, technical, informational and other aspects of realizing consolidating programmes more efficiently [4, 5, 6].

The main problems are:

Problems of the first level

1. Administrative and economic: arrangement of legal and financial interaction with authorities; search for co-financing facilities; organizing and holding conferences aimed at selecting «territorial base» for studying; organization of administrative, financial and legal support of educational activities.

2. Human resources:

- peopleware of the higher level: foundation of educational structure – school management; choice of leading teachers (instructors); organization of close cooperation with administration of the leading regional higher schools, higher schools of Russia and very likely with the higher educational establishments of foreign states; arrangement of in-depth trainings and master classes for teachers and instructors.

- peopleware of the primary level: choice and training of human resources for organization of entertainments and any other social events for children in the format of children's health camp (CHC); introduction of unitary requirements and rules of intragroup activities; choice and training of tutors of the primary team; introduction of rules for entertainments and leisure.

3. Organizational and educational: working out the structure of educational process; material and technical support of laboratory practical trainings and different activities, pointed at accident prevention; working out disciplinary rules for training in the format of children's health camp (CHC).

Problems of the second level

1. Educational and methodological problems connected with continuity structure of educational process; working out and publication of educational and methodological workbooks for training (foundation of the editorial and publishing department (EPD)); working out and publication of workbooks for instructors; working out and publication of report cards and documents (journals, school cards, train lists etc.); publication of printed matters for entertainments.

2. Organizational and territorial: joint use of educational «areas» (use of the same area, the same camp for different educational programmes); harmonization of disciplinary rules, rules and regulations of educational process, entertainments and leisure.

3. Arrangement of interaction of different educational programmes within the bounds of a large project of «go-ahead training», providing the transition of schoolchildren from one educational programme to another. It also proposes consistent guiding of project's participants.

4. Arrangement of integrated regional data portal – dataware of realizing regional educational projects; popularization of the projects; costs of the project; documentation and informational support of the project's participants; arrangement of educational festivals and competitions.

5. Organization of honest competition between educational projects through the accurate review of achieved results; introduction of rating system of their evaluation including private opinions of the project's participants.

6. Organization of close interregional (international) cooperation with non-commercial companies that, obviously, favour the development of culture and tolerance in the society.

Summary

Increase of effectiveness of educational projects unavoidably faces different problems. One of the most widespread problems is the lack of resources. There systematized the main problems that can be solved by means of realizing the project «Integral» (regional resource information-educational center), being actively developed in Volgograd region.

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INDIVIDUALIZATION OF EDUCATION: TECHNOLOGY PROJECT

*Isaev, A.V., Gaydadin, A.N.,
Volgograd, Volgograd State Technical University*

The article presents the goals, objectives and accumulated by the authors' experience of realization the concept of individualized educational path through the implementation of technology projects. In the context of significant reduction of the volume of training classroom hours using of technology projects has become, in fact, one of the most effective technologies of self-study students.

Keywords: technology projects in teaching, educational trajectory, an interactive educational platform, profile educational course.

One of the main problems in the educational process - is the formation of a stable internal system of student's motivation. System which determines the further trajectory and effectiveness of the whole learning process. Effective internal motivation system allows increasing the information level courses, significantly expanding the student's knowledge domain, thereby complementing a professional portrait of the future specialist. In this regard, the authors offer the following classification of the groups of learning objectives [1, 2]:

- the first - administrative; the goals are predetermined by the requirements of the sphere of labor relations of the student;
- the second - hypothetical, in which the purpose of teaching is a hypothetical structure of the employment relationship with the definition of the role participation of the trainee;
- the third - the group of the goals of personal interest, which doesn't offer the participation in labor relations.

Each of the designated groups' goals requires a different level of initial motivation of the learner, as well as the different dynamics significance of certain of its criteria, depending on the changes in the external, non-teaching process, situational factors. Each of the designated groups of goals offers a different level of initial motivation of the learner, as well as the different dynamics significance of certain of its criteria, depending on the changes in the external, non-teaching process, situational factors. At the same time the success of the educational process will largely depend on the ability to transform long-term incentive criteria of the student - it is interesting here and now [2]. In this regard, the formation of an effective system for monitoring and measuring of the current level trainer's preparation, development and application of the methods of prediction the dynamics of this developing level and prediction methods are becoming an important tooling of the realization of the educational process.

After, as the stability of the personal student's motivation is determined by long-term criteria, it's necessary to use an effective set of tools which will allow translating short-term motivational aspects in the long term - the student is interested in the final result. Moreover, the priority control mode in short-term objectives can significantly extend the final set of professional graduates' competencies.

The authors offer the structure of the management of motivational criteria in the teaching process, which realizes a consecutive transfer relevant motivational aspects from the

long-term prospects to the area of near student's attention and subsequent return of already transformed motivational system to the level of long-term prospects.

This structure is realized adequately implemented in educational technology projects.

As already mentioned, one of the negative factors which significantly reduces the overall level of preparedness of students is insufficient is the volume of the classroom. That's why, for increasing the efficiency of students' self-study the authors in the context of the technology training project was elaborated the following structure of the realization of self-teaching structure.

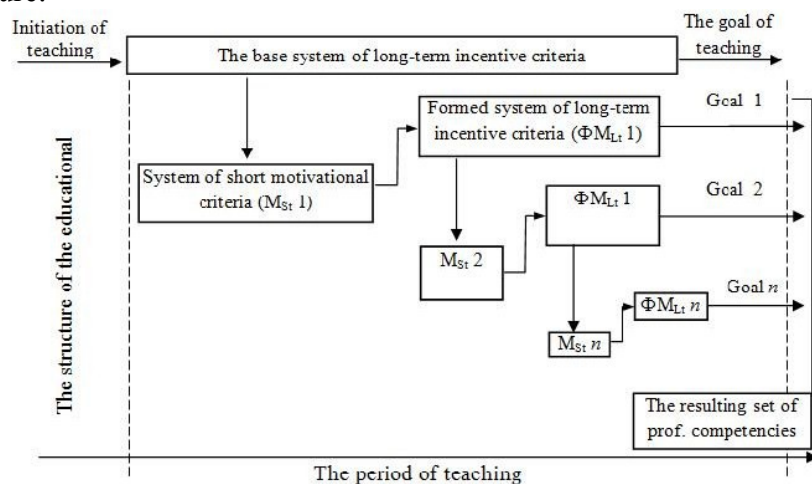


Fig.1. Building of the motivational system in the educational process

At the starting phase of the course the students are explained their goals and objectives, defined the volume of the training material, which knowledge allows forming required final professional competences and offers an exemplary plan of independent work. The exemplary plan of organization of independent work is usually linear, it assumes regular work of the trainee during the whole period of studying. In some works, the authors prejudice the effectiveness of such a linear curriculum [2, 3], because it does not take into account the inertia of the effectiveness of the student's perception of new information and educational contents.

The project technology of the organization of the independent work which is offered by the authors supposes the inertia of changing the current level of the student's competence, it integrates the elements of the teamwork and includes in the process of teaching the game component.

The main theses of the offered organization of the independent work:

- an independent work can be done by the student individually or as a part of the project team;
- the major components of the appraisal of the project (self-study) are the quality of the represented report, the time component - academic activity is encouraged, the effectiveness of the presentation of the project and the volume of the represented in the report researches;
- the admission of members in the project groups is realized by the head of the group;
- the number of the project team depends on the effectiveness of its work;
- the offered technology is not necessary for every member of the study group, part of them can study in the traditional (individual) organization of the independent work.

But they can join one of the project group next "control stage".

At the starting stage – the stage of becoming task, every member of study group is charged starting training units. The number of starting units allows forming at the starting stage the core of the project group. By the organization of the project group the members of

this group chose the leader of the group, and the group is fixed by the leading teacher, at the same time the members of the group lose the part of starting units which was become by them earlier. After the forming the group the leading teacher specifies united task for independent work, offering extra direction of the development of the researching work.

The whole period is divided into a number of “control stages” – control lessons at which the members of the project groups defend next stage of their work. An important aspect here is the obligation of the participation in the defense of the whole group of the project team.

The authors of this article elaborated the method of the rating system which allows taking into account the dispersion of individual levels of preparing of the students, by their taking part in the project group – its describing without going beyond the framework this article [4, 5].

According to the results of the defending, the leaders of the groups get bonus training units. This can be used by them for the reorganization of the group. The group can invite a subsidiary “member” or offer “ineffective” member of the group to leave the group. At the same time this member gets a part of studying units which are equal his “entrance fee” taking into account the indexing, which depends on ordinal position of the “control stage”.

When the project will be finished and defended the project group gets some bonus training units and distributes them among its members, depending on their grade of taking part in the project [6].

The number of training units is a base of marking the leader teacher the assessment of academic achievement of the students.

The offered organization of independent work has successfully shown itself including the organization of additional education which is realized as specialized courses conference/

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DISTANCE EDUCATION: INTERACTIVE CONSULTANT

Isayeva, L.A. Feofanova, L.N., Isaev, A.V.
Volgograd, Volgograd State Technical University

The article presents the experience of the educational process within the concept of supporting of individualized educational trajectory. The theoretical bases of the concept and the example of the realization studying course with using internet platform are presented.

Keywords: individualized educational trajectory, an interactive educational platform, internet consultant.

By constructing of the studying course the authors proceeded from the following major provisions [1, 2, 3, 4]:

- the process of developing by the student required training and informational content is inertia;
- the greatest effect by forming stable system of motivation is achieved by nonlinear construction of studying course – the intensity of the development of the studying material varies during the whole interval of the time of studying;
- the intensity of the accordance the students training and informational contents is determined by an effective norm of excess of demanded and current level of preparation of the student.

The process of studying of educational material is non-linear, which reflects the inertial character of the changing the level of student's professional competence. This process can be represented by three high-quality components:

- the stage of the initiation of the movement – is characterized by low dynamic of developing of the studying material, because a student doesn't possess the necessary professional tools in this area and doesn't have the knowledge of necessary informational contents. The base of motivational student's system at this stage are his expectation - long-term motivational criteria.
- stage of the movement - the intensity of training is close to linear (uniform) process. The stage characterizes the process of forming skills of using by a student the professional tools to different information content – at this stage the skills of the work with the values of this object domain are formed.
- the stage of the fixation (stagnation) - The final phase of training. It characterizes the transition of mastering student's knowledge personal level, which characterizes a student as a specialist. There is a risk by an ineffective educational process, which is connected with psychological aspects of the personality student, a complete rejection of the knowledge gained as inefficient information component.

One of the characteristics of building an effective educational path is the ability to sustain the psychological comfort for the individual difference between required from him (the curriculum) level of competence and its present level of training [4]. Using the compilation of synchronous and asynchronous forms of teaching provides a great opportunity. Asynchronous forms of teaching are more effective at the stage of initiation of movement (start of training) and at the stage of fixation.

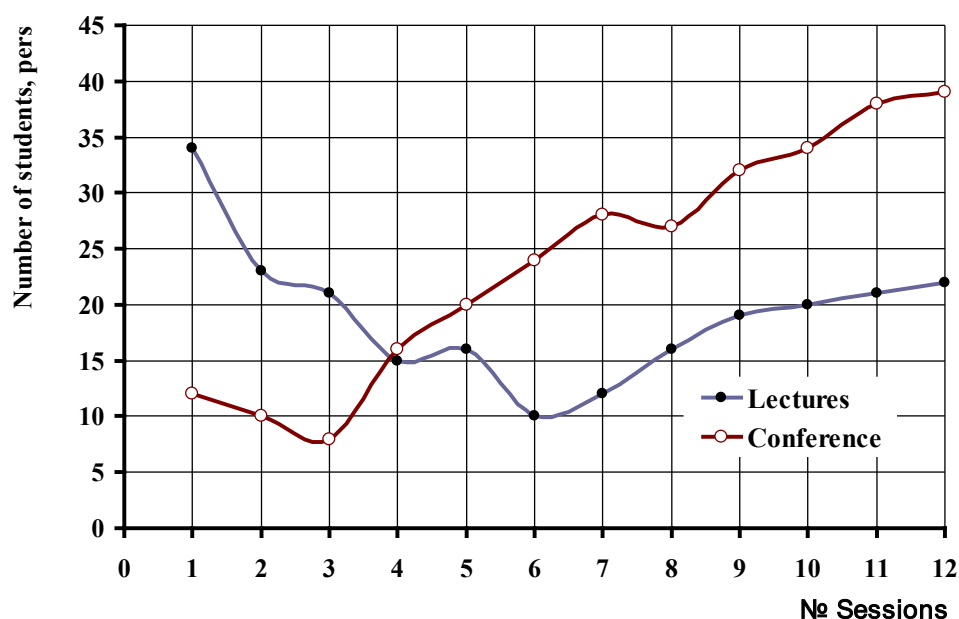
The stage of the movement - the stage at which is the predominant form of teaching becomes the realization of the consultant support of the teaching process. In this regard, using of internet platform allows you to create a flexible consulting support of the student educational trajectory.

As a control of outspoken supposition for the students (full-time and part-time courses) was organized an interactive platform for mathematical disciplines, which contains "interactive audience" is no more than 50 people. The opportunity of the taking part in online conferences was provided for five groups, two of which were full-time students, and the other was part-time students. The total number of students at the same time was about sixty people (58 students).

The functionality opportunities of interactive platform allowed realizing the synchronous classes, in the lecture classes, and in the mode of audio and video conference. For students was made a time table with the designation of lectures and consultation. The time tame was made regularly one lectures and one conference per week. It should be mentioned that the realization of the basic training lessons did not change and wholly consistent with the schedule of the educational process.

The figure shows the diagram of the attendance the lessons, which were realized on the internet platform. The splash of the attendance of lectures at the starting stage connected, according to the authors, with the increased interest of students to input into the educational process "novelty." More precisely, the development of the inertial nature of the educational process can be traced on the example of the academic activity of students in the format of conferences. The starting stage - low activity is associated with the "inability" to ask a question. Student does not fully master the conceptual apparatus of discipline and not quite confident imagine the ultimate objective of this training course that exemplified the lack of specific issues - the interests of students, mostly did not extend further than the desire to obtain information about individual control tasks, the fulfillment of which is provided core curriculum.

Educational activity students



The disadvantage of this experiment is the lack of quantitative indices, which characterize effective duration of each training lesson, which was held like a conference – the time of an active interaction a student with a teacher. Subjectively, the finding of the students in the information field of interactive platforms limited by the time which is necessary for clarify the details of the individual control task. The effective duration of the subsequent employment increased markedly.

In such a way, for the formation of stable dynamics of the academic performance of students is most effective nonlinear building of training course which supposes the active using of the synchronous forms of teaching at the starting stage, followed by transferring the focus on asynchronous learning forms. By the realization of some training courses the most effective in improving academic progress of students and their displacement is represented in the chart of the educational process of their study intervals. In this regard, the most interesting is the experience of the modular construction of the diagram of the educational process.

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COMPLEMENTARY STRUCTURE OF QUEST TECHNOLOGIES IN LEGAL EDUCATION

Sukhova, A.S., Selezneva, I. G.
Volgograd, Volgograd state technical university

In this article there was analyzed the structure of quest technologies in legal education, and also in this article there was disclosed the specificity and the character of influence of quest technologies on activization of student's potential and development of skills of the argumentation in legal training of students of different courses. Here was investigated the complementary complex of quest technologies and were disclosed their structure and forms in legal education.

Keywords: complementary structure, quest technologies, micro group, multimedia presentations, personal and factorial analysis, structuredness of information, multimedia technologies, activation of thinking.

Now in the system of higher professional education in Russia there is finding ways of transition to a new educational paradigm which implies the formation of competence, erudition, creative initiatives and culture of the person. Improvement of education, which is based on new information technologies, supposes forming of new models of the educational activity using information and telecommunication means of legal training. Forming of new educational and methodical models with wide using of information and telecommunication means of education is the main component of modernization of education. The most successful methods in acquirement of knowledge by students are training quest methods. The essence of these active methods of the training, which directed on forming of skills, is to provide the performance by students of those tasks solution of which allows them to acquire skills [1].

Information became the strategic resource defining development of any state. Consequence of this process was the necessity of informatization of education as these processes are interconnected: informatization of the legal sphere of social life demands qualitative experts, and it is possible to get quality education in information society only thanks to studying of innovative methods and using these methods in training of specialists. Manifestation and development of active methods of training is due to the fact that before training there were tasks not only acquirement by students of knowledge and forming of professional skills, but also development of creative and communicative abilities of the personality, forming a personal approach to the problem.

One of the complementary directions of forming of informational and communicatory competences is a quest technology. The educational process, relying on using of interactive methods of training, is organized taking into account inclusiveness in process of knowledge of all students without an exception. Today quests greatly vary not only on their subject, but also on structure. There are short-term and long-term quest technology. The purpose of short-term projects is acquirement of knowledge and realization of their integration into the system of knowledge. Work on a short-term quest can occupy one student's seminar. Long-term quests are directed on expansion and specification of legal conceptions. After completion of work on a long-term quest, student has to be able to carry out deep analysis of the received knowledge and to transform them. Work on a long-term quest can last for 2-4 seminars.

Besides, working over a quest, students pass a full cycle of motivation from attention to research of a legal problem, they get acquainted with an empirical material which allows students to discuss and consciously to build new concepts and relations in a context of modern legal problems.

Key characteristics of the quest - training are:

- relevance of educational tasks, their compliance to interests of students;
- involvement of students in research activity;
- interdisciplinary character;
- communication with public life;
- limitlessness of educational resources;
- the assessment of activity of students is made not only by the teacher, but also by students.

Educational activity has to contain surely tentatively motivational, operationally executive, reflexive estimated components and the most important goal of education is teach students to build from the first course their activity as full and reasonable where all parts are balanced, rather developed, realized and carried completely. At the same time it means that all actions, including control and assessment, the trainee carries out by himself. Work of students in format a quest technologies will diversify the teaching and educational process and make it live and interesting. Educational quest technologies embrace a separate problem, the subject, the topic and can be an intersubject. The subject of quests can be the most various, problem

tasks can differ in complexity degree. Results of accomplishment of a quest, depending on a studied material, can be presented in the form of oral appearance, computer presentation, essay, web page, etc.

Work over a quest among students includes the following stages:

1 . The initial stage where students get acquainted with the main concepts on the chosen legal topic. Roles assign out in team: there are several people for one role. All members of group must help each other.

2 . Role phase where individual work in group is directed on the general result. Participants at the same time, according to the chosen roles, carry out theirs tasks. As the purpose of work is not competition, during the work over a quest there is mutual training of members of team.

The group of students sums up of carrying-out of each task together; participants exchange materials for achievement of common goal.

Tasks:

1) searching for information in a specific subject; 2) development of structure of a legal problem; 3) analysis of materials; 4) rework of materials for receiving a final decision of a task.

3 . The group of students works at the final stage together under the leadership of the teacher, feels the responsibility for results of research. Conclusions and offers are formulated by results of research of a problem. There is a competition of the executed works where understanding of a task, reliability of used information, its relation to the set subject, the critical analysis, logicality, structuredness of information, definiteness of positions, approaches to a solution of the problem, identity and professionalism of notion are estimated. Both teachers and students take part in an assessment of results by means of discussion or interactive vote.

The quest is a complex task; in this regard the assessment of its carrying out has to be based on several criteria focused on type of a problem task and form of notion of result. Bernie Dodge recommends to use 4-8 criteria which can include an assessment of research and creative work, quality of the argument, originality of work, skills of work in micro group, oral performance, multimedia presentation, written text, etc. [2].

During the work of students over a quest a number of competences develops:

- using of information technologies for solution of professional tasks (including for searching for necessary information, registration of results of work in the form of computer presentations, websites, flash movies, databases);
- self-training and self-organization;
- work in team (planning, distribution of functions, mutual help, mutually control);
- ability to find some ways of solutions of a problem situation, to define the most rational option, to give prove the choice;
- skill of public statements (carrying out preliminary defend and defend a projects with speeches of authors, with questions and discussions is obligatory).

One of components of optimization of structure of educational process is introduction of new interactive forms, strengthening of importance of independent study of students. Without increase in a share of independent mastering of material without acquisition of skills of self-education in an educational, scientific and production activity in social conditions it is impossible to become the competitive expert. Application of a quest technologies allows not only to deepen and order the knowledge received at lecture, but also improves ability of students to analyze problems, forms student's opinion. It is especially important for teachers of legal disciplines. Informal activity of group supports an active intellectual involvement of students during all practical lessons [3]. As ways, which activate methods of teaching, used dialogues and interview in couples, impulse messages, role-playing games, boards with notes,

cards, and cards of opinions. Method of group research is applied in practice. This technology of handing on boundary control promotes development of research skills of student.

More widely in legal education are used quests which proved that they are promote not only to fixing of knowledge and their using in practical activities, but also to receiving skills. Application of game modeling in quest technologies allows to imitate the concrete situation connected with decision-making, corresponding to real circumstances in the conditions of uncertainty. At the same time, that is especially important, skills of system thinking are developed, the aspiration to searching for new ideas, creativity and collective interaction is waken, important social installations are formed, practical skills to find optimum solutions of specific tasks in the legal sphere are acquired.

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TEACHING OF INFORMATION TECHNOLOGY IN TECHNICAL UNIVERSITY

Avdeuk, O.A., Lemeshkina, I.G., Pavlova, E.S., Prikhodkova, I.V., Skvortsov, M.G.
Volgograd, Volgograd State Technical University

In the article we examined the General approaches to the teaching of information technologies for the students of the faculty of motor transport.

Keywords: information technology; graph theory; neural networks; transport logistics.

Currently, information technology is an integral part of any curriculum as humanitarian and technical bachelor degree and teaching methods themselves disciplines [1-6].

Therefore, in the course of training at the Faculty of road transport , Volgograd State University students get acquainted with the processes of formation of information and material flows in road transport , the role of information management processes and decision-making and information data processing technologies .

For example, for solving optimization problems of transport and planning the best routes in the geographic information systems (GIS) is currently used graph theory to plan the most efficient transport of goods. During training, students get acquainted with standardized languages (DOT, GraphML, Trivial Graph Format, ILOG, GoView), used to describe graphs in a form suitable for computer processing and at the same time convenient for human perception. Using these software environments allows you to automate the process of solving transportation problems using information technology .

Of information technology used in road transport should be allocated separately artificial intelligence technology to improve the efficiency of transport planning , optimization of timetables, vehicle recognition and modeling. Promising direction of information technology

using artificial intelligence methods are neural network technology (BAT). During training, students are introduced to neuropackages allowing design, develop and use neural networks to solve practical problems (neuropackages NeuroSolutions, NeuralWorks, Professional II/Plus, Process Advisor, NeuroShell 2, BrainMaker Pro).

Thus, the introduction of modern information technologies in the educational process allows students to form an information culture, to acquire the skills to apply the knowledge in the professional activities, thereby increasing the competitiveness of Russian specialists.

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GENERAL APPROACHES TO TEACHING BASICS OF ALGORITHMS FRESHMAN OF TECHNICAL UNIVERSITY

Gostevskaya, O.V., Avdeuk, O.A., Lemeshkina, I.G., Kurapin, A.V.
Volgograd, Volgograd State Technical University

In this article we identified a strategy of teaching the basics algorithmization freshmen Technical University, justified the choice high-level language for teaching purposes.

Keywords: computer science, programming, algorithmization.

To date, science stood in the fundamental science of information and logical models , and it can not be reduced to the other sciences , even in mathematics , very close to the studied issues. The object of study of informatics is the structure and methods of information processing. There are differences between computer science as a science with its own subject area and information technology [1-8] .

For the vast majority of people using computers in their work or in everyday life , familiarity with specific languages and systems need no more than a phone subscribers need the technical details of the phone and the PBX. Need a common thought , concepts, individual style of thought and mental actions . Currently, a set of almost everyone needs a specialist in any of the branches of science and technology .

Skill to plan the structure of actions needed to achieve a given target using a fixed set of resources is often called the ability to think algorithmically , although the term " framework for action " slightly wider than the classical definition of the algorithm. User activity on the description of the algorithm solved problem is that before seeing the ultimate goal - the result , it constructs a program (in the broadest sense of the word) , a plan of action , which is a sequence of individual more or less standard operations. What is sometimes referred to colloquially programming ability , determined primarily by the ability to present complex action as an organized collection of simple actions. In this case , the user must plan not only the acts themselves , but also used in this information and technical resources . Especially important is the ability to correctly determine what information is required , and on what grounds to organize their search . Discipline and structured language of communication - the ability to correct, clearly and unambiguously formulate an idea in an understandable form interlocutor and correctly understand the text message .

Computer as an educational discipline is evolving rapidly. A few years ago a basic course of computer science consisted of learning the basics of algorithms and programming , basics of design and application of computer technology , today the goal of the course is to improve informatics human use of the computer as a tool .

Choosing a strategy of teaching the basics algorithmization Technical University freshmen , be aware that the task of general education course - it is heavily develop a certain style of thinking, the most common form of skills , abilities and ideas , rather than development of specific languages and hardware programming.

At the same time, this course should serve as a basis for further professional study program at the undergraduate (as vocational training) .

At the same time, this course should serve as a basis for further professional study program in high school or high school (as vocational training)

Currently, there are three most common approach to teaching programming :

1) teaching programming as a theoretical discipline us all, without mastering specific languages and systems;

2) teaching on the basis of specially developed language -based basic skills training program ;

3) study of one or more programming languages that are widely used in solving scientific and economic problems (such languages can be called standard) .

The first approach is the most logical. However, its practical implementation faces serious difficulties , since the abandonment of the programming language , not only lost the ability to use appropriate tools , but often it becomes difficult to justify the need for its use.

The second approach is often used in teaching the basics of programming. Developed and specialized languages for these purposes , which greatly simplified and designed to allow high school graduates in the field of programming. This approach is good at studying computer science at the initial stage of learning.

Opponents of the third approach argue that it is not suitable primarily because none of the existing standard languages do not reflect sufficiently pure modern concept stock programming. This situation , in general , of course, as all of these languages have been developed with their goals , and each of them is focused on a specific , more or less narrow scope . Additionally, many implementations of standard languages downloaded many complex and technical details in the study.

Most appropriate for teaching the basics algorithmization freshmen Technical University is a combination of the first and third approaches - learning theoretical foundations of programming based on a standard language. It is not necessary to go into the depths of language. Students who are interested in it , can do it themselves . The greatest attention should be paid to the transition from algorithmic structures to their software implementation in a programming language .

It is worth noting that the language Pascal was originally designed as an academic language , but eventually gained wide acceptance as a standard language . Of existing software technologies most popular and widely used technology is structured programming " top - down " . Its advantage is that it allows trainees to form an algorithmic way of thinking that is required in the study of almost the entire course of programming and other technical disciplines. In Pascal carefully observed structural line programming. The greatest success and spreading the language Pascal brought the first personal computers. Company Borland International Inc (USA) has developed a system Turbo - Pascal for the PC. Turbo - Pascal - is not only a language and compiler with him , but also the operating envelope , allowing the user to work in Pascal . Turbo - Pascal went beyond the academic mission and became the language of professional programming with universal features.

Therefore , choosing a programming language for teaching the basics algorithmization Technical University freshmen , need to focus on one of the structural language which is the language of Pascal , as it was originally designed specifically for training purposes .

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PREPARATORY PROCESS FOR PUPILS TO THE OLYMPIADS IN INFORMATICS

Pavlova, E.S., *Smykovskaya, T.K.

*Volgograd, Volgograd State Technical University; *Volgograd State Social Pedagogical University*

The article presents the author's methodology of preparing pupils for Olympiads in Informatics. When developing methodology identifies the key topics for study in preparation for the Olympiad in Informatics, examined the role of system of the tasks and proposed forms of educational work with gifted pupils and their knowledge assessment system.

Keywords: methodology of preparation for the Olympiads in Informatics, Olympiad, giftedness, system of the tasks.

Currently in the Russian Federation implemented a national system for identifying and developing young talent. It is multilevel set of institutions, programs and activities that will promote the development and implementation of abilities and endowments of children and youth. The main goal of the program is to achieve outstanding results gifted children in their

chosen professional field. One of the priorities of the national system for identifying and developing young talent is to improve system intellectual, creative and sports Olympiads [3].

In our opinion, the process of preparing pupils for the Olympiads, in particular for the Olympiads in Informatics, allows you to create giftedness in the subject area, and participation in Olympiads allows the best way to demonstrate the knowledge and skills acquired during training. The process of preparing for Olympiads in Informatics allows gifted children to form and develop his talent as a combination of algorithmic and programming ability, providing a successful solution of non-standard tasks of different levels of complexity.

Analysis of the educational situation shows [2], that the overall preparation of pupils for Olympiads in Informatics is traditionally held on several fronts: 1) selection of gifted pupils, 2) testing of pupils to determine their level of preparedness on the subject, 3) the development of computer skills, 4) mastery of one of the basic programming languages, 5) the study of algorithms needed to solve of the Olympiad tasks, 6) study of the different methods of solving and of applicability of known algorithms, 7) analysis of the implementation of typical algorithms; 8) analysis of the effectiveness of programs; 9) study of the methods testing of programs, 10) forming of the techniques of writing and debugging programs on the computers, 11) study of the methods of debugging and testing tasks, 12) psychological training of the participants Olympiads.

We have developed and implemented in practice of the methodology for preparing pupils for Olympiads in informatics within the establishment of an additional education [1].

Subject part of the methodology was determined after analyzing the content of tasks Olympiads in Informatics. The main topics of study were linear and binary search, sorting data, dynamic programming, simulation, optimization, the long arithmetic, "greedy" algorithms, recursion, graph theory, combinatorics and the work with strings and files.

Using that methodology assumes that subject part of the methodology is organized in the of full-time and distance forms, but for the development of talent required the full-time study.

Classes with pupils took place within a small group. When conducting studies took into account that in the group there are pupils with different levels of giftedness (high, medium and low). The main forms of organization of training were selected lectures, practical and laboratory classes.

Training for each topic was held in three stages.

Stage 1 (lecture). Typical lectures within the didactic unit begin with a study of the theoretical foundations of the subject area by considering the basic algorithms for solving tasks of this type. For all the topics were prepared systems of the tasks. Pupils study training topics solving typical tasks included in the systems of tasks. At full-time study the algorithms for solving typical tasks are studied under the guidance of a teacher, with distance learning pupils learn by yourself, using cases.

Stage 2 (practical). To check the assimilation of the material in the systems of the tasks been added additional typical tasks that the pupils depending on their level of giftedness and/or phase of the solved by of the teacher, together with other pupils in the work of a small group or on your own. When parsing tasks the teacher and with pupils analyze conditions of tasks, determining their sufficiency or redundancy. After solving several typical tasks of the system and consultation with the teacher, it is believed that pupils had basic knowledge on the topic and may begin to self-solving tasks.

Stage 3 (laboratory practice). To support giftedness in the subject area in the laboratory practicum the pupils offered several tasks with uncertain conditions (i.e. non-standard tasks) for independent decision. In the learning process every pupil solved tasks at the maximum for themselves "of the threshold of difficulties". During laboratory practice teacher chose tasks of the three categories (availability tasks from each category required):

- tasks that can independently solve all pupils,
- tasks that can be solved by yourself, pupils with giftedness not below average,
- tasks that can resolve spontaneously only a few pupils with a high level giftedness.

System of tasks are designed so that the teacher can pick up tasks for pupils with different levels of giftedness. Therefore in the process laboratory practicum each pupil with any level of giftedness can independently solve tasks relevant to the of its level. This leads to the formation of basic knowledge and skills of solving tasks in a given subject area. But for the development of the giftedness of pupils in the time of laboratory practicum the teacher took tasks that are a higher level of difficulty. I.e. each pupil was given the opportunity to solve tasks, designed for pupils with higher levels of giftedness.

To stimulate pupils and create favorable conditions for the development of giftedness used a special system of evaluation results of pupils' work. At each lesson was given a certain amount of marks. These marks were distributed among three different categories of tasks evenly, for example, 2 +2 +2 = 6. It may be 3, 4 and 5 in a conventional system of estimation. If for a predetermined time pupil managed to solve the task, he received the maximum score. The pupil can solve their task itself, receive consultations of the teacher or tips of other pupils. In evaluating pupil work is taken into account only the number of solved tasks, and not the quality of solutions.

This system of estimation leads to that:

- 1) the pupil was withdrawn psychological fear of making a mistake (positive self-concept is formed by the pupil) ,
- 2) in formulating questions to the teacher or to other pupils understanding of the problem and find ways to solve it (i.e., intellectual abilities are formed in the subject area, systematic mind and creative thinking develops),
- 3) when the time solving the task limited, speed of thought processes and speed of learning new information is accelerated,
- 4) the decision "unsolvable" tasks increases the level of intellectual curiosity and a desire of new knowledge.

Additional advantages of the methodology is to increase the authority of the of pupils of high and medium level of giftedness among the other pupils, because through the work of a small group of these pupils can help solve of tasks from pupils with lower levels of giftedness.

As a result, in the course of further study in a small group formed a favorable climate for successful pupils with high levels of giftedness.

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IMPLEMENTING PRACTICE-ORIENTED APPROACH IN EDUCATION

Litovkin, R. V., **Naumov, V. Yu., *Avdeuk, O.A.
*Volgograd, *Volgograd State Technical University; **Volgograd economic-College of
Technology*

In this article we have discussed the main directions of practice-oriented approach to the organization of the educational process.

Keywords: practice-oriented approach, the educational process, competence in education.

The main change in the federal state educational standards (FSES) is a practice-oriented approach to education. The result of implementing these standards in aggregated groups of 230000 specialties was the following: the possibility of implementing learning conditions maximally close to the conditions in the professional IT- companies, the possibility of realization of personal student vector, constant professional growth of the teacher, etc. However, any negative aspects of this study: a significant bundle competencies of students like the real situation in the IT-sphere, conservative preparation curriculum and material leads to lag behind the modern trends of IT-industry. It is proposed to mitigate the negative properties as follows: to strengthen personal correction vector learning according to various professional fields existing in the IT-industry; to form the curriculum and material for the modules according to the dynamics of disciplines changing needs in the market of IT-sphere; to implement effective mechanisms of cooperation with employers in satisfying the needs all persons of training and professional spheres.

Practice-oriented approach involves several areas in the organization of the educational process. Above all, this increase in the proportion (over 50%) oriented hours for laboratory / practical work. Applied to group of 230000 specialties - this means a significant increase in the period of time the students perform some work or a portfolio of IT-projects. In the framework of the course there is some periods of intense training and work practices. Where educational practice involves modeling of the manufacturing processes that will meet the student on manufacturing practice. Everything else, according to new federal state educational standards (FSES), professional disciplines are grouped in a modular fashion, which significantly contributes to a balanced study of the various professional disciplines to achieve mastering certain skills.

As a result, a substantial proportion of hours allotted practical work, allows us get one's hand in and bring different techniques in programming and design / deployment of networks to automatism. A large amount of practice allows you to try "live" different paradigms and design tools, which to date has accumulated a huge amount. Great side effect of increasing the hours of practice is also an opportunity to introduce technology in teaching methods projects. Because IT-projects are usually quite time-consuming resources, it is important to instill a sense of planning and learner skill solutions force majeure. In this systematic achieve real and meaningful results educates students a sense of professionalism.

Availability practices made separately in the training schedule allow you to put the student in almost real conditions of employment:

- Time constraints of the project;
- Command dependence stages of the project;
- Responsibility and labor discipline;
- Customs, habits, informal code etc. inherent IT- industry.

Modular formation disciplines allows most flexibility to build the process of assimilation of competencies by building more flexible connections between disciplines. This

forms the student (and teacher) persistent understanding of the purpose, sometimes seemingly quite independent disciplines or educational material in them.

After the introduction of the federal state educational standards and after the application of innovative approaches to learning for a group of specialties 230,000 over two years to the following positive findings:

- a large number of "practical" hours yielded trained professional skills in the creation of projects in modern programming tools, adopted by most IT-companies;
- the constant presence of the student in terms of creating IT-project leads to a permanent development of his professional initiatives;
- the atmosphere of a real company allows personal vector apply for professional training, as with long-term monitoring of implementation effectiveness of the project is quite simple to determine the student's personal preferences and lay the foundation of his professional credo;
- uniform alternation of intensive practices in the educational process in a professional tone keeps not only students, but also teachers;
- the very existence of practices allows most naturally interact with employers to adjust the training material, according to the requirements and trends of IT-industry;
- because way of becoming a student of the student to professional in the IT-industry today goes around the historical path of development of IT- technologies, which is a huge amount of educational material, the modular principle of grouping and interaction of different disciplines most naturally led to a more natural understanding of learners and teachers goals and content of the training material;

However, you can highlight the negative aspects of the implementation and practice-oriented approach:

- just like in real life immersion in professional conditions and environment bring to the learning process "parameters and properties" of this life:
- limited resources (time) with rigid parameters and requirements for the development of knowledge and skills in planning and failure to lack of self-discipline and dedication leads to a steady backlog of student master the material , which reduces its competencies by the end of training;
- the atmosphere of competition and personal use of the vector bundle leads to the inevitable group of students in a professional capacity and dilution of lagging subgroups.
- bad choice of practical training or the presence of non-professional duties in an internship can lead to a significant decrease in professional tone, which further leads to a decreased ability of the student in learning the practice of the following competencies;
- conservatism and permanence in the design of the educational process, aggravated by, curiously enough, the modular principle of aggregation of disciplines and training material, leads and potentially contributing to a recession of the knowledge and skills of the student by the end of his training from the real needs of IT-industry that observed in the present moment, when Moore's Law for creating software products industry as timely as ever, ie almost complete change of technology or upgrading every two years;
- dynamically developing IT-industry requires significant periodic synchronization needs of companies and the quality of the graduates and material and technical equipment of the educational process that the practice-oriented approach is most relevant at the moment for most schools;
- "overbalance" hours into practice requires the teacher not only continuous improvement in professional terms, but more efforts to create tutorials and training materials having a "real practical" quality.

Attempts to eliminate or mitigate the negative side of the new approach are invited to:

- strengthen personal training vector as adjusted for the purpose of matches students' professional identity in the parallel IT-areas (eg , design , IT-marketing, analytics, etc.), the benefit of the IT-industry now provides the most plenty of choice in this regard;
- try to implement a tree formation system interconnections disciplines based modules to a wider professional orientation of students;
- eliminate conservatism and permanence in the design of educational process to the dynamic formation of knowledge and skills in accordance with the realities of the professional sphere;
- provide a qualitative scheme of interaction with IT-companies with a view to permanent involvement of the learner in the process of professional activities and the company as a potential or actual employer in the process of forming a competitive employee in a short time, for example, introducing a remote professional and educational interaction without significant separation of all persons of the process of professional duties.

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FORMATION ICT COMPETENCIES OF TEACHERS

* Dorodnikov, N.A. ** Klyuyeva, E.G. , ***Dorodnikova, I.M.

* *St. Petersburg, ITMO*; ** *Volgograd, Lyceum № 3*; ****Volgograd, Volgograd State Technical University*

Problems of formation of the ICT competencies of teachers. Proposed different ways of working with teachers to improve their qualifications and skills.

Keywords: ICT competence, modern teaching information technology

The changes happening today in modern society, substantially define need of modification of activity of the teacher. Now the increasing place is allocated for competence-based approach in education from which positions professionalism of the teacher can be considered as synthesis of the kompetentnost including subject and methodical, psychology and pedagogical and ICT components.

The ICT competence of the teacher-subject teacher is meant as the personal quality of the teacher which is showing in his readiness and ability independently to use information and communication technologies in the subject activity. The subject teacher competent of the ICT area has to conduct search and selection of additional information with use of resources the Internet; to apply various computer means, providing educational information; to participate in various on-line conferences, for the purpose of increase of the professional level; to create computer tests; to create databases of educational appointment; to apply multimedia development in the educational and educational purposes; to create education guidances in electronic form; and also to operate educational process by means of various electronic means and computer programs.

From modern pedagogical information technologies distinguish the following:

- the computer training programs including electronic textbooks, exercise machines, tutors, laboratory practical works, test systems;
- training systems on the basis of the multimedia technologies, constructed with use of personal computers, video equipment, stores on optical disks;
- the intellectual and training expert systems used in various subject domains;
- electronic educational resources on branches of knowledge;
- the means of telecommunication including e-mail, conference on-line, local and regional communication networks, data exchange networks etc.;
- the electronic libraries distributed and centralized publishing systems, etc.

Not to use these technical, information and communicative capabilities in the educational purposes would be the inadmissible miscalculation.

As practice shows, our educational institution teachers more and more actively use ICT at lessons. It is possible to note increase of interest of teachers to Internet opportunities. Teachers successfully master methods of navigation and information search, its receiving and preservation for the subsequent use in pedagogical process. Actively participate in Web forums and chats, mastering ethics of communication on the Internet. Considerably facilitates interaction with colleagues use of e-mail and holding webinars. Personal sites of teachers, methodical associations of educational institution are created. Form bank of the educational tasks performed with active use of ICT; develop own projects on ICT use.

Use of new information technologies significantly facilitates activity of the teacher:

- ▲ under the authority of various documentation (planning, abstracts of occupations, reports, etc.);
- ▲ under the authority of various documentation (planning, abstracts of occupations, reports, etc.);
- ▲ in preparation of various didactic materials;
- ▲ in possibility of use of multimedia of a projector, an interactive board, electronic magazines;
- ▲ in development of tests for which creation it is not obligatory for teacher to have profound knowledge of programming as many programs are intended for creation of interactive tests on the basis of forms;
- ▲ participation in the remote Olympic Games, conferences;
- ▲ organization of virtual excursions, etc.

However not all teachers are psychologically ready to ICT use in educational process that can be caused by a variety of reasons:

- have insufficient level of information and computer competence;
- insufficient quantity of the electronic means capable adequately to solve pedagogical problems of the teacher at studying of a concrete subject;
- absence of accurate methodical recommendations about use of electronic tutorials available in the domestic market;
- low level of proficiency in software for creation of own electronic tutorials (presentations, electronic textbooks, exercise machines, etc.);
- in an operating schedule of teachers time for research of opportunities the Internet, for creation of own electronic didactic material, and also for studying, development and deployment of new computer techniques of training is not allowed.

In too time there is a probability that, having been fond of ICT application at lessons, the teacher will pass from developing training to evident and illustrative methods. So many teachers are fond of presentations at maintenance of a lesson or out-of-class action, pictures slides, is frequent even not formatted, the poor quality, the overloaded animation or sound effects.

It should be noted that development of skills of use of ICT of technologies in the teacher directly promotes development of these skills in pupils. Experience of mutual training of the teacher and the pupil when the teacher to study at the wards to receptions and skills of work with the computer and in computer programs is in this situation interesting, the teacher teaches pupils to sense of proportion, style, laconicism in use of the computer appendices Power Point, Word, Publisher, to competent use of computer programs for representation of results of the work

We consider that it is necessary to practice different forms of work with the teachers, their qualifications directed on increase and skill. It is so possible to offer the following forms for increase of ICT competence of teachers:

- weeks of pedagogical skill;
- master classes;
- pedagogical workshops and mentoring;
- training seminars;
- thematic seminars.

So, the best practices — the fastest, operational form of permission ripened in practice of contradictions. For any teacher studying the best practices, it is important not only result, but also methods, receptions by means of which it is reached. It allows to commensurate the

opportunities and to make the decision on introduction of successful experience in the work. The teacher can visit occupation of the skilled colleague and is evident see how it is possible to apply digital educational resources in work with pupils.

At the same time, it is necessary to introduce the mechanism of encouragement of the teachers who have seized at the ICT sufficient level – kompetentnost. Now in the conditions of introduction of new system of compensation the administration of school had an effective mechanism of stimulation of such teachers. It is necessary to encourage not those who managed to download presentation from the Internet and to show it, the analysis of quality of the electronic materials created by the teacher, carrying out questioning and an ICT assessment - competence and ICT - activity of teachers, the accounting of carrying out open lessons and actions with ICT application is necessary.

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INTEGRATED EDUCATION AS A MEANS OF INCREASING OF INFORMATIVE ACTIVITY OF PUPILS

Dorodnikova, I.M.,* Rumyantseva, T.V., * Klyuyeva, E.G.

*Volgograd, Volgograd State Technical University, * Volgograd, Lyceum № 3*

The experience of integrated lessons in high school, when the integration is constructed taking into account the fact related subjects (science), studied in parallel with the sections of the basic course of mathematics and economics.

Keywords: interdisciplinary communication, integrated approach

Now there is a prompt development of process of informatization of the society, new information technologies get practically into all spheres of life of the modern person. Effective use of IT helps people to live in information society, to gain new knowledge, to achieve success in the professions chosen by them.

Modern IT allow to use effectively them in an education system for the purpose of training, education, development of creative abilities of pupils, the organization of cognitive activity of school students.

One of the main objectives of modern education is formation at school students of objective comprehensive knowledge of world around. The important place is taken here by intersubject communications.

In our opinion, such type of metasubject communications, when integration which is based taking into account the subjects of an adjacent subject (information scientist) studied in parallel with sections of a basic course of mathematics, economy is of interest.

The integrated training will allow to form the following knowledge, skills at pupils:

- ▲ to apply system of metasubject knowledge, skills to the solution of specific vital objectives;
- ▲ to solve the informative and practical tasks reflecting typical economic situations;
- ▲ to prove judgments, to provide proofs;
- ▲ to carry out search of the necessary information in the set subject in various databases;
- ▲ to carry out the critical analysis of information;
- ▲ to plan the activity, to select the most rational ways of the organization of work, in particular use of spreadsheets;
- ▲ to use methods of research activity, elementary abilities of forecasting (ability to answer a question: "That will occur, if... ") for the solution of problem, practical tasks;
- ▲ to use multimedia resources and computer technologies for processing, transfers, systematization of information, creation of databases, presentation of results of cognitive and practical activities.

On the basis of the offered approach in our lyceum work on integration of mathematics, economy, social science and fundamentals of informatics and computer facilities which was performed for two last academic years with the 10th and 11th classes was carried out.

Such work was carried out to some stages:

9. those subject domains of knowledge which most correspond to complex character of the set educational task were defined;
10. having worked programs for the chosen subjects, subjects which according to the contents supplement each other were selected;
11. by preparation of the integrated lessons the maintenance of practical tasks, creative works, business games carefully was thought over. Much attention was paid to interests of pupils, their vocational guidance.

Subject of the developed and tested integrated lessons: "Demand. Offer. Market balance", "The firm advertisement", "The solution of economic tasks by means of MS Excel spreadsheets", "Calculation of bank percent in Excel", "The solution of tasks on calculation of expenses and determination of efficiency of activity of firm", "Statistics as a method of studying of the phenomena of economy with ICT use", "Research of an individual index of inflation by means of interactive media products of a site of the State statistics", "Engel's law in reality: research of its manifestation by means of creation of schedules and charts in programs of a site of the State statistics", "The main tendencies of a demographic situation of modern Russia. Forecasts of the State statistics", etc.

On condition of systematic use of information technologies in educational process in combination with traditional methods of training it is possible to increase learning efficiency considerably. Use of standard appendices of the Microsoft Office package: Word, Excel, Power Point, Access, to Publisher in work of pupils gives rich opportunities for preparation for lessons and their carrying out:

9. construction and editing of dot schedules in the MS Excel appendix (informatics and mathematics, economy);
10. reading and analysis of graphic interpretation of economic tasks, fixing of knowledge of a subject (economy, mathematics, informatics);
11. ability to apply any necessary formula in calculations in the environment of MS Excel;
12. fixing of skill of work in a text editor of Word;
13. development of a method of application of spreadsheets in economic planning (informatics, economy);
14. formation of ability of creation of schedules, charts and histograms, their analysis (informatics, mathematics, economy, demography);
15. use of presentation graphics (PowerPoint) allows to add textual parts of creative work

of pupils with a visual row: to drawings, photos, charts, schedules.

Practice of carrying out the integrated lessons in our lyceum showed that at pupils the positive tendency of growth of skills of use of the computer and readiness of its use is observed at the solution of tasks.

It is integrated - thematic approach allows to establish that the studied subject can be connected with other subjects of a subject and a course, and also with various subjects of other disciplines, that is in the studied subject intra subject, intra course and intersubject communications at the same time can work.

It should be noted that the structure of the integrated lessons demands the special clearness and symmetry, reasonableness and logical interrelation of a studied material in various subjects at all stages of studying, for this purpose by preparation for a lesson the teacher needs to think over carefully receptions and work methods at the solution of this or that task. It is successfully reached due to compact, concentrated use of a training material of the program, but also, connections of some modern ways of the organization and studying of a training material.

Integration is a source of finding of the new facts which confirm or deepen certain supervision, conclusions of pupils in various subjects. She removes fatigue, an overstrain of pupils due to switching on various kinds of activity.

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INTERNET RESOURCES IN PROJECT ACTIVITY IN USE PUPILS

* Klyueva, E.G. * Shvarts, W.A. Dorodnikova, I.M.

*Volgograd, Volgograd state technical university, * Municipal educational institution lyceum
No. 3, Volgograd*

An example of use of Internet resources in design activity of pupils is reviewed. For the purpose of detection of features of distribution of modern network information technologies the analysis of their use on the example of sites of several travel agencies of the Volgograd region was carried out.

Keywords: internet marketing, ecological tourism, method of projects

As an optimum method during the work with Internet resources at school most effectively to use a method of projects. It is really possible to allocate the following types of projects:

1) Research. For such projects existence of accurately set actual and significant purposes for the participants, the thought-over and reasonable structure, use of various methods of research, use of scientific methods of processing and registration of results is characteristic.

The subject of research projects has to reflect the most actual problems of development of subject domain, consider their importance for development of research skills of pupils.

2) Practice. Feature of this type of projects consists in preliminary statement accurate, significant for the pupil having practical value of result, expressed in a material form: preparation of the magazine, newspaper, video movie, computer program, multimedia of products, etc. Development and carrying out this type of the project demands detail in structure study, definition of functions of participants, intermediate and resulting effects. For this type of projects more rigid control is characteristic from the coordinator and the author of the project.

3) Creative. Their feature is that they have no in advance certain and in details worked structure. In the creative project the teacher determines only the general parameters and specifies optimum solutions of tasks. Necessary condition of creative projects is accurate statement of planned result, significant for pupils. Specifics of such project assume a hard work of pupils with documents and materials, often inconsistent, not containing ready answers. Creative projects stimulate the maximum activization of informative activity of trainees, promote effective development of skills and abilities of work with documents and materials, abilities to analyze them, to draw conclusions and generalizations.

The method of projects is always focused on independent activity of pupils - individual, pair, group which pupils carry out during a certain interval of time. The choice of subject of projects in different situations can be various. In one cases this subject can move forward teachers taking into account an educational situation in the subject, natural professional interests, interests and abilities of pupils. In others, the subject of the projects which have been especially intended for extracurricular activities, can be offered and pupils who, naturally, are guided thus by own interests, not only purely informative, but also creative, applied.

At the heart of a method of projects development of informative skills of pupils, abilities independently to design the knowledge, ability to be guided in information space, development of critical thinking lies.

Work "The marketing analysis of supply and demand in the market of youth ecological travel of the Volgograd region" became an example of use of Internet resources in design activity of pupils in our lyceum. Tourism, being one of the most dynamic spheres of economy, represents highly saturated information branch. Successful development of tourism in the territory of the Volgograd region assumes wide use of the latest technologies as in the field of tourist's product creation, and its advance on the market of services. Addressing to the Internet in search of the permit, the client waits something bigger, than simply for a line from "Tourism and rest", presented in electronic form. The potential tourist needs to provide complex information on tourist resources of the region.

In the market of ecological tourism of the Volgograd region we carried out studying of the offer of tourist's services on the basis of the analysis of Internet sources. The VOLGOGRAD.RU First Volgograd Server Internet resource represents the city portal submitting the actual, constantly updated catalog of the Volgograd Internet sites, the enterprises, the organizations, educational institutions, etc. In the section "Tourism and Rest", 187 organizations were found in subsection "Travel Agencies of Volgograd". As showed the analysis, not all travel agencies of Volgograd have the sites (only 52%). The analysis of sites of travel agencies showed that only 35% from them render services at regional level, including on ecological tourism of only 6%. As a result of the marketing analysis the Bank of the commercial organizations which are engaged in ecological tourism in the territory of the Volgograd region was made.

The practical purpose of this market research was research of possibility of satisfaction of demand for concrete types and the services of ecotourism preferred by our target groups

(graduates of lyceum No. 3). The Bank of tourist services in types of ecotourism in the territory of the Volgograd region, by the most preferred by respondents by results of demand research was made. One of ways of the organization of ecotourism of the Volgograd region is use of recreational resources of natural parks of the Volgograd region. According to Federal Law "About Especially Protected Natural Territories" natural parks can render tourist services. For the purpose of studying of the offer of tourist's services we carried out monitoring of sites of natural parks of the Volgograd region. Results following. From seven parks three have the official sites are parks "Donskoy", "Nizhnekhopersky", "Volga-Flood Plain Akhtubinskaya". On Ust-Medveditsky and Elton parks of official information is not present, information is provided by a site "Ecotourism. Discover for itself Russia". All natural parks in the territory will organize different types of ecotourism – ecological camp, alloys, ecological tracks, cycle routes, water rounds, excursions. Besides, it should be noted insufficiency of use by Internet tour agencies as means of promoting of the services in the market. The city portal "Volgograd in a network" does not provide full information on the ecotourism organization in the Volgograd region.

Having found out prospects of development of ecological tourism in the Volgograd region, we decided to analyse how effectively tour agencies use possibilities of the Internet-marketing tools for advance of the services.

At the first stage we defined the main instruments of Internet marketing in the tourism sphere, having used Surkova O. A. technique. Them is the following: booking and booking by means of the Internet (so-called "on-line" booking); e-mail, allowing to support constant interrelation of consumers and travel agency (e-mail marketing); communication "on-line" by means of the Internet – pagers; advertizing on the Internet on own sites of travel agencies and on the specialized tourist portals, allowing as much as possible to facilitate and automate activity of travel agency.

Existence of the Internet site is an indispensable condition of successful functioning and development of tourist base. However, as it was stated above, only 52% of travel agencies have sites.

For the purpose of detection of features of distribution of modern network information technologies the analysis of their use on the example of sites of several travel agencies of the Volgograd region was carried out. Monitoring of sites showed the following, all travel agencies use advertizing (100%), also all agencies give opportunity to contact them and to ask necessary questions by means of e-mail of the marketing, 3 of 14 agencies use possibilities of "on-line" of a pager, very small number of firms give opportunities of "on-line" of booking (3 of 14).

Proceeding from it it is possible to allocate the following reasons of a low level of development of tourist services in the region: lack of sites at travel agencies that complicates possibility of access to operational information and possibility of an adequate choice of services, backwardness of services as "on-line" a pager, with the help which the consumer can easily contact agency and receive information on round, big convenience to tourists presents also to "on-line" booking which is also developed very poorly.

Thus, it is possible to draw a conclusion that travel agencies poorly use possibilities of information technologies, in particular instruments of internet marketing that complicates receipt of information on offered tourist services in the Volgograd region that confirms conclusions of respondents seniors about the reasons of bad development of tourism in the Volgograd region. The research conducted by us showed that for development of ecological tourism in our region there are all necessary conditions – our earth is rich with unique corners of the nature which are capable to satisfy the demand – from rock-climbing and a river rafting before acquaintance to vegetable communities, natural landscapes.

Thus, during the project the pupil receives abilities to use research methods: to collect necessary information, the facts; to be able to analyze them from the different points of view, to make hypotheses, to draw conclusions and the conclusions. If the graduate of school gains the skills stated above and abilities, he is more adapted for the life, able to adapt for changing conditions, to be guided in various situations, to work in common in various 'collectives.

Besides, ability to use a method of projects - an indicator of high qualification of the teacher, his progressive technique of training and development of pupils. Not without reason these technologies refer to the technologies of the XXI century providing, first of all, ability to adapt for promptly changing living conditions of the person of post-industrial society.

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INNOVATIVE APPROACHES TEACHING SOCIAL INFORMATICS IN SCHOOL

Bakshaeva, N.V.

Cheboksary, "I.J. Yakovlev Chuvash State Pedagogical University"

In this paper considered questions of changes in the content of social informatics at schools. It is proposed to include in the content of the discipline to study the processes associated with the construction of e-government, e-government services and information society in Russia.

Keywords: social informatics, e-government, the model of the electronic citizen, government services implementation model, content on social informatics.

Social informatics as a scientific discipline refers to the study, to analyzing and assessing the impact of processes of information on the objects of social and economic spheres, including the transformation of social relations, and social institutions of society.

Transformation of social relations can be defined as the relationship, changing in the developing information society. Previously, the information society was formed influenced by active penetration of information and communication technologies in business processes, the interaction between business and citizens or between citizens. In the ongoing process of formation of the information society is built and begins to significantly affect governance. Consider in terms of governance stages of building the information society. Distinguish the successive formation of e-government, e-government as the basic components of the modern architecture of quality governance, which in turn becomes the basis for building the

information society. From the standpoint of fundamental social institutions of society (political, economic, educational, cultural, etc.) in the emergence of the information society is projected e-parliament, e-elections, e-justice, e-citizen, e-business, e-health, e-education, e-libraries.

E-government is implemented by creating government (federal and regional) information systems for their own functions of the executive power in electronic interaction across the chain of command from municipal to federal levels. The second important element for a e-government is the implementation of the electronic interaction of executive power from citizens and businesses in the provision of electronic services.

Merging programs and concepts of e-government in one common state program for the development of the information society in order to improve the quality of life of citizens allowed analyzing the results and identifying barriers to the accelerated development of information society in Russia. One such factor is the lack of dissemination of basic skills in the society of information technology. This applies to both the general public and state and municipal employees. A significant obstacle to accelerated development of information society in Russia is the lack of mass interactive citizens and organizations with public authorities in the provision of public services. It is worth noting that the quality and delivery of public services, when citizen has the opportunity to remotely get the service in full without a personal appeal to the public authority is not enough to electronic services become more attractive to citizens.

Currently undergoing significant changes to the implementation of the requirements of electronic public services, which will be developed joint solutions for all stages of their delivery: registration, application, write to the queue to visit, payment information, appeal. The first will develop services most needed by citizens and businesses. One of the services provided by the federal authorities «Processing and issuing of passports of the Russian Federation, the identity of the citizen of the Russian Federation outside the territory of the Russian Federation», affects the interests of most young citizens - schoolchild, receiving his first passport.

The above leads to the conclusion, that the electronic citizen of the information society in the course of its life promotes cooperation with the government, including the preparation of e-government services. Formation of citizens understanding of the rules of procedure in the information system requires significant effort and preliminary examination of the structure and content of the portal, about the order of services forms obtain intermediate and final results in the process of registration, submission of applications, electronic records in place, payment, information and appeal. It should be noted that each of these steps represent the original set of steps for their execution. As a rule, citizens intuitively follow a predetermined algorithm process, reflected in the interaction interface, based on previously obtained experience in other systems, or acquire it naturally necessary manner, including the use of services in the portal of public services. However, the high uncertainty of the required knowledge, the amount of effort and time to produce the desired result is a barrier for self-first positive result, after which you can adjust the ratio of the proposed services.

For the formation of the necessary skills of the citizens should be to develop a model of the electronic citizen of the information society. This model still requires additional research in terms of targeted training to work with for information systems, the creation of which government programs aimed at improving the quality of life of citizens. There is a contradiction, the citizen feels better the quality of life, when the quality of the itself citizen will be better. Exploring of the portal of public services, familiarity with the procedures for obtaining public services are acquires significance in the various age groups in society, and meet the requirements to the qualitative characteristics citizens of the information society.

Development of schoolchild's skills obtaining public services in the electron form can be implemented as a computer science lessons in the section of social informatics. Social informatics can become the nucleus for the formation of appreciable meta - level knowledge of the pupils for life in the information society.

Currently, the social informatics content revealed through the concept of information resources, information society, information law. This approach is defined by a document adopted at the II-th International Congress of UNESCO "Education and Science" (1996), in which social informatics included the following thematic sections: information resources as a factor of socio-economic and cultural development of society, the information society - laws and problems of formation and development, information infrastructure of society, personal development opportunities in the information society, the problems of democratization in the information society and their solutions; information culture and information security of the person.

Consider the results of the analysis of textbooks on computer science for school subjects disclosure of Social Informatics.

In primary school textbooks L.L. Bosses, N.V. Makarova, N.V. Matveeva, Y. Pervin, mastering the elements of social informatics at the propaedeutic phase of the study of computer science in school contributes to achieving the following objectives: the formation of concepts of information process and information, the basics of the scientific worldview, by demonstrating the role and importance of information technology in the development of society and change the way people live, education foundations of information culture and competence of students. In accordance with these goals on the contents of the line in a propaedeutic phase of the study of computer science represented by the following themes: "The role of information in the life of the people ", "Information human activity ", "Fundamentals of information culture. "The main methods of learning at this stage are playing methods and the projects".

For the baseline study phase meta subject and subject learning outcomes (skills safe and purposeful behavior when working with computer programs and the Internet, the ability to comply with the rules of ethics and law information) based on the study of the elements of social informatics. Line social informatics content in the basic science course 8 - 9th classes consists of the following didactic units (textbooks A.G. Gein, A.V. Goryachev, I.G. Semakin, M.I. Shutikova): information resources of society, educational information resources, personal information, information security, information ethics and law. Analysis of existing teaching aids showed that the overall goals of studying social informatics in primary school are the formation of ideas about the process of informatization of society and its impact on society and individuals, laying the foundations of the scientific worldview, educational problems solutions, the formation of information culture, ethical and legal standards activities in the information environment.

At the profile stage of the study of computer science in school (textbooks I.G. Semakin, N.D. Ugrinovich) social informatics line represented the "Basis of social informatics" (for the baseline study of computer science and ICT in 10-11 class of the school) and "Information activities of man" (for profile level) . Study of social informatics suggests maturity of ideas about the role of informatics in modern society, a basic understanding of the legal aspects of the use computer programs and the internet; maturity of views on the impact of information technology on human life in society and the adoption of the ethical aspects of information technology, a sense of responsibility of people involved the creation and use of information systems, information dissemination. In the 10 - 11th classes content line social informatics compared to the base rate in the 8 - 9th classes supplemented by the following themes: "The Information Society and the main stages of information", "Information culture".

In a study of a number of scientists justified that the paradigm of social informatics, studied at different stages in the course of computer science at school, for its completeness and correctness must be supplemented by the following concepts: “informatization of society”, “lifestyle information”, “information environment”, “information ecology”. Furthermore, the most effective for the study of this line in 8-11 classes school are dialogues, discussions, educational games, educational situations, designs, abstracts.

According to the analysis, we can conclude that the complex and urgent problem, questions remain content selection Social Informatics. Modern social informatics content should be aligned with the current state and the requirements of the information society.

It should be noted that the period of building in Russia e-government begins with the adoption of a policy document in 2002., And for the next decade the basic guidelines sets the current program information society in Russia. Concepts such as " e-government ", " e-government services ", " e- citizen" during the determination of social informatics in the late 20th century was not, and therefore could not have formed their definition on a theoretical level, with a demonstration of practical results.

Recommend to consider a number of definitions: the openness and accessibility of information, state and municipal information systems, public information resources, the protection of data.

Because state systems (and not only in the state) processed data of individuals to add definitions: personal data, personal data processing.

Should review the structure of the portal of public services as a single entry point to get public services in electronic form at the federal, regional and municipal level. To work with the portal disclose definition : public service; applicant; administrative regulations; multifunctional center, providing state and municipal services in electronic form; portal of public and municipal services; registration portal of public services; unique identification number of the citizen (SNILS, assigned to each Pension fund citizen for life, already at birth and at the request of parents), which is a single number for all cross-cutting departmental databases, digital signature, private office; fillable forms and other documents.

During the exploration and development of the proposed concepts can use resource portal of public services gosuslugi.ru, arrange in multi-function center (MFC), to simulate the implementation of public services through accession to download application forms. Subsequently, an analysis of data from the application form, which enter into the database. Simulate the database that you populate the citizen (schoolchild) in the registration and the data from the application form. Perhaps modeling prototypes of interfaces of electronic application forms in the software environment.

Thus, in the social informatics can implement universal education through personal actions, regulatory, general educational, cognitive and communicative activities that are meaningful in the information society.

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AN APPROACH TO FACTS EXTRACTION AND SEMANTIC ANALYSIS OF EDUCATIONAL WEBSITES

Salin, V.S., Papshev, S.V., Sytnik, A.A.
Saratov, Saratov State Technical University

This paper describes the approach of website's human-readable content representation in a way, understandable by machines. The approach consists of four methods that can be applied to educational website consequently to extract all required information and present it in a machine-readable form, according to Semantic Web standards. Extra attention has been paid to the method of webpages' semantic segmentation, which is based on mathematical model of the website's hypertext structure.

Keywords: semantic web, educational websites, mathematical modelling, hypertext analysis, RDF

From year to year, the volumes of information presented on the pages of web resources are increasing. In particular, there is an increase for information posted on the websites of educational institutions. Human's information retrieval process from such systems becomes more and more complicated. On this background, new trends appeared, and most of these trends aimed at personalization of specific websites for the users. That is why it is necessary to analyze, formulate and organize all of the information contained on the target website's pages.

Originally, the content of the webpages presented in a way, which is understandable and the most convenient for human, the site visitor (for example, the student or teacher). It significantly complicates the work of machine analyzers while processing semantics of webpages. Different methods of natural language processing (NLP) often use latent semantic analysis (LSA) or its modifications, applicable to the content from particular page of the website [1]. Such analyzers do not take into account the semantics of all other pages of the site and the links between them (the overall context of the website).

The similar task of search and unification of information is also actual in the Semantic Web area [2]. By providing all necessary information, presented on the web site in the form of facts and ontologies, we will greatly simplify the task of machine «understanding» webpage semantics and the whole site as well. To define automatically, what information was placed on the website, it would be enough to process the facts related to website's pages.

Currently, there are no known working tools or approaches, allowing to perform complete semantic analysis of the website and to present its data as machine-ready output. However, at the same time, there are several techniques aimed at the identification and detection of a certain kinds of facts, and performing the analysis of the information provided on the website.

The first method is based on the analysis of the logical and hypertext structure of the website. To perform this, we have developed tools that can automatically build a website graph. In this graph, vertices correspond to the pages of the website, and the edges correspond to the hyperlinks between pages. By analyzing this graph, we can detect a set of its properties, like the diameter of the graph, the presence of the unreachable vertices, as well as to identify components of strong coupling. These properties of the website's graph can be presented as facts in RDF, which is standardized and supported for machine reading. This method has some limitations imposed on the analyzed website (for example, number of pages should not

exceed the number of 100 000). However, most educational websites are in the scope of applicability of current method.

Another method is the detection of already known facts and knowledge in the text contents of the site. There are already existing tools, which allow performing NLP to extract special entities and relations from text. Combining them with the large-scale knowledge bases, we can identify already well-known terms and facts associated with them, if any are found on the pages. The same approach is already used in RDFaCE system [3]. With help of this instrument, we can get another set of facts and the known terms relevant to specific of the site. Since a significant part of the information placed on educational site is in text form, this method can be applied effectively.

The following method, which can be applied to educational sites, based on semantic analysis of the text. Applying the LSA technique, we can identify different categories and associate them with blocks of text information presented on the site. Such categories in most cases can be interpreted as the terms. In turn, the mention of term association with page can be presented as a fact. Finally, set of facts for all website's pages, can also be represented in RDF format. In comparison with previous, this method allows detecting and identifying new facts and knowledge, which is essential to the objectives of the semantic web and linked data principles.

Finally, we describe a method to perform task of categorization of webpages according to chosen criterion. The categorization of webpages can provide additional information about the content presented on these pages.

The task of webpages categorization interprets the problem of semantic segmentation, performed on the website's mathematical model. There are different approaches to implement semantic segmentation, and one of them is based on the decomposition of the set of all website pages on equivalence classes. To perform this, mathematical model of the website must be introduced. In particular, we can use website's automata model.

Let $A = (S, X, \delta)$ is finite automaton, which is model of some hypertext information system. The equivalence θ on the set S is named congruence for automaton A , if it is stable concerning transition function δ as it is defined Eq. 1

$$(\forall s_1, s_2 \in S)(\forall x \in X)((s_1, s_2) \in \theta \Leftrightarrow (\delta(s_1, x), \delta(s_2, x)) \in \theta) \quad (1)$$

I.e. if s_1 and s_2 are in the same θ -class, then states produced under action of any input signal will be also in one class.

Identity relation Δ and universal relation $S \times S$ are congruencies in any automaton.

As an example let's consider the case when in automaton $A = (S, X, \delta)$ there are some states s_1 and s_2 for which for any input signal $x \in X$ $\delta(s_1, x) = \delta(s_2, x)$. Such states are named indistinguishable. It is obvious that the relation of indistinguishability is congruence of automaton A .

The collection of all congruencies of automaton A are denoted as $Con A$. It is well known that partly ordering set $(Con A, \subseteq)$ is a lattice. The node "0" in the lattice correspond to identity relation Δ and node "1" correspond to universal relation $S \times S$.

Let $Con A$ is a congruence lattice for automaton A . The partition of states of automaton A (pages of site) into equivalent classes is correspond to some congruence $r \in Con A$. This partition is produced by congruence in assumptions about paired equivalence of some automata states. We can make these assumptions on the basis of statistic exploration of site page viewings. Partition is defined by congruence allows to structure information of the site, logically uniting automata states, which correspond to one equivalence class. More detail

information about automata algebraic structures may be found in the book of Birkhoff, Bartee (1970).

Analogical procedure may be done if a tolerance relation will be selected instead of equivalence relation. It may be more adequate to some fuzzy classification for site pages. In this case, we will have covering corresponding to tolerance relation instead partition corresponding to equivalence relation.

Compliance with a particular equivalence class by specified criterion can also be interpreted as a fact in terms of the semantic web. In addition, we can use the results of partitioning to introduce new facts and relations between existing terms. All these results can be presented in the form of RDF.

One of the important feature of the previous method is its applicability in the context of the whole site, which distinguishes it from a text analysis and search of known facts in the context of a single page, locally. Such approach allows revealing the facts peculiar to the content of the entire site, not just the selected page. Another interesting feature is the ability to use this method for completely different criterions, thereby producing set of facts by changing the criterion and choosing most appropriate one.

In this paper, we have described different methods that can be applied to the website to extract the knowledge and represent it in machine-readable form. It is a one of the most important aims of Semantic Web concept: by representing human-oriented information in standardized way (as ontologies and facts in RDF format), we make the content of the website easily readable and accessible by machine analyzers (i.e. search engines, parsers, knowledge storages). All these methods are applicable to educational websites and can help to analyze and extract their contents.

The most complete result in solving the problem of machine-compatible semantic representation of the site is achieved by using all the methods considered. Applying them consequently allows describing the content of the website pages in the most complete way. Based on the above approach, it is possible to develop software system for automated analysis of the content and structure of the website.

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METHOD OF PRACTICAL AND LABORATORY STUDIES OF THE CIRCUIT DESIGN DISCIPLINES USING SYSTEMS OF MATHEMATICAL AND CIRCUIT SIMULATION

Andreevskaya, T.M., Bogachyov, K.A.
MIEM HSE Electronics and Telecommunications Department

In most educational institutions studies of such courses as "Electronic Engineering" , "Electronics", "Fundamentals of electronic circuits", "Fundamentals of Radio Electronics and Communications", "General Communication Theory", etc. , provision laboratory workshops

to allow students to gain a deeper understanding of the discipline. However, even a well-equipped laboratory cannot cover the entire range of discipline that leads to gaps in practical training. In such cases it is recommended to include various computer modeling systems to the educational process which will help to visualize physical processes in the electronic circuits.

Keywords: circuit design, electronics, modeling, schematic diagram analysis, math model, the frequency response.

Mathematical system and circuit simulation represent the key interest in study of circuit design disciplines. They allow for estimation of electrical and electronic circuits, and the use of rather complex mathematical models of electronic components provides a good correspondence to actual parameters of the devices with real components. This paper illustrates the application of mathematical modeling program MathCAD, and MicroCAP system for circuit simulation.

MathCAD is a very convenient (or user-friendly) and compatible tool for numeric and analytical modeling. Powerful set of complex mathematical formulas and graphic presentation of calculation results, allows us to undertake analysis of both simple and complex linear and nonlinear electronic circuits, and to model transformation of various signals in electrical and electronic circuits.

As an example, we will show the results of the preliminary analysis of laboratory stand of the serial oscillating circuit. Figure 1 shows a schematic diagram of the experimental layout.

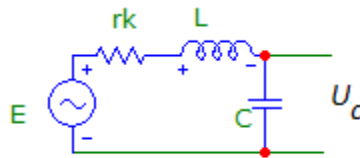


Fig.1. Schematic diagram of the experimental stand

The objective is to obtain such transmission circuit characteristics as a transient $g(t)$, the Dirac response $h(t)$, the amplitude-frequency response $K(f)$ and the phase-frequency response $\varphi_K(f)$. And analyze the influence of the coil losses r_k on circuit characteristics. Additionally, the laboratory task is supposed to analyze the waveform of the output signal at different shape and frequencies of the input signal.

A preliminary calculation using the MathCAD identifies the key parameters of the circuit, the type of its system characteristics, and allows to obtain graphs of waveforms for certain types of input signals.

Figure 2 shows the obtained formula for further analysis of operator format of the transient characteristics, which allows you to get the basic transient and frequency characteristics of the circuit.

$$H(p) := \frac{1}{1 + p \cdot r_k \cdot C + p^2 \cdot L \cdot C} \quad H(p) \text{ invlaplace, } p \rightarrow \frac{2 \cdot e^{-\frac{r_k \cdot t}{2 \cdot L}} \cdot \sinh\left(\frac{t \cdot \sqrt{\frac{C \cdot r_k^2 - 4 \cdot L}{C \cdot L^2}}}{2}\right)}{C \cdot L \cdot \sqrt{\frac{C \cdot r_k^2 - 4 \cdot L}{C \cdot L^2}}}$$

Fig.2. Operator and pulse characteristics in a symbolic form

The Dirac response of the circuit $h(t)$ was obtained by application the inverse Laplace transformation (invalaplace operator). Further, inputting specific values of the circuit parameters, it is possible to plot $h(t)$ characteristics and the functions and transient graphs and frequency characteristics (see Figure 3). We can also obtain, for example, the resonant frequency and Q-factor.

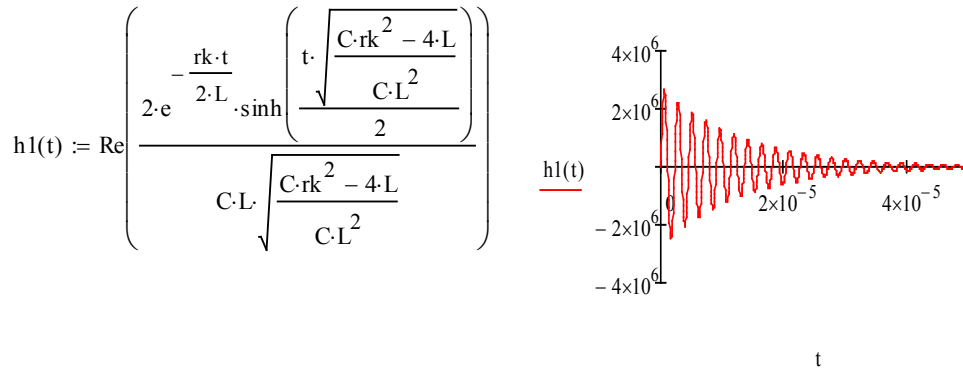


Figure 3. Formula and plots the Dirac response

Figure 4 illustrates graphs of waveforms of input and output signals, obtained by the Duhamel integral, which allow to conclude that system’s characteristics are discrete.

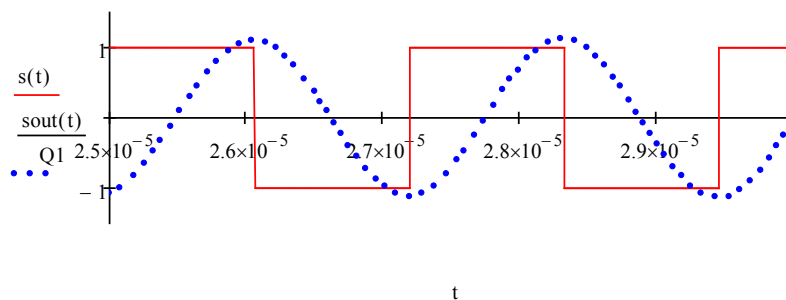


Figure 4. Waveforms of the input (red) and output (blue) signals

Thus, preliminary calculations and research in mathematical modeling will allow the students to obtain approximate values of the circuit parameters, view waveforms and spectrum of the corresponding signals, if it is stipulated by the task.

We will now look at the possibility of electronic circuit simulation. Of all the diverse systems of electronic circuit simulation system MicroCAP became the most widespread, since it does not take up much space and its system requirements are simple. It allows graphical input of circuits, simulation of electrical processes, and displays the result in graphic format. A library of standard components, except the foreign element base also includes domestic analog and digital elements. Direct Current analysis (DC - analysis), the TRANSIENT - analysis and frequency response (AC – analysis are most useful for the educational process. For the educational).

MicroCAP is quite a popular program of circuit simulation. This is due to its convenient, user-friendly interface and relatively modest requirements for computer hardware. However, its capabilities are quite substantial. MicroCAP can analyze not only analog but digital devices as well. The latest version of the program can undertake mixed analog-digital simulation of electronic devices. Experienced users can create their own precarious situation macromodels for simulation modeling.

MicroCAP key features:

Graphics capabilities.

- Construction of functional and principle electrical circuits using built-in graphics editor and the library of conventional graphic symbols of electronic components.
- Change of graphic symbols of components in accordance with Russian national standard (program uses an American Standard).
- Create personal graphic symbols using the integrated Shape Editor.
- Drawing text labels on the electronic circuit area, including text and symbols of the basic units (for the convenience of simulation), the possibility of on-off display of text labels on the circuit area.
- Adding to the circuit area the stamp with a basic part on the electronic circuit.
- Drawing of different geometric shapes (rectangles, circles, lines) used for the isolation of complete functional blocks.
- Inserting and placing on the circuit area file with additional information in any of the common image formats.
- Placing on the electronic circuit area (or in a special text box) text directives on simulation control, model parameters and set global parameters.
- Display circuit node numbers, assigned by a graphical editor when entering the scheme schematic entering.
- Ability to select displayed electronic component attributes: the nominal value, the names of the tag conclusions, and the name of the macro model parameters, etc. - through the installation / removal of flags in the parameter setting of a respective component.
- Ability to enable-disable display of all allowed electronic circuit text attributes.
- Use the enable / disable grid with different pitches.
- Ability to use "stretch wires" which do not violate the electrical connections when moving components of the circuit.
- Scaling circuit image on the screen (increase, decrease).
- Ability to search electronic component basing on certain criteria.
- Circuit navigation using the scroll bars and pulling the right mouse button.
- Alignment marks (flags) on the large size circuit for quick navigation.
- Ability to display the connections of components to identify the gaps in connection between them.
- Ability to change color and font settings display circuit elements or elements separately before entering for the whole circuit.
- Actions with a selected block of the circuit (copy, reflection, reproduction, etc.).

Simulation capabilities.

- Electronic devices mode simulation, specified by using principle and functional circuits.
- Analysis of transients in circuits when power is applied and (or) the impact (effects) of arbitrary shape with the construction schedules circuit state variables and their functions: time-dependent, independent of each other, the Fourier series of harmonic components.
- Analysis of the small-signal frequency characteristics of the circuit (linearized in the DC mode vicinity) when exposed to one or more sources of harmonic signal with constant amplitude and varying frequency. You can still conclude the following graphs:
 - dependence of complex values of state variables (amplitude, phase, group delay) on the frequency of the linear, logarithmic, semi-logarithmic (logarithmic along the X axis or the frequency and linear axis Y) scale;
 - Dependence of complex values on state variables from each other. For example, construction of the radius vector locus of state variable by using the variable X as a frequency-dependent real part, as a variable Y - frequency dependence of the imaginary part);

- Dependence of the noise spectral density on frequency given to the specified input and output nodes.

- Analysis of the transfer characteristics of the DC. Possibility to make analysis two input variables are changed, which allows to reflect the scope of device characteristics in the graph (such as the bipolar transistor's output characteristics family IC (UCE) for different values of base current IB). You can still display the following graphs: dependence of the selected state variables on changing input variable 1 (DCINPUT1).

- Dynamic DC analysis with a display on the components (optional) voltages, currents, powers, semiconductor devices mode using slide regulators - SLIDERS-largest source of EMF, current, resistor values.

- Dynamic small-signal AC analysis of the circuit (linearized in the vicinity of the operating point of the DC) with the diagram showing the values of the state variables of integrated circuits at different frequencies (defined list) when the values of passive components (resistors, inductors, capacitors) with the slide controls - SLIDERS.

- Sensitivity calculation in DC analysis. In this mode, sensitivity of one or more output variables to changes in one or more input parameters (derivatives with respect to the input parameters) is calculated. All the parameters of the models, the values of passive components and symbolic parameters can serve as input variable parameters for this type of analysis. .

- Calculation of the small-signal transfer functions in the DC mode. The ratio of measured changes in the user-specified output amplitude to small perturbation of a user-specified input DC voltage (current) which caused this change is calculated. Calculated ratio of the to cause this change in a). This automatically calculates input (relative to the input terminals of the source) and output (relative to the nodes of the output voltage) circuit resistance in DC mode.

- Calculation of nonlinear distortion of amplifier circuits using mathematical apparatus of spectral Fourier analysis.

- multivariable analysis within the main three simulation modes: transient , small-signal frequency characteristics and transmission characteristics of DC mode. The following changes are possible: denominations of simple components, the values of component model parameters, the values of character variables with linear and logarithmic step with a choice of up to 20 simultaneous change parameters or organization up to 20 nested loops. You can automatically sign each variant analysis graphs. 3D- simulation , called from a menu type of analysis is used in multivariate analysis. When Z -axis value of the variable parameter is deposited (or the version number in a statistical Monte Carlo analysis), and the surface is constructed in the space where all curves of multivariate analysis lie. in which all curves lie multivariate analysis.

- Parametric circuits optimization for the three main modes of analysis: transients, small-signal frequency response transfer DC characteristics. Optimized function is selected from the PERFORMANCE menu, which includes a large set of standard parameters of graphs (such as a long rise / fall time, the global maximum / minimum, etc.).

- Monte Carlo analysis - multivariate analysis with statistical scatter component parameters in each of the three basic simulation modes. Output distribution function histograms (eg, the length of the front, the global maximum) of the interval values within this analysis can be.

- Application of a graphical postprocessor PROBE in the analysis of transients, small-signal frequency analysis, and the analysis of the response characteristics of the DC mode. After the launch of one of these types of analysis the user gets an additional convenience for graphics output state variables of component parameters. For example, the desired voltage is displayed in a special window on the left of the circuit area after double-clicking the mouse in the interest component node.

Next, we undertake circuit simulation of the above mentioned sequential circuits oscillating circuit (Fig. 5) in the MicroCAP system.

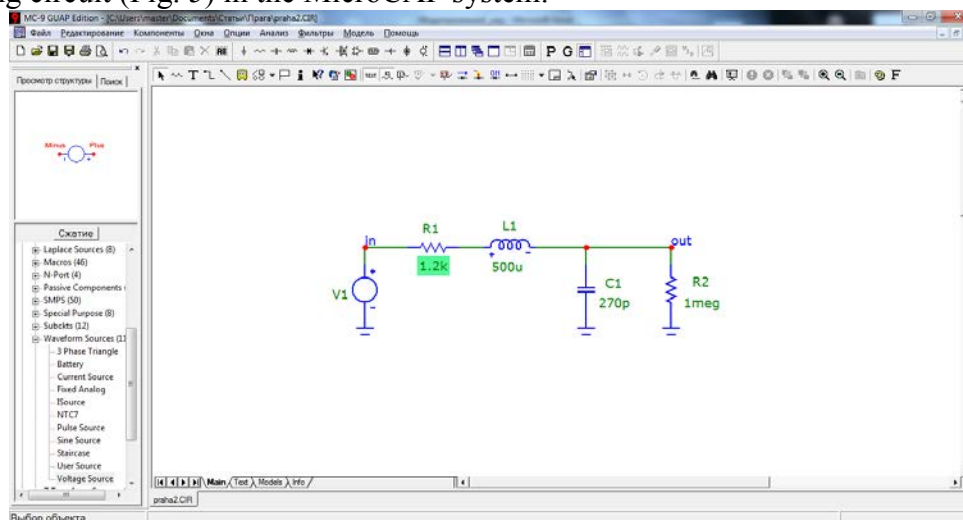


Fig. 5. Graphical input circuit diagrams

MicroCAP allows us to easily get the amplitude-frequency and phase-frequency characteristics of this circuit, for which we need to enter this is entered the number or name of the output circuit node (in this case, the node «out»). The Screen displaying the modeling of the frequency analysis is shown in Figure 6. Figure 7 shows the frequency response of the circuit. Figure 8 illustrates the selective properties of the circuit upon application of a periodic sequence of rectangular pulses with a repetition frequency equal to the resonance frequency of the circuit.

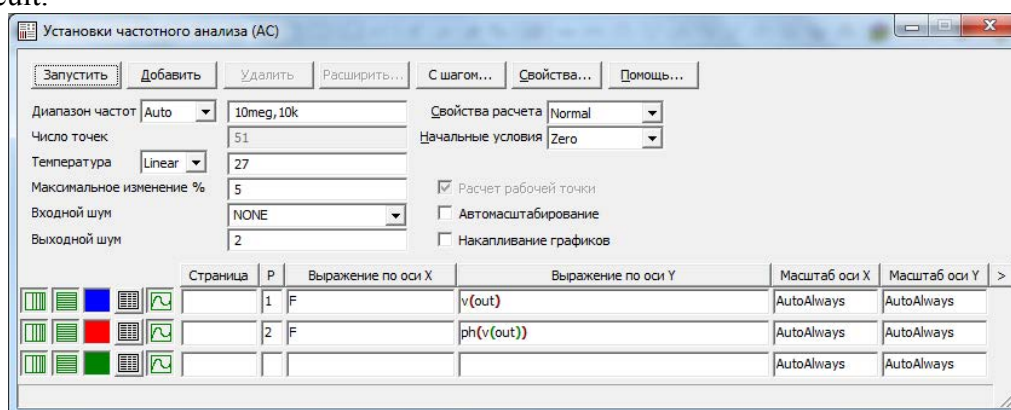


Figure 6. Exercise: frequency analysis of the scheme

Comparing the results obtained with the help of mathematical and circuit simulation, we see their compliance. However, both modelling methods allow to obtain new knowledge about the subject, as successfully hold full-scale experiments in the laboratory [1,2]. In addition, circuit simulation gives students have a unique opportunity to "tune" the component parameters, conducting analysis of variance, which significantly reduces the working time. A similar approach is used in the circuit design. Proposed method of studying circuitry disciplines is implemented and successfully used in MIEM HSE at the Radio Electronics and Telecommunications Department.

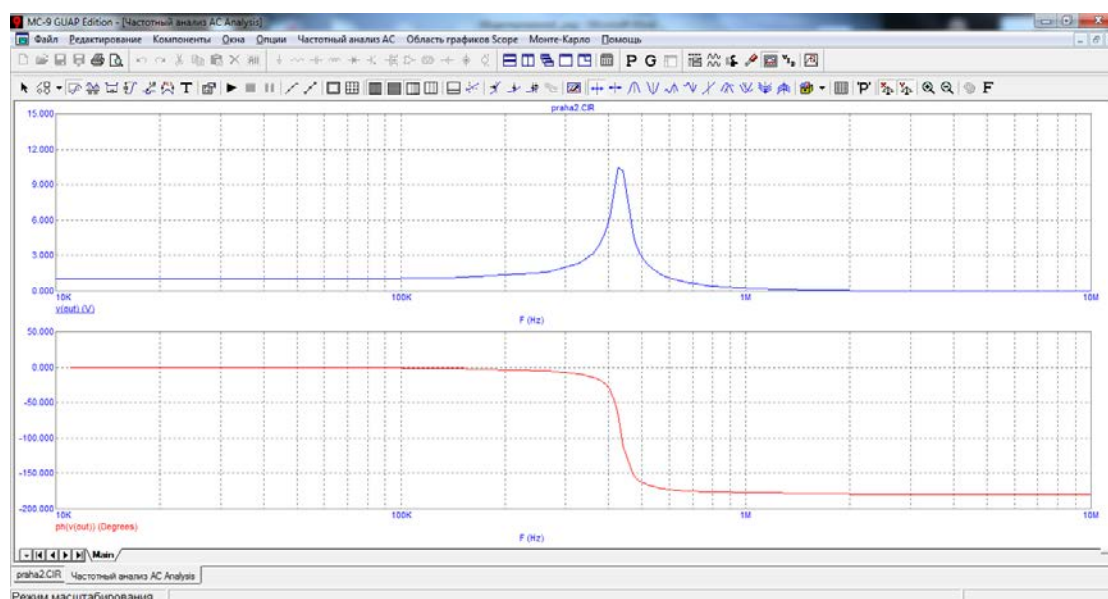


Figure 7. Frequency characteristics

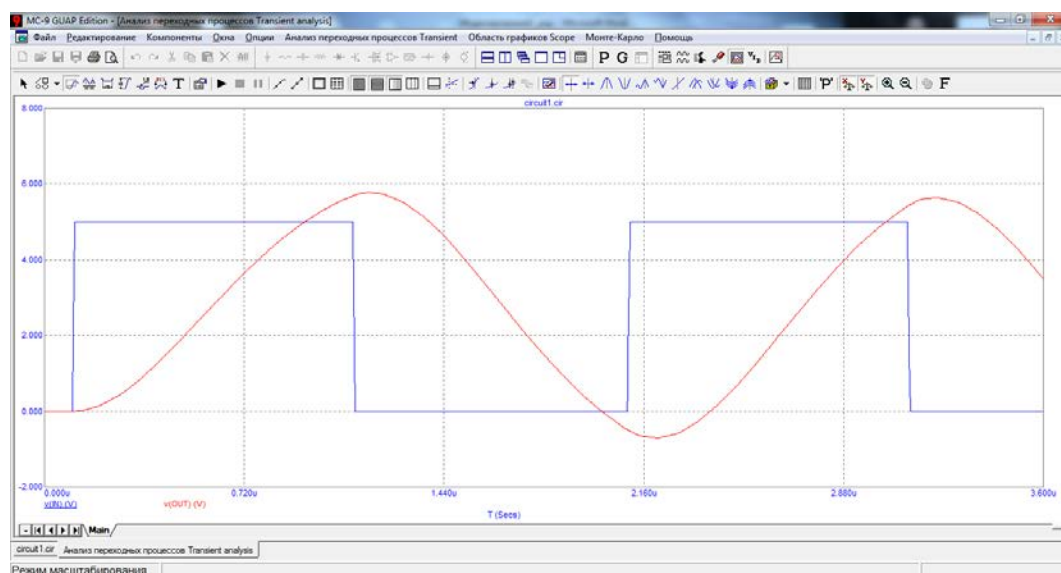


Figure 8. Output (red) and the input signals of circuit

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METHOD OF CONSTRUCTION LEARNING PATHS IN VOCATIONAL EDUCATION

Bershadsky, A.M., Lushnikov, A.V.

Federal State Educational Institution of Higher Professional Education Penza State University

The article focuses on finding ways to get higher education in Russia. The technique, which allows to calculate the degree of conformity of specialties of vocational education and training areas of higher education.

Keywords: Higher education, secondary vocational education, methodology, educational system.

The most prestigious level of professional education in Russia is higher vocational education (hereinafter VPO). Most high school graduates seeking VPO enrolling in university postsecondary education complete. This formed the modern stereotype, which, along with economic factors, creates an imbalance in the labor market as well as in the educational market. According to Rosstat, in the period from 1990 to 2012 the number of officially registered universities in Russia increased from 514 to 1080, while the number of secondary vocational education institutions declined by more than 50% from that of the beginning of the 1990s.

In recent years, secondary vocational education has lost the status of "sufficient" for successful employment in today's labor market, despite the fact that over the last decade the Russian labor market is experiencing an acute shortage of staff working professions. For most employers higher education employee became the de facto standard, even in cases where it is, in fact, is not required.

Secondary vocational education (hereinafter SPO) in Russia can be used as a convenient intermediate step between school and university, getting the basics of professional education.

SPO institutions in Russia presented technical schools and colleges. According to regulations on educational institution of secondary vocational education (secondary vocational school) [1]:

Technical schools - Educational institution, the basic professional educational programs of secondary vocational education training base;

College - Educational institution, the basic professional educational programs of secondary vocational education and basic training programs of secondary vocational education in-depth training.

Often colleges are established at universities and conclude with the university a contract in which graduates can enter the third year of this institution of higher education in order to obtain higher education in the short-term program for three years.

Option of a first secondary vocational, and then higher education in Russia is not very popular, but in some cases it increases the chances of employment. For certain categories of staff, such as accountants, the presence of secondary vocational education is an advantage. This suggests that the employee was determined with a professional vocation and motivated to work in this area.

Opportunity to go to university to any training direction (hereinafter NP), regardless of what specialty to a college or technical school attended before, creates certain problems. The list of specialties SPO usually correlates with NP universities only within a group of specialties.

It is proposed to develop a methodology for constructing the possible ways of learning

(learning paths) in the SPO - VPO, allowing to define the list of NP, the most suitable for further studies of college students (college) with minimal retraining.

It is assumed that you have a database with a list of specialties SPO and NP VPO, and also a list of their disciplines.

Denote the set of specialties SPO as $S = \{s_1, s_2, s_3, \dots, s_i\}$, the set of NP as $B = \{b_1, b_2, b_3, \dots, b_j\}$.

Introduce the function D , the result of which is a list of specialty disciplines or NP, then:

$D(s_i) = \{d_1^{s_i}, d_2^{s_i}, d_3^{s_i}, \dots, d_n^{s_i}\}$ — set of disciplines i-th specialty SPO;

$D(b_j) = \{d_1^{b_j}, d_2^{b_j}, d_3^{b_j}, \dots, d_k^{b_j}\}$ — set of disciplines j-th NP VPO;

Introduce the function F , which is used to calculate the extent to which the two NP:

$F(b_j, s_i) = diff$, where *diff* — a positive integer equal to the sum of minimum differences disciplines.

To find the minimum difference between the names of the two disciplines, we introduce the function $levenshteinMod(d_n^{s_i}, d_k^{b_j})$. This function calculates the Levenshtein distance [2] between two lines, but with some modifications.

In the classic form of Levenshtein distance has a disadvantage: the distance between the very different short words are small, while the distance between the very similar long words are significant. To address this shortcoming, it is necessary to modify the function.

It is proposed to add a check on the entry lines. If one line is getting into another line, the line will be considered semantically identical, otherwise it is necessary to compare two strings Levenshtein distance with a minimum length of the string. If the distance exceeds the length of the minimum Levenshtein string, count lines logically different and the result is a predetermined large value difference of rows, otherwise the result of the function will be equal to the Levenshtein distance.

Thus, the function becomes:

$$F(b_j, m_i) = \sum_{d_t^{b_j}}^k \sum_{d_r^{m_i}}^n \min(levenshteinMod(d_t^{b_j}, d_r^{m_i}))$$

Since F is an additive, its minimum value of zero would indicate complete agreement of the two training areas.

The method consists in the following:

1. You must select the original specialty SPO, for example, 230115 - Programming in computer systems;
2. Select all areas of training VPO. It can be both directions of bachelor's and master's degrees, as well as specialty of magister;
3. For each match "specialty SPO - NP VPO" calculated by the proposed formula F satisfaction degree.
4. Select multiple NP VPO with the maximum degree of conformity (the minimum value of *diff*). Selected NP called "direct" correspondences.

In addition to the "direct" respective capabilities "transitive" - these are areas of training masters who are "straight" for a similar specialty SPO.

To determine the "transitive" compliance is necessary:

1. For selected specialty SPO function F to find a match among other specialties SPO.
2. Repeat steps 2-4 correspondences direct search techniques.

Experimental verification:

Table 1. "Direct" correspondences

Specialty SPO	NP VPO
230115 – Computer Systems Programming	230400 – Information Systems and Technology
	230100 – Computer Science and Engineering
	010300 – Basic computer science and information technology

Таблица 2. «Транзитивные» соответствия

Specialty SPO	Simple specialties SPO	NP VPO
230115 – Computer Systems Programming	230111 – Computer Network	230400 – Information Systems and Technology
	230401 – Information Systems (by industry)	
	230701 – Applied Informatics (by industry)	010300 – Basic computer science and information technology.

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CLASSIFICATION OF COMPUTER TRAINING PROGRAMS FOR THE CONTINUING EDUCATION CENTER

Derugin, I.A.

Balakovo, Balakovo Institute of Technics, Technology and Management

The aim of this article is to describe the types of training programs, as well as their features and characteristic properties. This article shows all the main advantages, as well as a program based on the main principles of training programs, to show how they are implemented in practice.

Keywords: training program, interface, testing.

Despite the fact that the additional education of children today bears the imprint of the past relationship to it, one can see completely new features. First of all, turned the whole network of institutions of additional education and appeared countless additional educational services. Secondly, additional education of children gained flexibility incredible for such a conservative sectors like education and pedagogy. Third, there is a clear trend towards the further intensive development of extensive growth and scope of further education.

Educational program or training group of children - it is a document that reflects the concept of teaching in accordance with the stated goals of containing the conditions, methods and technology to achieve the objectives and intended end result; document that reveals the structure of the organization, the sequence of implementation, information, technological and resource the educational process in accordance with the reasonable objectives and content of education.

There are several types of supplementary education programs:

- Sample (Sample) program - approved by the Ministry of Education Russian Federation of the recommended additional education as an educational area for a specific activity or direction.
- Modified (or adapted) program - a modified taking into account characteristics of the organization and the formation of groups of children, mode and time parameters of the activities of non-standard individual learning outcomes and education.
- Pilot Program - its purpose is to change the content, organizational and pedagogical principles and teaching methods, offer new areas of knowledge, the introduction of new teaching technologies.
- Authoring program written entirely teacher or team of teachers, its content - a set of proposed means of addressing problems in education other than novelty and relevance.

As has been noted, the creation and development of computers has led and continues to lead to the creation of new technologies in various fields of scientific and practical activities. One such area was the formation - the transfer of systematic knowledge and skills from one generation to another. Being itself a powerful information sphere and possessing experience of using different classical (non-computer) information systems, education, quickly responded to the possibilities of modern technology. Before our eyes, there are non-traditional information systems related to training, such systems are naturally called information and tutorials.

Due to their structural and functional features of a modern personal computer is unique in its capabilities learning machine. It is used in teaching a variety of disciplines and serves as a base for creating large numbers of new information technology training. Features PC distinguish it from the first known teaching machines and means of training is a combination of:

- interactive (dialog) mode;
- «personality» (small size and cost, allowing computers to provide a whole class);
- good graphics, illustration capabilities;
- ease of management, the availability of flexible programming languages, human-machine dialogue and computer graphics;
- ease of recording and storing information about the learning process and student work, as well as the ability to copy and reproduction of training programs.

The basis for classification are usually features educational activities of the students when working with programs. Various authors distinguish four types of training programs:

- Training and monitoring;
- mentoring;
- simulation and modeling;
- developing games.

First type programs (training) designed to consolidate skills. It is assumed that the theoretical material has been studied. These programs offer a random student issues and challenges, and counted the number of correctly and incorrectly solved problems (in the case of a correct answer can be given encouraging student cue). If an incorrect answer the student may receive assistance in the form of tips.

Second type programs (mentoring) offer students the theoretical material is for learning. Challenges and issues are in these programs for the organization of man-machine dialogue, to control the flow of learning. So if the answers given by the student is incorrect, the program can "roll back" for the re-examination of the theoretical material.

Third type programs (modeling) based on graphically illustrate computer-illustrative opportunities, on the one hand, and computing, on the other, and allow for a

computer experiment. These programs provide the student the opportunity to observe the display some process, affecting its course supply to keyboard commands, change settings.

Forth type programs (game make available to the student some imaginary environment that exists only in the computer world, a set of some features and tools to implement them. Using the provided software tools to pursue opportunities related to the study of the game world and the activity in the world, leads to the development of the student, the formation of his cognitive skills, self-discovery of the laws of relations of objects in reality having universal significance.

Represented program is a computer learning system in the form of testing. In this case, the program is training. Interaction with students by using the user interface.

In the learning process are the following advantages:

- Intuitive GUI
- Ability to define test any topic
- Assessment of Knowledge through comprehensive system of scoring
- Effective knowledge testing
- Interaction with the user

The presence of a GUI in this tutorial helps you configure dialogue with the user by providing testing for subsequent verification of knowledge. Also, the interface is intelligible, thereby allowing any user to operate with this program. The interface is an essential part of the program and performed very interaction with the program. He also highlights program on the total weight of other like her.

Testing, where you can specify any topic is a huge advantage of the program. Since this feature is not present in all programs of this type, but also allows you to select one or more specific topics in which the student must test their knowledge and gain experience in the development of this material.

In this program, assessment of knowledge through accrual of certain points for each correct answer. This system allows you to accrue points, but did not make an assessment, which in turn failed at not passing the test can psychologically affect the further motivational component of the student.

This training allows the testing of knowledge effectively teach the student because it helps train your memory as well as a better understanding and development of training material. This system of verification of knowledge is also the most adequate, because it helps to understand how student learned the theoretical material.

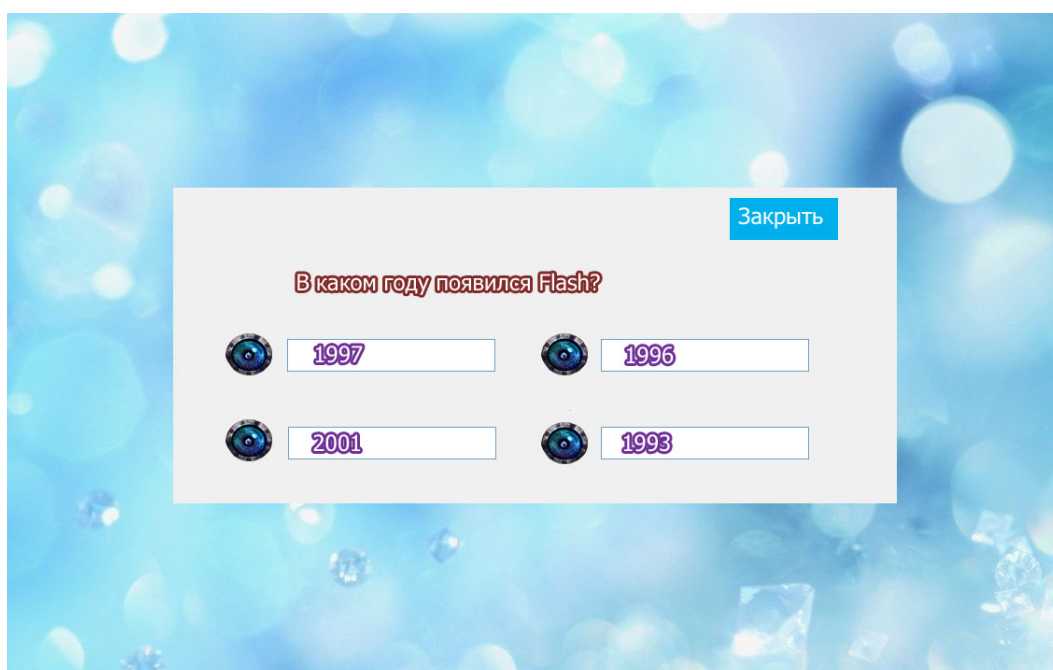
Interaction with the user is also one of the most important elements of the program, along with a graphical interface. It allows, in contrast to the multimedia learning tools allow the user to choose what he will interact. This interactive learning allows the student a positive motivation to form a cognitive interest in the subject of training, as well as to create conditions for the development of pedagogical skills of the student. This interaction involves dialogue with the user, that is, instead of simply presenting information here can exchange it. All of the above makes a productive learning process itself and allows the student to feel their intellectual consistency and success.

User interface - a set of software and hardware, providing the user interaction with the computer. Constitute the basis of this interaction dialogs. Under the dialogue in this case understood regulated information exchange between man and computer, implemented in real time and to jointly solve a particular problem. Each dialogue consists of separate input-output processes that physically provide communication user and computer. Exchanging information is happening by send the message.

Interface training applications on flash consists of the following stages:

- 1) The application main menu with the following elements:

- "Close" button to exit the application, located in the upper right corner of the window;
 - In the center of the window is a form for user registration , consisting of fields for entering the name, group and button «Play Now», after entering data and clicking on which the user can navigate to the window of the game;
 - In the upper right corner is a button "Expand to full screen", which deploys the application to full screen.
- 2) The testing window with the following elements:
- "Close" button to exit the application, located in the upper right corner of the window;
 - In the center of the window is a form to display the test questions and answers with the appropriate buttons;
 - In the upper right corner is a button "Expand to full screen", which deploys the application to full screen.
- Interface testing window is shown in picture 1.



Picture 1 – Testing window interface

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THE ADVANTAGES OF USING INTERACTIVE TRAINING SYSTEMS IN THE CONTINUING EDUCATION CENTER

Ershov, I.M.

Balakovo, Balakovo Institute of Technics, Technology and Management

The aim of this paper is to identify the advantages of interactive learning systems compared to traditional teaching methods. This topic is relevant, since the process of excellence involves the use of additional education beyond basic. And this article helps you choose the most effective solution to this problem.

Keywords: interactive learning systems, additional education.

The process of preparing professional people is lengthy and complicated. Education in high school and then in institute of higher education takes up almost a third of the length of human life. Moreover, in today's information society knowledge very quickly grow old. To be able to perform a professional activity, expert must constantly replenish his knowledge.

Therefore, the main task of our time secondary and tertiary stages of education is not to inform big amount of knowledge, and to teach how to produce independently this knowledge and creatively used to produce new knowledge.

Additional education - a constituent part of the system of education and bringing up children, adolescents, students focused on free choice and development additional educational programs. The purpose of additional education - development of motivating people to knowledge and creativity, promote personal and professional self-determination of students, their adaptation to life in the community. Additional education contributes to social, recreational and leisure functions of free time, allowing people to use it to maximum advantage, combining leisure with entertainment, creativity. Additional education is organically related to educational process in school, extra-curricular work.

Institutions of further education in accordance with direction of additional educational programs realize following activities: teaching, research, artistic and aesthetic, scientific, technical, ecological and biological, tourist and local history, sports and athletic.

By the end of the 20th century, the role of knowledge throughout the world has increased incredibly. Proficiency in knowledge, or more generally, information begins to determine political and economic status of the states. And to succeed in such conditions states need people - highly skilled professionals. Therefore today education becomes one of the most valuable sources of strategic resources - human capital and knowledge, which ultimately determines overall development of society. And the main accelerators of its development becomes informatization. Informatization of society, in turn, is almost impossible without the computerization of the education system, whereby this problem by its significance goes now in first place in teaching science. Priority to this problem is amplified by the fact that it is a fundamentally new. Originating with the advent of the computer, i.e. in the past two decades, it can't use the experience of past centuries, as it done in classical pedagogy, and forced to develop only "inside", forming its scientific base simultaneously in all required fields - philosophy, psychology, pedagogy and methodology. This fact, combined with highly practical necessity, makes the problem of computerization increased urgency, turn out it on the first place in the group priorities of modern pedagogy.

Comprehensive computerization of schools and universities are now focused on the formation and development of intellectual potential of science to improve the forms and

content of the educational process, introduction of computer training methods, the use of pedagogical work of modern information technologies.

Information technology is deeply integrated both in the administrative and organizational part of the learning process (corporate management information systems), and directly in the process of teaching, learning and monitoring the successful development of knowledge (e-learning system). Moreover, there are at the present stage successfully introduced throughout educational-methodical complexes combining both administrative and educational functions (educational intranet and Internet portals, distance learning systems, etc.)

One of the types of educational information systems used in the learning process are computer training system (hereinafter - CTS).

Computer training system - a specially designed software modules used in the educational process and for controlling the cognitive activity of learner, formation and improvement of his professional knowledge and skills.

Advantages of CTS:

- Understanding of documentary, accuracy depicted events;
- Seeming "reach" of primary sources, defiant peculiar effect of personal involvement to represented;
- Practical accessibility of cultural and artistic information of any region and understanding personal involvement in the global artistic heritage common to all mankind;
- Ease of handling images, the possibility of rearrangement of arbitrary layout and technical editing.

Computer training system include:

- means declarative type - printed material (or their electronic copies), audio and video;
- online tutorials, virtual classrooms;
- virtual simulators;
- computer systems automation training activities;
- training - monitoring systems and automated control systems of knowledge;
- interactive learning systems.

The most used at the moment are interactive learning systems (ILS). This type of CTS has maximum information that allows to achieve the highest efficiency of teaching material, as well as gives you the opportunity both organize training and control results.

"Interactive learning system" - a computer program designed to train and test student's knowledge interactively using modern computer design and multimedia technology.

Developed ILS is intended for use in children's computer school for teaching children the basics of computer hardware structure and subsequent verification of knowledge on this topic.

By means of developed ILS you can do following operations:

- View information about computer components and input-output devices;
- Be tested for knowledge on this topic;
- During teacher mode you can create new test questions and edit available test questions;
- During teacher mode you can view results of test.

Interface of interactive learning system about devices of PC consist of following stages:

1) Menu with following elements:

- Three buttons to navigate to other windows of system and button "Exit" at the top and bottom of window;

- In the center of window is a form for user registration, consisting of fields for entering name and group, "Next" button, after entering data and clicking on which, user can navigate to other windows of program;
 - In the upper right corner is a button "Expand to full screen", which deploys application to full screen.
- 2) Testing window with the following elements:
- Three buttons to navigate to other windows of system and button "Exit" at the top and bottom of window;
 - In the center of the window is a form that display the test questions and answers with appropriate buttons;
 - In the upper right corner is a button "Expand to full screen", which deploys the application to full screen.

Main menu interface is shown in the Figure 1.

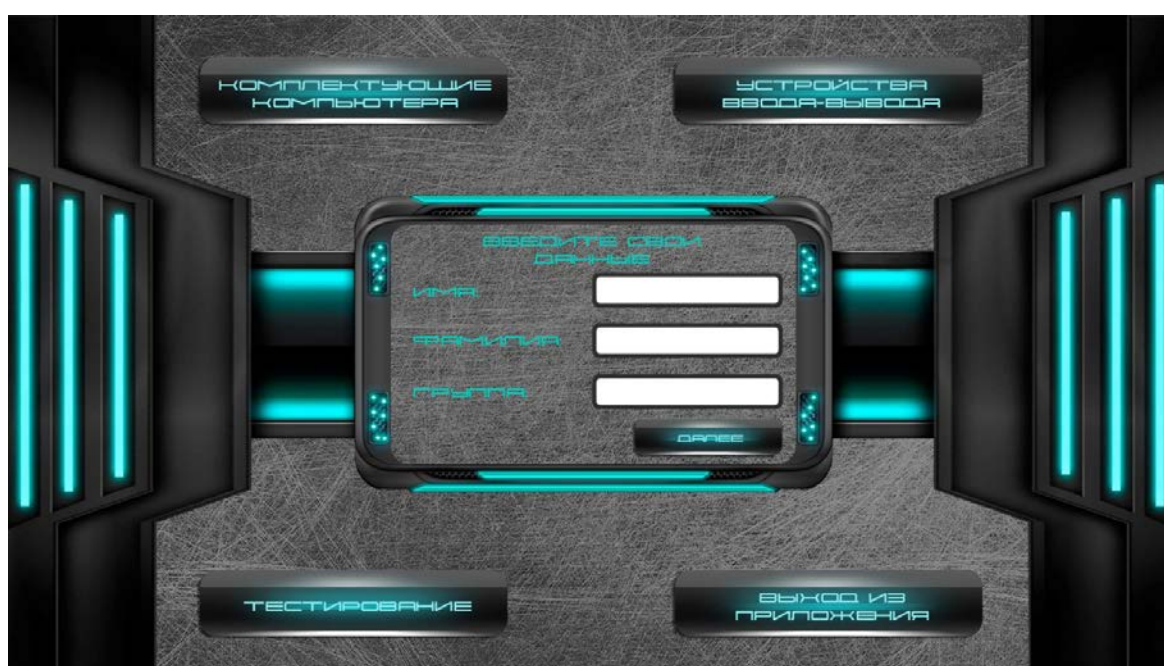


Figure 1 - The main menu interface of applications

Interface of testing window is shown in the Figure 2.

Advantage of using an interactive learning system in comparison with traditional teaching methods (lectures, presentations, videos, etc.) consist in combination learning with acquisition work skills of students. Interactive teaching methods create conditions for experience success situation in the educational activity for students. It realize creative potential of students, stimulate their cognitive activity. First of all, interactive learning gives expanse for using different models, sign systems that help to structure large flow of information, highlighting necessary information for active use.

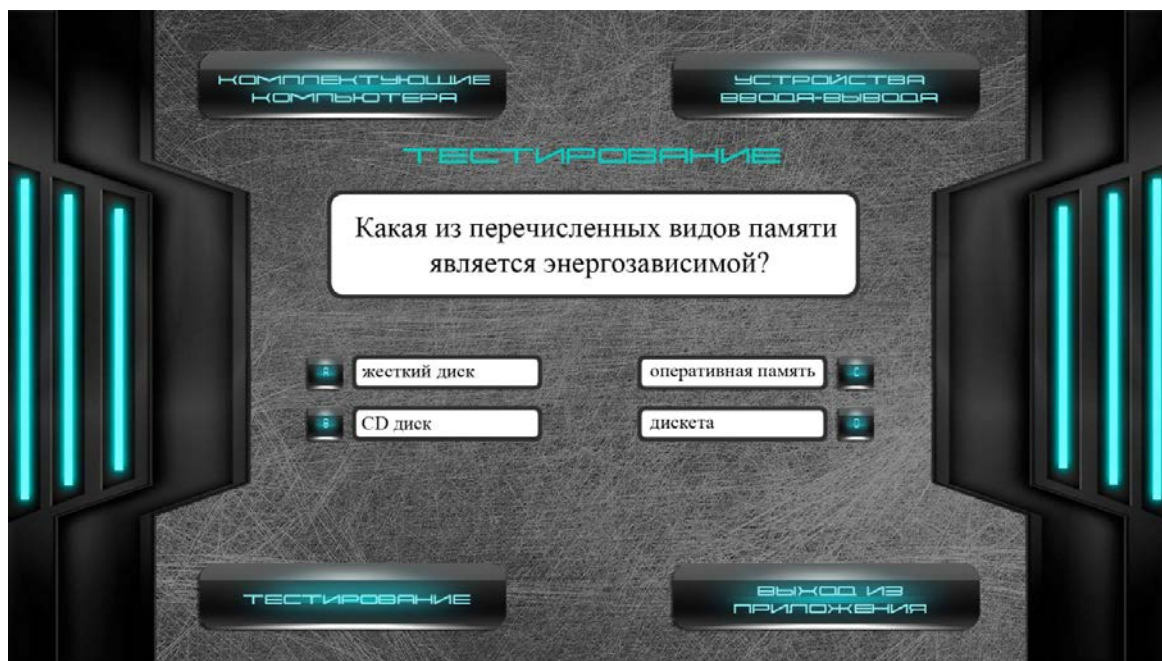


Figure 2 - Interface of testing window

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OVERVIEW OF TECHNOLOGIES FOR DEVELOPMENT INTELLIGENT TUTORING SYSTEMS

Frolov, D.A.

Saratov, Yuri Gagarin State Technical University of Saratov

This article discusses the use of computer feature learning systems, as well as the core technology for their development. As a three-dimensional graphical editors offer a powerful environment to use 3ds Max, for the development of software parts - platform Java, as well as a database - Oracle Database.

Keywords: intelligent tutoring systems, 3ds Max, Java, Oracle.

Continuous modernization of the education system needs to find new approaches to learning. Informatization of education can effectively use electronic educational resources for the educational process and the organization of interaction of subjects of this process. Modern

educational systems allow you to manage independent work of students on a completely new organizational level. These systems can reduce time and cost of the study material, reduce the burden on teachers, eliminate the use of expensive equipment, and improve the assimilation of the material trainees. Since people have different perceptions of the training material, the information in the computer-based training systems appears in various forms: text documents, illustrations and photos, video and three-dimensional models. Thus, excess material can improve performance of some students and accelerate the learning process of other.

Recently, special interest are intelligent tutoring systems (ITS). These systems allow you to manage training activities at all stages, from the formulation of the problem and ending with the optimal solution, and use the interaction with learners using dialogues. Construction of ITS is the analysis and modeling of the entire domain, covering the learning process. The student needs to learn from practical problems, which is achieved using visualized three-dimensional models whose behavior is defined by software. Standard means of template development environment is not enough to create a high-quality model of the process, so it is advisable to start the development of ITS in general purpose editors using its software code.

To use a three-dimensional image required for the ITS needs to develop a three-dimensional object model for each element of the simulated device. Leader among graphics editors is three-dimensional modeling software Autodesk 3ds Max, which contains powerful tools integrated 3D-modeling, animation, rendering and compositing. 3ds Max has a wide variety of tools to create the shape of three-dimensional computer models using several mechanisms.

When creating complex models used for ITS polygonal modeling. Using a bunch of composite objects allow you to implement a virtual computer representation of any complexity. 3ds Max has a system of calculating the behavior of physical objects, on the basis of which can be modeled by different states of solid objects under the applied forces. Visualization 3ds Max displays all the material properties of objects after applying the effects of the environment. 3ds Max system has its own renderer, and also allows the use of plug-ins as a large number of third-party software.

Important function of the three-dimensional graphics editor 3ds Max is the possibility of network rendering scenes containing high polygon objects and animation. This feature allows to use the processing power of networked computers that can significantly reduce the time of drawing complex scenes and animations.

3ds Max has a built Material Editor Slate Material Editor (SME). SME - is a powerful tool for creating and manipulating materials nodal method (node-based). It gives a clear graphical representation of materials and maps, their relationships, input and output connections shaders (communication). Nodes are circles, active nodes are highlighted in green and have a line of communication red. Thanks to the editor materials challenging realistic materials can be created quickly and easily. SME allows you to use the same texture in several materials, combine them, and at the same track where and what kind of communication are used, due to scheme of the material components.

Built-in library materials Autodesk enables transmission of material parameters between multiple applications Autodesk. This provides one correspondence data, allowing you to have a clear definition and exterior materials. Thus, eliminating the need to plan assigning materials after import data.

Editing three-dimensional modeling 3ds Max is the most optimal development environment. This software is a versatile editor that allows you to develop models of equipment of any complexity. 3ds Max has a high degree of realism of rendering images, as well as interoperability with other applications Windows.

As the main programming language used to develop ITS can perform object-oriented language Java. The Java platform provides a flexible and powerful object model allows you to

design the most complex systems. Java is significantly different from the others-oriented programming languages. Typically Java towards the term "platform". Typically, a combination of hardware called platform architecture, which is determined by the type of processor used with the operating system. When writing software developer always use the means of the target platform for network access, support threads of execution, with a graphical user interface and other features.

Java applications are executed, a special universal medium, which is called the Java Virtual Machine (JVM). Environment JVM is written specifically for each real platform to hide all its features and provide a single runtime environment for java-applications. Sun has created a JVM for almost all modern operating systems. Thus, the main feature of Java-technology is cross-platform, which is achieved by using a virtual machine JVM. Accordingly, the developed ITS can be performed under various operating systems.

For storing and processing multiple data ITS requires advanced and powerful database management system. Oracle Database offers a new many rental architecture that simplifies the deployment and management of cloud databases. Innovations such as Oracle Multitenant for rapid consolidation of multiple databases and automatic optimization of data to support a thermal map Heat Map for tighter compression and data capture, provide maximum efficiency and flexibility in the use of resources. These advanced technology combined with greater availability, security, and support for large data make Oracle Database ideal platform for deploying private and public cloud environments.

Thus, ITS, developed with the help of these tools, allows you to fully automate the learning process. Tasks instructors reduce the duties of an expert in this field. Instructor only designs the content of training sessions and monitor the activities of the trainees.

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DESIGN OF DECISION SUPPORT SYSTEM FOR THE FORMATION OF EDUCATIONAL PROGRAMS

Cherkasov, D.V.
Ufa, USATU

This article describes an approach of automated formation of educational programs based on employer requirements for specialists and describes the design of the implementation of decision support system for the formation of an educational program.

Keywords: educational program, federal state educational standard, the requirements of the employer, the decision support system.

The question of automated generation of educational programs for the training of employers' requirements is highly relevant in view of the fact that the constant need educational programs that would meet the maximum requirements of employers to specialists.

The transition of the Russian universities on federal state educational standards for third-generation (FSEP) requires a change in the management of the educational process, the structure of the basic educational programs of higher education, as well as a need to improve management of available resources and teaching staff.

At the heart of the FSEP is the notion of competence. Under the competence refers to the ability to apply knowledge, skills and personal qualities to be successful in a particular area. And the notion of competence implies ownership of relevant competencies.

As a result, the problem of formation of the educational program that meets the requirements of industry competency specialist. Also need to consider the efficiency of the process to identify mainstream educational program requirements of the industry, as with the development of technology will change the industry and the requirements to specialists, and therefore must have the possibility of changes in the educational program, that's, there is a need of having a dynamic and mobile form of educational programs.

The main purpose of the competency approach is not only improving the quality of education and that it be subject to the immediate needs of the labor market, and providing graduates readiness to actively participate in their professional activity and the formation of the qualities expected in society and the individual current conditions. The solution of this problem is actively engaged in the professional scientific community.

Training, meeting modern changing demands, is an urgent task. To solve it is necessary to create a dynamic educational program, which will be taught by experts. The solution of this problem would save the student time they spend on education, and employers - resources that are spent on additional training specialists. Graduate school will increase their status by issuing professionals with labor market demand.

Theoretical approaches to this problem are presented in [1]. As a methodological basis for the formation of technological base is supposed to use the methods presented in this paper [2].

The purpose of this study is to develop decision support system for educational training programs in accordance with the requirements of the FSEP and employers.

The mathematical formulation of the problem

One of the first steps to solve this problem is to formalize the process of formation of educational training programs that have to meet competency requirements of employers, as part of compliance with the requirements of the FSEP of the third generation.

On the one hand, there are many competencies FSEP K_{FSEP} , which, in turn, consists of many different competences basic educational programs (BEP)

$$K_{FSEP} = \{K_{FSEP_i} | i = 1, 2 \dots n\} \quad (1)$$

On the other hand, there are many competencies K_r imposed on employers to specialists, consisting of competencies K_{r_j} , where j – the seats of employer. K_r represents the integration of professional competency standards in areas $K_{prof\ stand}$ requirements and job descriptions K_t .

$$K_r = \{K_{r_j} | j = 1, 2 \dots m\} \quad (2)$$

$$K_r = K_{prof\ stand} \cup K_t \quad (3)$$

On the basis of the intersection of sets of competencies and specialist sets K_r competencies FSEP K_{FSEP} selected areas of training that meets a set of competencies and K_{r_k} minimally different from competency formed by FSEP in the direction i .

$$K_n = K_{FSEP} \cap K_{r_k} \quad (4)$$

where K_n - many areas of training competencies that meet the requirements of employers .

But there is so many unmet competencies Δ_j , the satisfaction of which is done by filling the variable part of the BEP, consisting of national and regional components (NRC) and elective courses students (ICS):

$$\Delta_j = K_{r,k} \setminus K_{FSEP,i} \quad (5)$$

Need to choose the direction of the most satisfying training set $K_{r,j}$. For this it is necessary to solve the optimization problem, aiming at minimizing Δ_j selection and training areas closer to satisfy the maximum number of sets of competencies $K_{r,j}$:

$$\Delta_j = K_{r,k} - K_{FSEP,i} \rightarrow \min \quad (6)$$

If $\Delta_j \leq NRC + ICS$, the preparation is carried out according to the BEP specialist. If $\Delta_j \geq NRC + ICS$, then formed under the additional education courses, covering the remainder of the uncovered competencies:

$$D_{course} = \Delta - (NRC + ICS) \quad (7)$$

The next step to solve this problem is to determine the disciplines that will satisfy the whole set of necessary competencies within the specialist requirements.

On the one hand, there is a knowledge base (KB) competencies, on the other hand, KB disciplines. KB disciplines in varying degrees of competence satisfies presented in KB competencies. In turn, the core set of competencies specialist satisfied FSEP, the rest (about 50 % of the curriculum) must be met at the expense of subjects included in the NRC and ICS. But in a set of competencies can be competence, not included in KB competencies, therefore, these competencies were not previously covered by any discipline of KB disciplines. To solve this problem, it should be possible to the decision-maker (DM), in particular the teacher responsible for the formation of the BEP, add additional discipline with reference to those competencies that will be formed by them, or choose from existing disciplines, also referring to the competence, which they satisfy.

As a result, the following tasks that should be solved to achieve the objectives of the study:

- Development of a method for decision support when choosing the direction of specialist training, the optimal fulfillment of the requirements of employers on the basis of the FSEP.
- Develop a mechanism for the formation of decision support variable part of the BEP. That is, the formation of recommending how to fill a variant part of the educational program of specialist training in the chosen direction.
- Development of tools forming additional education programs, implementing unpatched BEP part of the requirements of employers. It is understood that the expected development of educational courses that fill unmet needs and competencies to be met by the employer to a specialist.

Design of decision support system for the formation of educational programs

In simplified form, the process of formation of the educational program is the implementation of business processes such as:

- Processing requirements of employers . As a result of this process occurs in the requirements formalization employer competence relevant competencies used in the FSEP.
- Select the FSEP for specialist training . This process involves analysis and comparison against the competencies requirements to a specialist with FSEP competencies . The result is the identification of the closest options for FSEP specialist training required employer. Also, this process involves coordination of FSEP selected for training and approval of his employer.

- Adding NRC disciplines and elective courses. To meet all the requirements of the employer in addition to the federal component disciplines, NRC added discipline and discipline of their choice. This block is based on the disciplines list of competencies presented to a specialist who is not satisfied with the selected FSEP. If you can not meet all the requirements of the employer, for whatever reasons, such as restrictions on the complexity of implementation and the like, is formed supplementary education program that will be implemented parallel to the main.

- Review and approval of the project curriculum. This process involves checking compliance of this curriculum educational standards and educational standards of the university.

To meet the previously described business processes necessary to a decision support system (DSS) for the formation of educational programs performs the following functions :

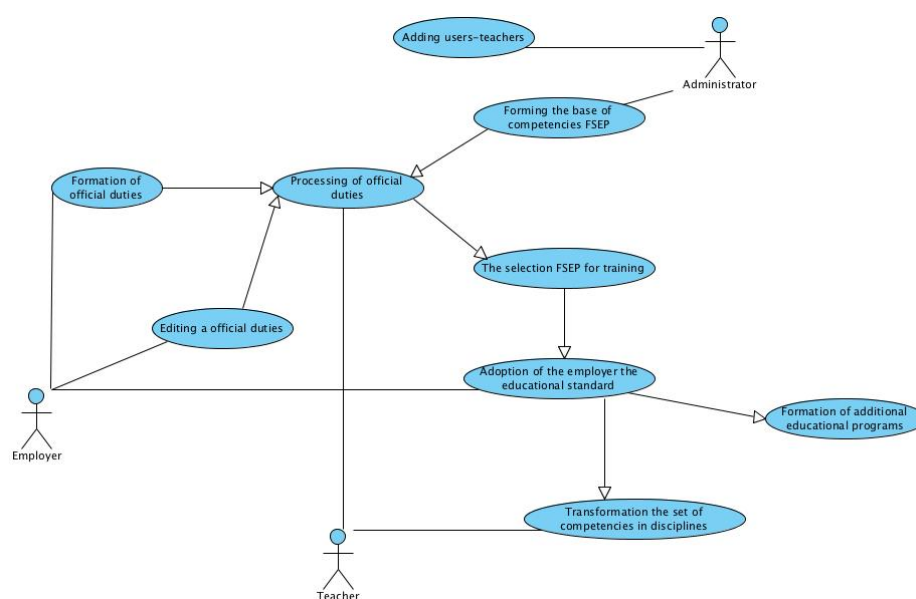
- 1) initial data input (list of competencies specialist);
- 2) selection of the optimum direction of specialist training on the input data while preserving the results in the database;
- 3) addition of the selected areas of training unmet competencies;
- 4) forming a variety of disciplines , satisfying a set of competencies direction of specialist training;
- 5) formation of additional training courses satisfying "not included" competence;
- 6) show directories FSEP and professional standards;
- 7) reporting.

This DSS will be three groups of users with different access rights to information and functionality: DMP-employer, DMP-teacher, administrator.

In accordance with the above requirements to the functional part of the DSS will include the following modules:

- 1) Module of the access control.
- 2) Module of the formation of the employer's requisition.
- 3) Module of the automated selection areas of training .
- 4) Module of the formation and viewing directories.
- 5) Module of the formation list of disciplines.
- 6) Module of the reports.

A supposed logic of the DSS.



Picture 1 – The model of decision support system of the formation of educational program

Automation tools forming the BEP is a subsystem, which in turn helps the main issues on the formation of the BEP to meet the requirements of the employer and the FSEP [3]. An illustrative set of functional units of this subsystem is shown in pic. 1.

To work with the employer produces a subsystem registration using their data, e-mail, which will take place through direct contact, as well as data necessary for authorization subsystem. If the employer is registered in the subsystem, it is necessary to make the authorization for further work with the subsystem.

The employer shall direct its essential functions - generates a set of requirements to a specialist. Set of requirements to a specialist is an enumeration of duties, competence of professional standards, as well as borrowing a certain amount of competence set of competencies FSEP.

After the process of generating a set of requirements subsystem performs automatic processing and formalization of the entry requirements to a specialist.

Next, the system provides a list of areas of interest to the FSEP evaluation covering the entry requirements of the employer. FSEP is expected to provide options for specialist training with the degree of satisfaction of the requirements. As a result of this process has been the choice of locale, which should be the specialist training.

Approving the proposed draft standard and direction of training, the transformation of the generated set of competencies in educational specialist disciplines that will fully satisfy the given set. This transformation is carried out proposal disciplines within the selected standard, with reference to the competencies that they satisfy.

In this step, the employer may choose the direction of training the most suitable to him.

After that teacher modifies the selected direction of training and as a result the output direction has training for the employer filled with the variable part and the list of disciplines covering this educational program.

In turn, the DSS administrator performs user registration system, namely teachers. DSS also provides the primary administrator and further formation of the database of the authority prescribed in the FSEP, and responsibilities in accordance with the professional standards in the field of information technology [4].

This article describes a model of educational programs based on employer requirements for skilled and FSEP, as well as presents the required modules and DSS algorithm.

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CLOUD COMPUTING AS THE BASIS OF ELECTRONIC UNIVERSITY CAMPUS

Gmar, D., Kryukov, V., Shakhgeldyan, K.
Vladivostok State University of Economics

The problems of creation of university electronic campus are the main items of the discussion. Cloud computing is the basis of datacenter of the electronic campus. Server virtualization and desktop virtualization are implemented at Vladivostok State University of Economics. We consider efficiency of server and desktop virtualization at the article. Cloud computing allows to develop new educational models, new methods to communicate between teachers and students.

The current situation in the education sector is characterized as a systemic crisis manifested in the fact that the activities of the educational system contradict socio-economic context, the status of the university as the institutional intellectual center creating new knowledge and cutting-edge designs is lost, and the content, models, and technology of education are irrelevant. The national economics does not generate a request for specialists, in the most of the students direct on the middle level and the nest alumni have not self-actualization in Russia and they leave the country. Experts discuss the different options for the development of higher education, which are largely dependent on future scenarios of socio-economic development of Russia and the policy of state regulation in the field of education. The expert's opinion is that we will have the conversion of higher education, universities have to adapt to the new conditions and polycentric system of higher education will be developed, where regional universities are the centers of excellence, research, and development.

Informatization process of University is designed not only to help in achieving these goals, but to do this effectively. It now depends on whether the universities are able to respond to changing external requirements quickly, whether they have a flexible business models, consider whether the information technology (IT) as the basis of efficient management and a means to achieve competitive advantage, as well as an integral part of corporate strategy.

Past 15 years, most of the universities were engaged construction of the network infrastructure, the development of systems, applications, and services designed to automate the activities of the university, as well as providing access to Intranet and Internet resources. As a result, by the end of the "zero" years most of the universities have a network infrastructure which connects computers on campus, a server farm with servers and storage, ensuring the functioning of the university services automation.

Currently, the Corporate Information Environment (CIE) is a mandatory component of the educational institution, supports process management, provides access to data and support decision making. The main objective of CIE is automation of key areas of the university: managing the learning process, the support of the educational process, research management, administration, financial management, and management accounting, managing information resources.

External challenges cause to change IT strategy and organization of IT-department work, to deploy new technologies to support IT-processes. Implementation of these tasks can be combined into a single concept of creating an Electronic Campus of University (EC), which is based on the approach and methodology used in products such as "smart" home, digital city, and electronic government. The construction of such ECU requires union set of technologies, equipment, and software into a single concept (Figure 1). The introduction of

such a concept in the university makes new demands of IT staff and the organization of IT processes.

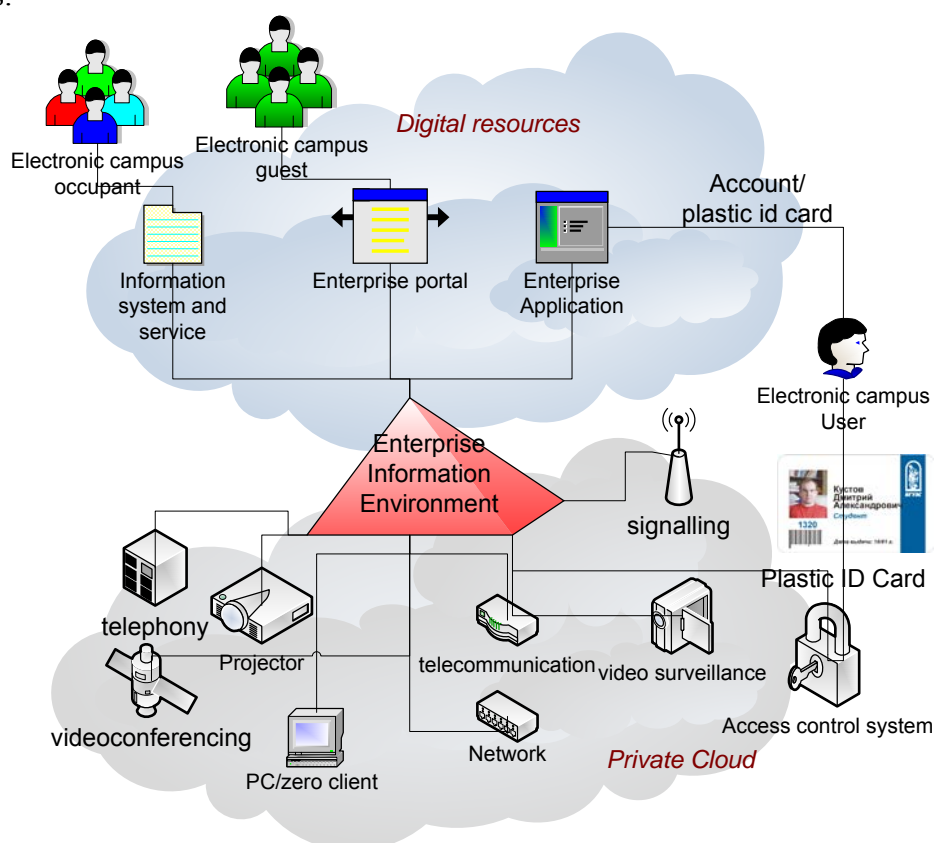


Figure 1 – Electronic campus

University relies on IT, its activities bases on IT-infrastructure, IT-services, and software systems. But there are some problems such as

- servers and network equipment are unreliable and inefficient;
- missing the centralized storage of backups and archives (poor data preservation);
- electrical power consumption of the server room is too much costly;
- conditioning system cannot cope;
- IT-support works inefficient, IT-department cannon be expanded science not enough money.

University raises demands to its IT infrastructure which are associated with the effectiveness of providing modern educational models, the maintenance of the IT infrastructure and its further development (Figure 2).

IT-infrastructure should be adaptable, reliable, productive, and effective. The demands can be provided with

- Server and desktop virtualization, and clustering provides adaptability;
- Server virtualization and clustering provides reliability;
- Clustering, server and desktop virtualization provides performance;
- Rapid deployment of new desktop (desktop virtualization) and reduction of IT-infrastructure maintenances provides efficiency.

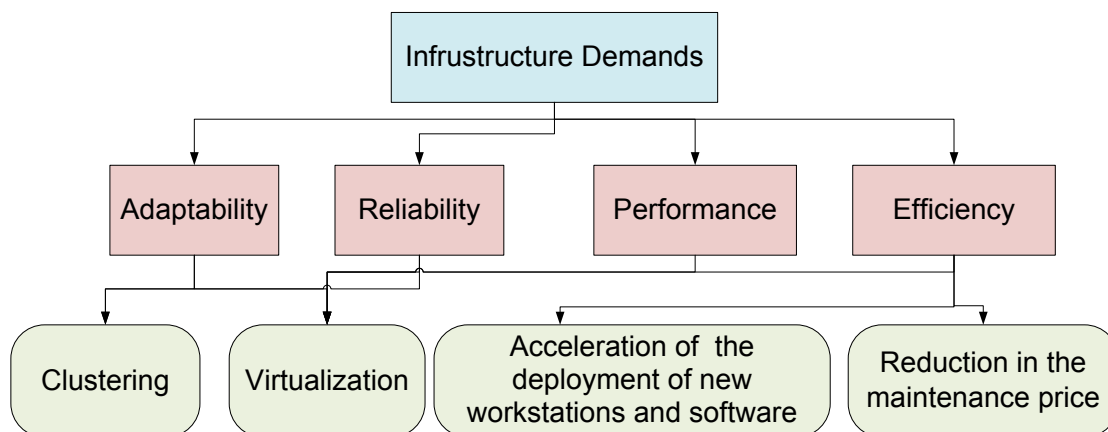


Figure 2 – Demands to IT-infrastructure of University

In recent years the virtualization technologies are being deployed at Vladivostok State University of Economics (VSUE). It leads to the need to upgrade computer and network infrastructure to meet the new requirements: relapse operating costs for the use of server hardware and client computers, reduction the time required for the deployment of new workstations and software applications (software), simplification license management, increasing the capacity of inter-server communication in a data center, and between the data center and distribution layer switches, improved manageability, and security of computer networks.

The technological basis of ECU is data center ensuring proper functioning and performance of the required systems and services EIS.

By the end of 2012 at VSUE modernizes the data communication network. New core switch (Cisco 6509) was evolved and optical communication lines were updated. After upgrading the data center all the physical servers are integrated directly into the core of the network. It provides non-blocking switching at a speed of 10 Gbit/s in 2013. Two clusters were built: cluster of server virtualization and virtual desktop cluster (Figure 3).

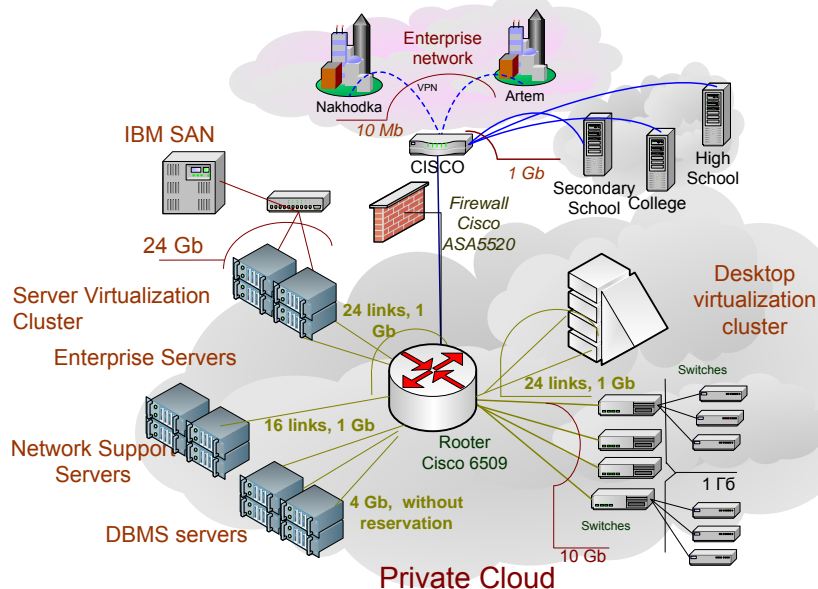


Figure 3 - VSUE's data center architecture

The private cloud has been created in computing infrastructure using server virtualization technologies VMWare. The effects obtained from the deployment: improving operational reliability and performance of all services and ECU's systems, efficiency of resource consumption and savings due to the rational allocation of computing power on the tasks according to their needs, reducing downtime, minimizing deployment time and cost of their maintenance.

Some features of server virtualization cluster are reduced in table 1.

Table 1. Features of Electronic Campus

Features	2010	2013
The numbers of servers	100	32
Virtual servers	30	160
Network storage area	2 SAN IBM	2SAN IBM DS3524 (96x900GB + 192x600 GB)
Energy costs	3 million rubles	1,8 million rubles
Required power conditioners	7,26 kWt/h	4 kWt/h
Hypervisors	VMWare ESXi, Citrix	VMWare (vSphere 5.5) 4 hypervisors, RAM 1,5 TB 64 cores (Intel)

Server virtualization had solved some problems of IT-infrastructure and ensured some demands. But there are some problems with desktop maintenance at VSUE. The problems in 2010:

- High cost of desktops maintenance, high noise levels and energy consumption;
- Permanent rapid growth of system requirements;
- Poor efficiency of computing power of employee's desktops and computer classes(10%);
- Requirements to deploy new desktop rapidly
- Risks associated with the actions of users
- More time for maintenance of existing IT- infrastructure rather than developing it;
- Preservation of data
- Difficulties to support mobility of users, their work from home and from business trips.

We should had selected technology to desktop deployment in future. We had considered three technologies (Table 2).

Table – 2. Variants of desktop deployment

	PC under centralized control (MS System Center)	Terminals (MS RDS, NComputing)	Desktop virtualization (VMWare View, Citrix XenDesktop)
Centralized control	Yes	Yes	Yes
Noise level	High	Medium	Low
Power consumption	High	Medium	Low
Rapid deployment	Low	Medium	High
Performance	High	Medium	High/Medium/Low
Cost of ownership	High	Medium	Low
Risks from user	Low	High	Low

actions			
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All teachers and staff of VSUE used PC at their work in 2010. We could use PC as a terminal or as a desktop further. We decided not to use PC any more. Desktop virtualization is the best solution to desktop deployment at our University. We selected type of clients: thin or zero. The features of the types are shown in table 3.

Table 3. Selection of clients

Features	Thin client	Zero client
Performance	5-8 Mpx (software decoding)	50 Mpx (hardware decoding)
Embedded operating system	Yes	No
Acceptable lifetime	5 years	10 years
replacement parts	Yes	No
Speed of deployment of new desktop	Medium	High
Protocols	Any	PCoIP
Power using the switch	No	Yes
consumption of electricity	94 kWt/h	35 kWt/h
Noise level	Medium	Low (without noise)
Cost, rubles	25000	19500

We had selected zero client because the technology is the most effective and productive. We selected desktop virtualization technology from VMWare or Microsoft (Table 4).

Table 4. Desktop virtualization technologies

Features	VMWare	Microsoft
Hypervisor	VMWare ESX	Microsoft Hyper-V
Support for zero clients	Yes	No
Operating system for hypervisor	Microsoft Windows, Red Hat, SUSE Linux , FreeBSD, NetWare, Solaris 10	Microsoft Windows, SUSE Enterprise Linux
Protocols to connect client to server	RDP, PCoIP, HTML Access	RDP
RAM for hypervisor	2 GB	10 GB
Operating system for client	Microsoft Windows, Ubuntu	Microsoft Windows

We had selected VMWare as the only technology supporting zero clients. Moreover VMWare support HTML Access protocol allowing work into enterprise network from home or business trip by Internet.

Datacenter of VSUE is shown on figure 4.

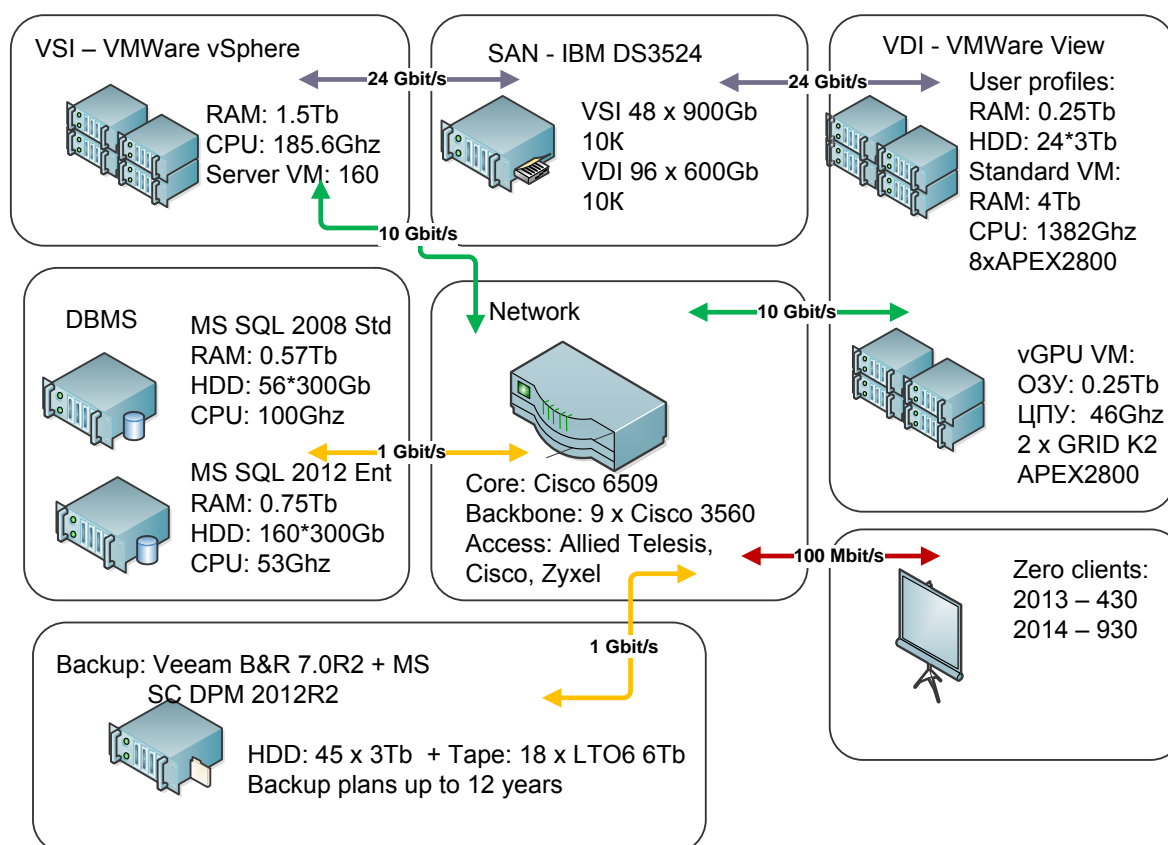


Figure 4 – Structure of VSUE datacenter

We have two clusters: server virtualization and desktop virtualization. Server virtualization cluster has 4 servers. Desktop virtualization cluster has 8 servers intended to 900 zero clients and GRID K2 server intended to 3D graphics on 50 zero clients. The datacenter has 2 SAN. Solution Veeam is used to make backups of all data from server and desktop virtualization cluster and SAN.

At present to automate ECU's infrastructure management Microsoft System Center 2012 is deployed. It allows monitoring data center, archival copy, and fulfilling configuration management. Data protection manager is used to make backups of databases. The network management system (Cisco Prime Infrastructure) and Service Desk-based System Center Service Manager have been deployed also. The systems will ensure quality control of the network, as well as IT-support.

Server and desktop virtualization clusters are connected to two storages (IBM DS325 SAN) through two SAS switches (Figure 5). Two switches and two SAN provide reliability of IT-infrastructure for servers and desktops.

The first computer classes with zero clients (90 personal places) are deployed in 2012 to teach student. Other computer classes with zero clients (200 personal places) are deployed in 2013. 60 zero clients are deployed at the library in 2013. 50 zero clients for staff are deployed at the University in 2013 also. 30 zero clients for 3D graphics are deployed in 2014.

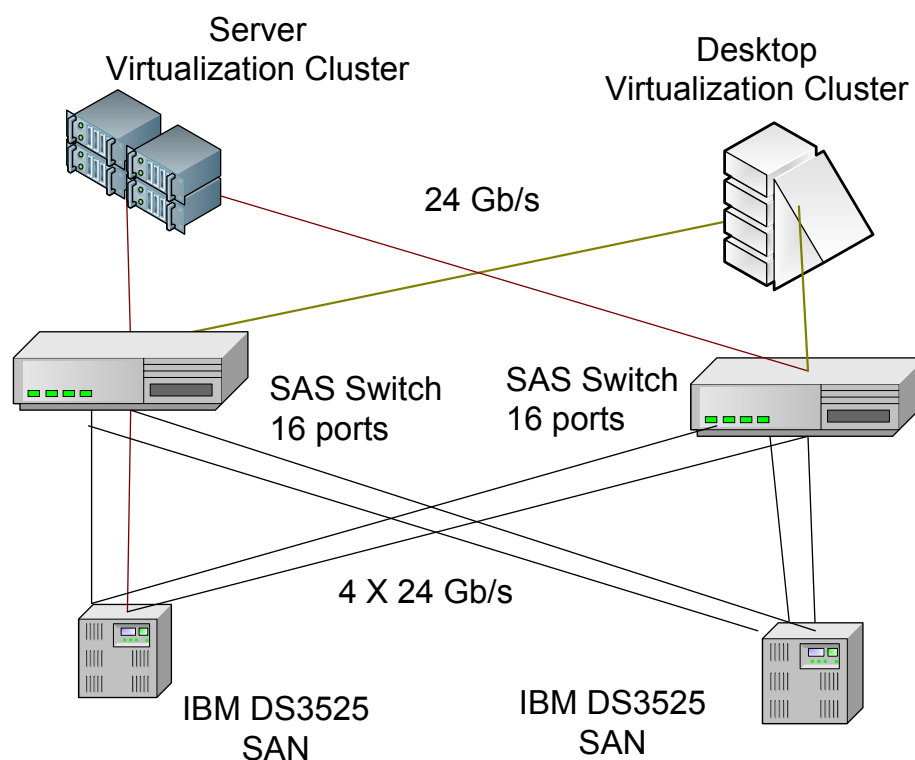


Figure 5 – Connections between virtualization clusters and SAN

Desktop virtualization involves replacing the client computers to zero clients connected to the data center. This solution is claimed there that require a large number of similar jobs with frequently changing application software and an increased risk of loss of efficiency due to the inept actions of application users. Changing-over to the zero clients can significantly improve IT processes to support user workstations (as well as reduce energy consumption, improve ergonomics) (Table 5).

Table 5 - Costs of desktop maintenance for 5 years

	PC (rubles)	Zero Client (rubles)
Client device	19000	19500
Windows + SA / VDA	3 500+3 000	4 500
VMWare View 5.5	0	5600
Data center resources	0	4000
Salary	25000	5000
Power	8400	1200
UPS	1200	200
Total	60100	40500

We develop and deploy information systems and services for ECU. The information systems and services are the main tools to teach, learn, and work for students, teachers, and all staff. The systems and services should be developed so that its cost of maintenance would be small. We have to change the systems and services simply as possible without recoding or with minimum recoding.

We use meta-data repository to provide simple changes (Figure 6).

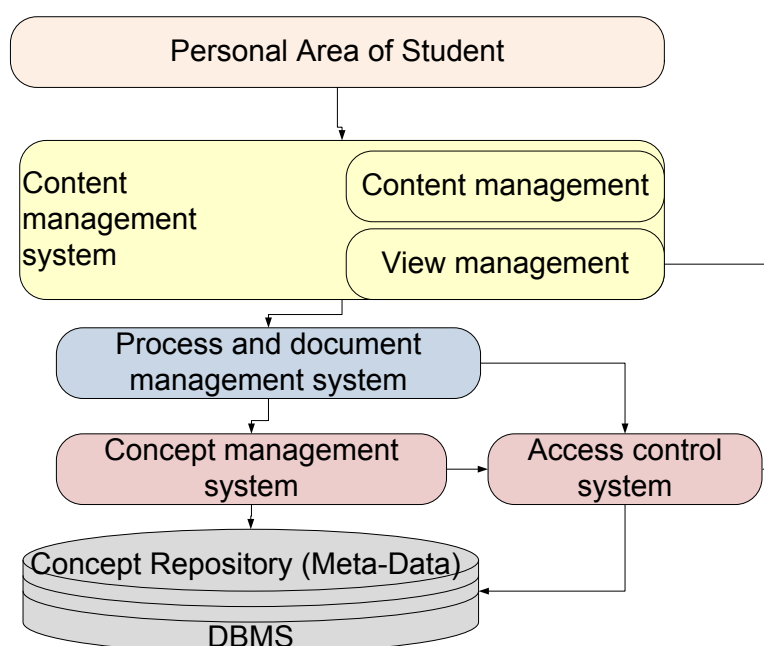


Figure 6 – Software architecture of ECU

To improve the quality of education the service "Personal area of student" has been developed in 2012. The service provides virtual private workplace for each university's student. It includes access to all the necessary teaching and learning materials, schedule, progress, testing, financial information and advanced communications capabilities for interaction between administrative services of the University, faculty, and other students.

The service is developed through content management system. The system is developed as superstructure on process and document management system. Process and document management system is developed as superstructure on concept management system which connects with meta-data repository. All of the systems are developed at VSUE and allow to change information systems and services very fast.

Table 6 – Some features of Electronic campus

	2010	2013
Number of information systems at the University	57	66
Number of assigned access rights	6 millions	17 millions
Number of changed access rights per day	30000	100 000
Deployment of information system (rating system to evaluate teachers and departments)	3 months at VSUE	1,5 months at Far East Federal University

IMPLEMENTATION OF KNOWLEDGE CONTROL ELEMENTS INTO EDUCATIONAL ENVIRONMENT OF “DUBNA” UNIVERSITY. EXPERIENCES AND PERSPECTIVES

Belov, M.A., Lishilin, M.V., Tokareva, N.A.
International University «Dubna»

The practice of implementation of knowledge control elements into educational environment of “Dubna” university is discussed. It has been shown that integration of virtual computerised laboratory and informational knowledge space will allow to ensure efficient accumulation and use of knowledge potential, it will play an important role in forming-up the student’s competences demanded by the contemporary society.

Keywords: knowledge management, quality of the educational, advanced information technologies.

When training high-qualified IT-specialists an important task for the higher educational establishment is to form up professional competences of graduates so that they are able to successfully resolve tasks in accordance with the profession being obtained. Provision for a high level of education for such specialists is significant for stable development of the society within intensive changes in social-economic, scientific and technical fields as well as in those professional. For the educational institutions which currently operate within market relations the matters of ensuring a respective level of education and increasing in its quality obtain crucial significance.

In order to improve the quality of professional training the educational institution must catch up with the progress introducing innovation components into the educational process, such as educational process support systems based on advanced information technologies. In Dubna International University for Nature, Society and Man there has been developed and successfully implemented an innovation system for educational process support - a virtual computerised laboratory (VCL) based on a cloud computing technology [1][2]. VCL is a multi-component software and hardware complex where computer resources and hardware owned by the University are provided to users as the internet-service allowing for remote joint work with laboratory’s distributed resources. Whereas, a feature of centralised complex control by the University staff is still available.

The VCL hardware unit is based on the high-end data processing centre (DPC) which is based on blade technology. Software tools are represented by various systems, such as hypervisors, various control and monitoring software systems, a load balancing system, network security systems, interactive training content, user communications systems, user-to-user communications systems, virtual servers, a virtual computer classroom based on application delivery system, etc. Interconnection of such components is provided by an integrated control system which is the system top level which level determines the possibility to execute centralised control, monitoring and distant work.

That software and hardware complex allowed to successfully resolve the most urgent problems which arise in the process of training of IT-specialists; this is reached by providing university’s software and computational resources against a respective request in order to set up virtual servers, to perform scientific research papers, resource-intensive computational calculations as well as the tasks relating to mastering of major informational systems. VCL provides for access to any software applications being used within university training process without their conventional installation and adjustment on the client device which allowed for substantially increasing quality of the educational process at all forms of education (day-time,

extra-mural courses, distant learning). The students who prefer individual paths for training have received new resources for their selection and implementation.

Laboratory services are implemented and used in the educational process of not only Dubna University but in the National Research University “The Higher School of Economics”, as well. As well, VCL services are integrated in one of Dubna city gymnasias and have passed experimental pilot operation at an enterprise of the instrument-making sector, namely “Tensor” Special design bureau, CJSC (a member of JSC “Instrumental plant “Tensor”, group of companies, Dubna city). Besides, VCL services were provided for experimental pilot operation at one of foreign power-engineering enterprises. VCL was introduced for training and upgrade courses for personnel, for elective training courses, etc. At each of the facilities VCL services were successfully operating during experimental pilot operation and they still function now. This enables us to speak of territorially dispersed system approbation. Further on, authors plan to perform experimental pilot operation session or introduction of VCL services in other educational institutions in Russia and even in business.

Successful introduction of the virtual computerised laboratory enabled to commence resolving of new important tasks relating to an increase in the quality of educational process. Adaptation of advanced models and techniques for corporate knowledge control to the specificity of operation of the modern Russian higher educational establishment and development of relevant services for VCL allows not only to make it a supplier of computational resources for the educational process but also the tool to obtain and formalise new knowledge and to obtain the competences relating thereto. This will enable higher educational establishments to faster react company’s demand, to maintain closer relation with business and research institutions, to timely actuate educational paths [2]. The informational knowledge space VCL being developed and introduced into the training process in Dubna University provides for operative actualisation of the content of educational courses, formation of knowledge content in the spheres of researches and technologies which are the most demanded by potential employers.

It is worth mentioning that the key difference of higher educational establishment’s knowledge space from traditional systems of corporate content control is association of all the interested persons into a social network. Such approach enables to form more objective knowledge so far as all the participants are involved into the process of knowledge formation; in arguments, discussions and argued updates trueness and impartiality of knowledge gets increased. On the basis of activity of knowledge space participants there appears a possibility to obtain the most objective information; and short messages as discussions and comments allow to learn knowledge more easily and comfortably as far as discussions enable to omnilaterally handle the issues which cause the most difficulties. It is due to that reason such knowledge organisation form is an important component of didactic environment of the educational process which enables students to better and easier learn new material; whereas integration of knowledge space and VCL ensures formation of “complex” knowledge and competences for interested participants.

Now we can point out several important tasks which resolution is ensured by the use of the knowledge space of VCL, namely:

- VCL integration with the informational knowledge space of the higher educational establishment provides for opportunity to appraise new hypotheses (knowledge statements) which arise within the process of knowledge content development. Whereas, VCL enables on a timely basis and with maximum flexibility to create software infrastructure necessary for simulation or mathematical modelling of challenging situations. Primarily, this relates to knowledge domains relating to information technologies but it is not limited by them.

- At the stage of creation of new knowledge VCL functions as a site for collective performance of practically significant projects and research projects, it creates potential for emergence of new knowledge hypotheses. Formalisation and socialisation of such knowledge is ensured by the relevant tool-set of the informational knowledge space.

- The task of knowledge obtainment is resolved by way of search in open sources, integration with library systems and a possibility of adding new knowledge content by system participants.

- The task of knowledge identification and their further analysis is resolved due to application of domain ontology, semantic annotation of knowledge units, tagging.

- The task of storing formalised knowledge is resolved by VCL means. Knowledge in the system may be presented as articles in the wiki, entries and forum discussions or in the message exchange system as well as in the form of text, audio or video documents, models, graphics or presentation.

- The knowledge already existing in the system are reconciled with those new, being obtained as a result of research work, search and approbation of solution variants of practical tasks. Integration of VCL with the higher educational establishment's knowledge space enables to timely identify and remove conflicts arising between the existing knowledge and those newly obtained.

- Effective use of the knowledge which finally is the purpose of knowledge control system development and introduction may be ensured by system wide integration into the educational process, by engaging employers' representatives to filling-up of the system and by implementing in the system the services which ensure project operations.

Thus, one can declare that informational knowledge space of VCL provides for support of all the principle activities of the knowledge control cycle [4] and possesses serious potential for improving education quality.

Currently, tasks of filling up informational knowledge space of VCL and its introduction into the educational process are being resolved. Elements of knowledge space have already been applied during the course "Knowledge control within challenging situations".

Conclusions

The practice of VCL use has demonstrated that this efficient instrument can and must become a part of the knowledge control system. A necessity in availability of such systems both in education and in business is a practically undisputable matter to-date.

Integration of VCL and informational knowledge space will allow to ensure efficient accumulation and use of knowledge potential, it will play an important role in forming-up the student's competences demanded by the contemporary society.

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PROFESSIONAL CERTIFICATION AS A STRATEGY FOR MEETING THE ELECTROMAGNETIC COMPATIBILITY CHALLENGE

Agnello, Sal.

Exemplar Global (iNARTE), USA

The purpose of this paper is to provide a case study as to how personnel credentialing is a significant strategy for addressing a modern technology challenge. The focus is on the need for assuring electromagnetic compatibility, which requires specialized competency. The iNARTE EMC Engineer certification program is based on engineering expertise both in EMC applications, and on international standards for personnel certification.

Keywords: EMC, certification, professional development, competence, testing, risk

The Challenge of Electromagnetic Compatibility

Most electromechanical manufacturing, most visibly including that of such major products as aircraft and vehicles, make use of ever-advancing technology advances. Highly complex electronics, software applications, and wireless communication frequency management enable capabilities that in the past were unimagined.

Yet, technological capabilities for the electronic interoperable functionality that we now take for granted do not assure the quality and functionality of the end-use products. Indeed the application of technology represents the risk of safety failures and business and legal risk (In 2013 Exemplar Global, non-profit parent organization of iNARTE programs conducted a survey of Asian engineers involved with electronic testing and manufacturing. The criticality of electronic risk management issues was suggested by 87% of the respondents reporting compliance testing as one of their primary responsibilities. 47% reported the correction of such problems to be a primary responsibility).

A major reason for this is that greater application of ever-sophisticated digital electronic components represents a special challenge for engineering expertise. Independent component testing involving trained engineers can indeed validate the safe functionality of individual electronic components. The challenge is how they function together as the end-use product.

Expertise in the design and testing of individual components does not necessarily constitute expertise in testing how components work together in the same platform, how they perform in conjunction with different manufacturers' products, and interact with the environment at large.

Different products, projects, and manufacturer specifications involve different combinations and thus unique situations. Achievement of safety, functionality, and meeting customer specifications requires special engineering knowledge and experience in Electromagnetic Compatibility (EMC). Professional development in this area has thus assumed a critical importance.

Specialized Resources for Professional Development

Specific concentration on EMC provides a focus of commercial and regulatory compliance application which many academic programs do not have. Moreover, as with most professions, there is a need for ongoing development of the engineers and technicians

involved in these activities. This was recognized early by the US Navy which undertook EMC training for its own personnel and contractors for weapons systems applications.

Specialized competency related to design, manufacturing, and testing in these sensitive areas has since also been addressed by industry through continuing education and professional communities, the largest of which is the IEEE EMC Society. Organizations such as this and their local affiliates contribute significantly to continuing training, facilitation of ongoing peer interaction, and sharing of best practices.

However, the actual assessment and confirmation of an individual engineer's knowledge and experience is best assured by a formal professional certification process. Without personnel certification, there exists no minimum objectively demonstrable standard with which to gauge the competency of the practicing EMC Engineer/Technician.

Professional Certification

A certification program is designed to test the knowledge, skills, and abilities required to perform a particular job, and, upon successfully passing a certification exam, to represent a declaration of a particular individual's professional competence (As defined by the Institute for Credentialing Excellence (ICE)). Professional certification is formal recognition of these by a respected, recognized, and established independent credentialing organization.

The most prominent and recognized such organization to meet these technology challenges for over thirty years has been iNARTE, now part of Exemplar Global. Exemplar Global, a worldwide personnel certification body is an independent, nonprofit association which assesses and certifies individuals in the fields of Telecommunications, Electromagnetic Compatibility/Interference, and Electrostatic Discharge Control and Product Safety through the iNARTE programs (iNARTE (The International Association for Radio, Telecommunications and Electromagnetics, Inc.) was founded as a non-profit membership/certification organization in 1982 and was formally merged with Exemplar Global (formerly RABQSA) in 2012.).

The operating standard for iNARTE certification programs is to operate under international guidelines, primarily ISO 17024 in that an individual has demonstrated a proficiency within, and comprehension of, a specified body of knowledge. The standard defines competency in a field or occupation in terms of "the demonstrated ability to apply knowledge, skills and attributes." The source of the body of knowledge/skillsets referenced is professional organization members who are recognized subject matter experts and practitioners in the field of the particular certification.

iNARTE's contributions to this industry has been to establish a widely-recognized career path for professional development not only in EMC but other critical applications such as product safety engineering and electrostatic discharge (ESD). This certification program has also served as an objective method for companies to identify the most knowledgeable and capable engineers and technicians in this field.

Certification is sometimes confused with training certificate programs, whose purpose is only to assess whether learning objectives of specific training were met. While there is nothing inappropriate with providing evidence of a successful course completion, this should not be confused with the rigor and achievement involved in earning a professional certification.

The iNARTE EMC Certification

In 1988, the US Naval Air Systems Command (NAVAIR) selected NARTE to co-develop a certification program for Electromagnetic Compatibility specialists. A US Navy command mandated NARTE certified personnel for government contract services. As these specialists increased in the private sector, iNARTE EMC certification has become recognized worldwide.

Electromagnetic Compatibility (EMC) engineer certification is applicable to professional engineers practicing in EMC fields to include bonding, shielding, grounding, EMI prediction, EMI analysis, conducted and radiated interference, lightning protection and more. The required experience is 9 years for Engineer and 6 for the Technician. The certification process has 4 phases.

1. Application submittal, including the individual's resume, university/academic institution transcripts, and three personal references, including one from a supervisor. This phase ensures that the applicant has the appropriate education, relevant work experience, and peer and supervisory endorsement of work quality.

2. Exemplar Global's iNARTE staff performing administrative screening of the application for completeness and meeting educational and experience qualifications, and forwarding to the Certification Review Committee which is comprised of volunteer subject matter experts.

3. Examination administration at one of the authorized iNARTE test centers located worldwide and returned to Exemplar Global headquarters for grading. The examinations are objective (multiple choice/true-false) and require a 70% grade for passing. (The exam may also be taken prior to or during the application process. Overall, over 70% of engineers taking the exam pass it) 40 of 48 questions must be answered.

4. The file is processed and reviewed by the Review Committee, which certifies the individual or requests additional information.

The following subject areas are tested (The iNARTE website provides the applicants references to consult for examination preparation.)

Bonding	Terminology
Grounding	Mathematic Spectrum Analysis
Shielding	Electrostatic Discharge
Interface Control	Electromagnetic Pulse
Filtering	Lightning Protection
Materials and Special Devices	Inter-system and Intra-system Design
Conducted Interference	Equipment Design
Radiated Interference	Electromagnetic Prediction and Analysis
Military specifications and standards	Field Theory
Test Plans	Antennas
Test Equipment	Filter Theory
Test Facilities	Safety

Global Scope and Recognition of the iNARTE Program

In addition to EMC the iNARTE programs include the related certifications of Product Safety Engineering, Electrostatic Discharge, EMC Design Engineering, as well as Telecommunications and Wireless Devices. Individuals holding these certifications span over 20 countries.

Over its 32 year history iNARTE has expanded its global footprint through the approval of test and training centers, as well as establishing regional partners throughout the world. The recognition of the iNARTE certification programs is reflected by its affiliation with such organizations as the IEEE EMC and Product Safety Engineering societies, as well as the ESD Association. In addition, more than 500 manufacturing, testing, electric companies and governmental entities recognize these certifications.

Reported Benefits of iNARTE Certification

iNARTE clients, both individuals and organizations, have recognized benefits of the certification programs.

From the perspective of the certified individual, iNARTE certification provides several advantages in the competitive in job market. It provides a recognized credential in lieu of licensure where no such licensure requirements exist. The robust certification methodology provides a measurable level of expertise and quality that provides proof of EMC competency. The credibility of the iNARTE certification has prompted many communications, transportation, utility and manufacturing corporations as well as the US military to mandate or prefer iNARTE certification as a pre-requisite to employment.

For the engineer's ongoing career, it establishes the individual as a top performer in the industry, judged against an international standard of excellence. It is thus an advantage for technical and positional advancement within the organization. Maintaining iNARTE Certification provides evidence of dedication to remaining current in this field of expertise.

For the high-tech organization, there is the ironic reality that EMC risks cannot be prevented and solved by technology alone. Human expertise applied to complex technology is the key success factor for assuring product quality, safety, compliance, and limitations of liability. Certification provides the means of identifying the most knowledgeable and capable engineers and technicians. iNARTE provides an independent, non-product-based competency credential. Assignment of certified individuals increases the likelihood of a successful procurement or project.

For design, consulting, and testing service providers, proof of having competent professionals holding a globally recognized credential increased the acceptability of product testing results by customers. Proof of technical competency encourages customer confidence in a company's dedication to excellence. Overall, having certified staff enhances the public image of the company and its technical personnel.

Aside from market and regulatory benefits, certified individuals facilitate personnel hiring, assignment, and advancement decisions. Moreover, the iNARTE members' requirement to abide by the certification's ethical code of conduct can provide an additional level of confidence to the employer. Finally, there is the benefit of the workplace environment being enhanced by the sense of achievement and confidence among employees.

Summary

Ever-sophisticated electronics and software applications will increasingly produce the potential for expanded product operational capabilities, cost-effectiveness and quality. But technology alone will not assure these outcomes.

On the contrary the rapid dissemination of new technology, speed of adoption by competitive enterprises and lagging knowledge will continue to increase the need for valid assessment and certification of individual competencies in this area. Even though it is not a panacea for all risks of product failures, professional certification increases the chances for success.

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AUTOMATIC COLOR CORRECTION OF VIDEO STREAMS

Gorokhova-Alekseeva, A.
Moscow, MIEM NRU HSE

This paper gives an account of the research into video tone correction algorithms and their program implementation. It describes the process of choosing and developing an algorithm suitable for video streams processing. Also, the process of program creation is described.

Keywords: video processing, image histogram, broadcasting, OpenCV, color balance.

Recent developments in automatization of video settings have heightened the need for further research. To date the quality of a video recording can only be enhanced by professional video operators who control the parameters of a recording. Amateur and gadget recordings, however, often fail to have appropriate settings, which results in problems with colour temperature and other defects.

Despite the fact that many video color correction programs are on offer today, there are still a considerable number of inaccuracies in their configuration. One of the most popular professional video processing programs is Adobe Premiere. It generally performs well, however, it is quite expensive and not user-friendly enough for an average consumer. There are some other products on the market such as Avidemux and VirtualDub, but they lack real-time stream editing features that are necessary for broadcasting. Thus, it is becoming increasingly important to develop a simple and cheap program that can deal with both video files and streams.

The objectives of the project are to give a brief overview of various video tone correction algorithms and to develop a new one. We are aiming at creating a more efficient and fully automated algorithm which will be able to improve color parameters in video recordings.

Choosing the algorithm

Due to the fact that a video frame is a raster image, still-image algorithms could be used for programming color settings. There are plenty algorithms for image tone adjustment. The most efficient are usually too complicated so they overload CPU time and cause noticeable and unacceptable delays during live broadcasts. To meet real-time production requirements on typical hardware, the fastest of examined algorithms have been chosen.

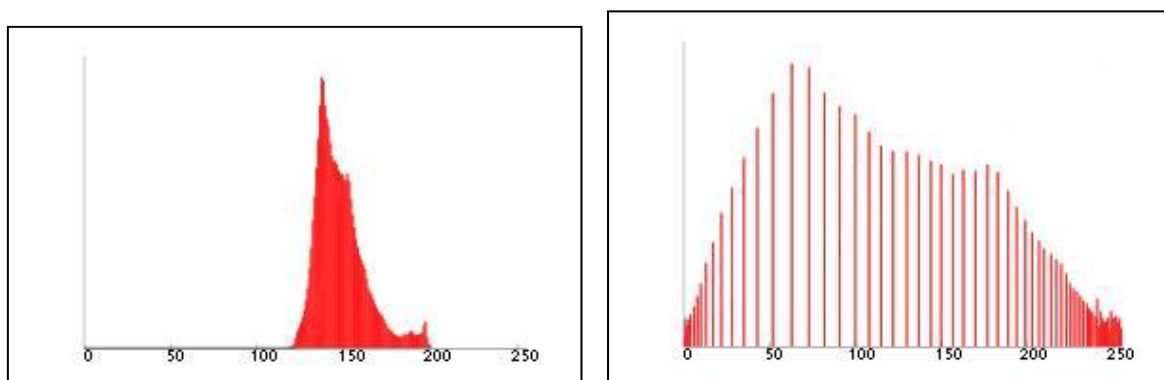
Non-linear masking (<http://urlid.ru/bk11>) builds an image mask and then mixes it with the original image to correct the tone.

Krzysztof's algorithm (<http://urlid.ru/bjqg>) was developed for face detection. It uses masking and sequencing and is similar to the non-linear masking algorithm. However, they use different mathematical models.

The next two algorithms are based on the changing image histogram. Histogram is a plot, which characterizes the distribution of brightness levels of an image. While working with RGB images, a histogram could be built for each of three channels and one average. On the horizontal axis there are values of brightness from 0 to 255 and on the vertical – the corresponding number of pixels with the brightness value.

Histogram centration algorithm places a histogram in the center of the segment of brightness values and appropriate modifications are done on each pixel's value.

Histogram equalization is stretching a histogram evenly from 0 to 255.



Unequalized (left) and equalized (right) histograms

The first algorithm is very effective, but very resource-intensive. The following equations are used here:

$$Output = 255 * \left(\frac{Input}{255} \right)^{2 \left(\frac{128 - Mask}{128} \right)}$$

$$I = 100 \left(\frac{A}{A_w} \right)^{c_1 \left(1 + c_2 \left(\frac{Y_b}{Y_w} \right)^{1/2} \right)}$$

Krzysztof's algorithm is quite effective too, but works only with facial images. After testing, the histogram centration algorithm was regarded as ineffective because it failed to perform effectively in the part of sample images. Histogram equalization is more effective than the third one, but it also failed to process some images. However, it was chosen for our program, provided that further improvements were made.

The general histogram equalization formula looks like this:

$$h(v) = \text{round} \left(\frac{cdf(v) - cdf_{min} * (L - 1)}{M * N} \right)$$

Where cdf_{min} is the minimum non-zero value of the cumulative distribution function, $M \times N$ gives the image's number of pixels (M is the width and N is the height) and L is the number of grey levels used (in most cases, like this one, 256).

Cdf was defined as

$$cdf_x(i) = \sum_{j=0}^i p_x(j)$$

and p_x being, in fact, the image's histogram for pixel value i , normalized to $[0,1]$ is

$$p_x(i) = \frac{n_i}{n}, \quad 0 \leq i \leq L$$

Where n_i is the number of occurrences of gray level i .

The modification of this algorithm boils down to updating to the normalization of the histogram: a much more sophisticated algorithm. Before stretching, it cuts the edges of the plot which has a few pixels. That makes this process more effective owing to the noise which creates a tail of low values as a result.

Implementation tools

Implementation tools are very important. They can dramatically influence both developing and executing speed. A variety of libraries were studied while choosing a library to work with video streams and to obtain data from a video. Two of the most suitable were OpenCV and portVideo libraries. They both provide instant access to the video data, are open-sourced and cross-platformed. However, OpenCV is more popular and widespread and, as a result, it is better supported and is easier to understand. It can support three programming

languages: C, C++ and Python. C++ has been chosen, because it is more advanced than C, so it is easier to work with. Also, it is not as advanced as Python, so it works faster. There are many programming environments which support C++ and make programming more effective.

Related work

An idea of this project occurred while working in the video club of a lyceum of information technologies. The club members recorded and performed Internet broadcasting of some important events in the lyceum's life. The color in the broadcast was often distorted because the students working in the club were not skillful enough to adjust the camera in the right way. In addition, there is a need for digitizing analogue tapes nowadays. Therefore, we decided to create a program which allows to process videos and streams automatically.

Future work

Future plans include:

- to implement file handling support
- to make the algorithms work more efficiently
- to search and develop new more effective and faster algorithms

Conclusion

The results of this work have shown that histogram normalization algorithm can be implemented in the OpenCV library and it can work effectively enough. It enables both streams and files to be processed by the system. There was discovered a problem with file handling related to the different video codecs, aspect ratio, frame rate and copying them into a new file. OpenCV does not cope with such problems.

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PRINTED VERSION OF THE TEXTBOOK ON ENGINEERING AND COMPUTER GRAPHICS

Grekova, K.V.
Moscow, MIEM

The main purpose of this work is to create a textbook on engineering and computer graphics for students from the faculty of Information Technologies and Computational Technique. As a result of work we have a complete tutorial, based on lectures, which are usually given during the course, and illustrations, most of which have been redone. During the work author was focused on layout, using innovational methods and ideas, and especially illustrations, because of the popularity of infographic. It was also necessary to apply special ways of visualization of data to make the textbook more effective.

Keywords: information product, computer page-proofs, visualization, graphics.

Topicality of such problem is in shortage of tutorials, which could be useful in studying and work and also interesting for students. Today young men prefer to take information from the Internet, and the reason of this new tendency is principally in paucity of big texts there. As a rule, technical material on web-sites is given in pictures, infographic and short articles. This way of presenting information gives students the opportunity of fast memorization, and as well it looks more attractive. It makes no sense to deny power of the Internet and make a step back, but advantages of paper textbook are obvious – textbook is

always available, student may elaborate it by another information, and everyone can afford it. Thus, the best way is to combine the pluses of the Internet and conventional book. In the end of the work will be received the tutorial, which is fully adapted for students.

The most appropriate way to give students data was found after survey of analogues in exercise books for English studying. There is a very common method of feedback, which can be perfect replacement of trite questions on the last page of paragraph. Students are offered to feel the gaps, or to complete the crossword, there are also a lot of callouts, another words, so students can constantly use their knowledge and expand them. Unfortunately, this method is used in technical tutorials very rarely. As a rule, information is given to students in form of lectures, but they could become useless without practice. Interest and practice are the most significant components of technical education, so, this textbook is based on them.

We expect to give the students possibility to touch their knowledge, so, art-version of textbook is made with this purpose. In contradistinction to ordinary version, color transparencies, cardboard and other materials are used there. There is also a possibility to embed electronic devices in it, to realize this idea, special electronic book have been already found.

Presently a large array of work has been already done. The first step to start was analyzing of existing analogues. After that, modular grid, types and styles of the textbook were outlined. They made a base for future layout. Also, all lectures were rewrite and adapted for book's format, to make information short and clear, to make a space for schemes, pictures and other additional information. The majority of illustrations were made by the author.

The most appropriate international format for book like this is A5, it is compact and customary, so this format gave the opportunity for realization of following ideas:

1. Folder.

Studying of the subject should not be limited only by one book. Students face with large body of knowledge every day, any information from another area could be helpful. Taking this to account, author decided to realize the textbook as a folder, to make it a thrift-box for knowledge. Undoubtedly, it reflected the layout – there is a necessity to consider holes for rings on the pages and dispose the contents according to this requirement.

2. Infographic

It is the most common way to make information available without using the text. Infographic is constantly used in the Internet and in mobile applications as the good way to display algorithms and sequences.

3. Timeline of the course.

It is very important to give students the rules of assess, the structure of the course and other data, which could be useful during the studying. For this purpose, one of the first pages is given for timeline. Owing to this helper, students will be always up to date with all laboratory works, tasks and deadlines, and will be able to calculate the future assessment.

4. Callouts

It is expected to fill left side of the textbook with links to Internet recourses, so, student will be able to watch video and read articles on this topic. Some links will be given in QR-codes. Also students may leave their notes and marks on the callouts.

5. Self-verification

There are a lot of tests and exercises during this course and all of them are shown in the textbook. It is expected to give students possibility to verify themselves after answering the questions. It can be realized on transparencies with right answers.

6. Electronic book

Textbook contains a lot of links on additional materials, and students may browse them directly in the book with a special electronic device, which is integrated in folder. It will be realize only in art-version, QR-codes are used in original version.

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USING AN INTERACTIVE INFORMATION-ANALYTICAL SUPPORT SYSTEMS OF SCIENTIFIC-PROJECT ACTIVITIES

Gridina, E.G.

National Research University Higher School of Economic

The aim of the paper is to provide an overview of research studies of scientific project activities in higher educational institutions of Russia through modern technology, oriented active learning process, work with various sources of information, development of independent critical thinking, communication culture, the ability to perform various social roles in joint ventures as well as the acquisition of skill cooperation under certain social roles in the team.

Keywords: Project portfolio selection, project management, integrated framework, decision support

Relevance of science-project activity

Scientific and project activity is one of the methods of developing education and focuses on the development of independent research skills (formulation of the problem statement, collecting and processing information, experiments, analysis of the results) and promotes the development of creativity and logical thinking, combines the knowledge gained during the training process, and attaches to specific vital issues.

Tasks:

- Conducting research and design activities in institutions of Higher Professional Education (HPE) (including interdepartmental and interdisciplinary);
- The possibility of a scientific project activities under the scheme School - High School, with the assistance of talented youth;
- Creation of a platform for discussion and implementation of startups;
- Creation of PR-projects;

Functional

Support system research and project activities - an environment aimed at presenting educational material to the Internet and implementing an interactive learning process, it supports full-time, part-time and correspondence forms of training for different types of organization of educational process reflecting the differences of system users on the territorial location, time zone and features hardware and software of their workstations.

The system supports the following technologies:

- multimedia technology;
- project-based learning technology through the Internet;
- technology AJAX;
- Web technology mash-up;

Key features:

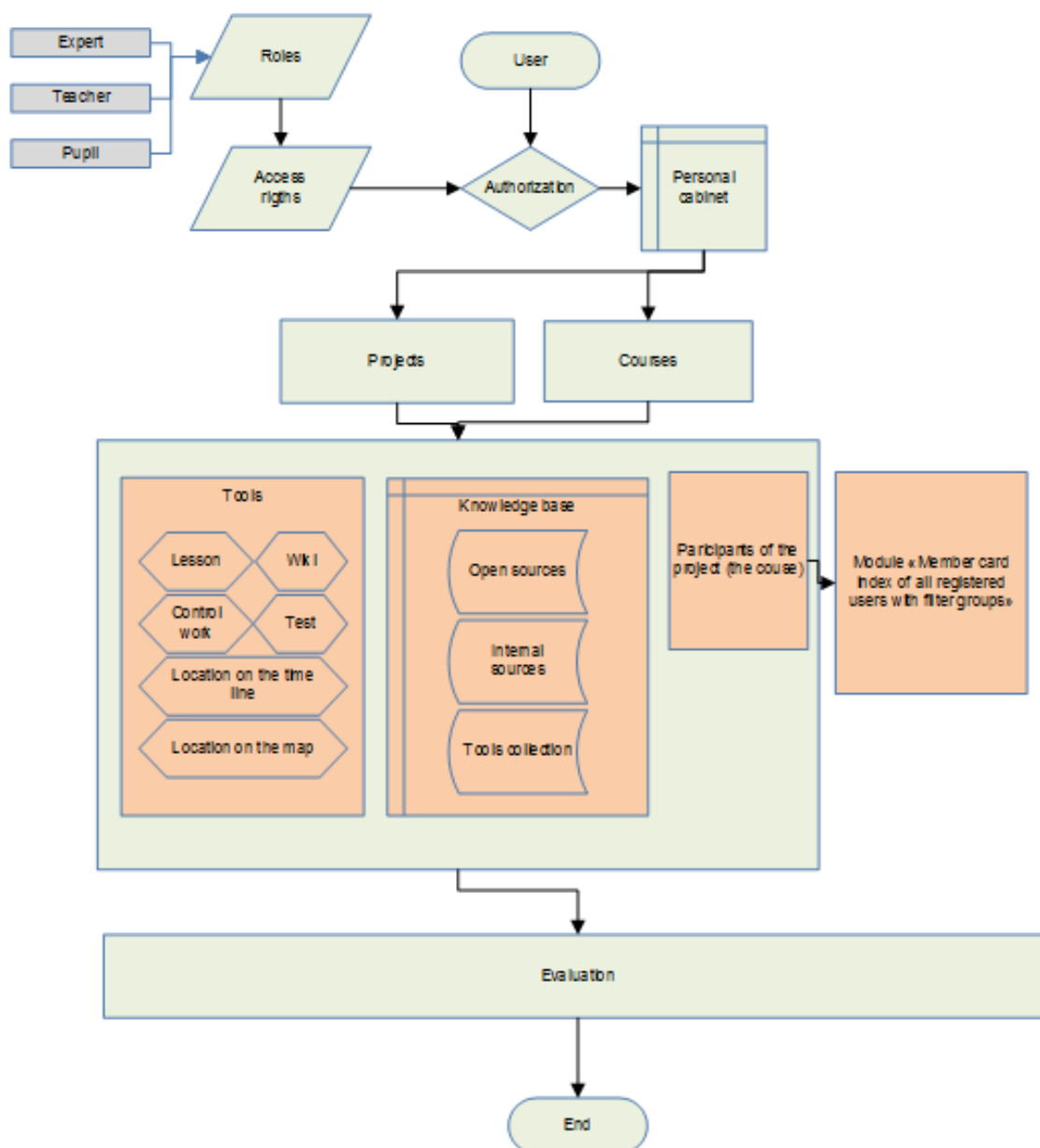
- Automatic generation of portfolio project using the Project Designer ;
- Selection of materials relating to research in the Knowledge Base ;

- Create questions for reflection and the development of evaluation criteria of the project activities
- Formation of several research groups , a discussion of the study participants in the group
- Track performance of participants on projects , evaluation of the participants activities
- Integration with the accumulated educational materials institution;
- Performance evaluation using " Anti-plagiarism ";
- Services to work with databases (import / export) for the formation of groups;
- Social services to support communities ;
- Organizing Project Collection ;
- Organization portfolio of students and teachers ;
- Organization roadmap projects;
- Organization of methodological grounds.

Interactive services:

1. Search service (search services information resources).
2. Service group resources.
3. Service creation of information resources.
4. WIKI - editor.
5. Service timing visualization resources.
6. Service GIS visualization resources.
7. Service planning and organization of work.
8. Support the project participants.
9. Service on-line discussions.
10. Service of personal space for participants.
11. Service creation of conceptual diagrams.

Modules Structure



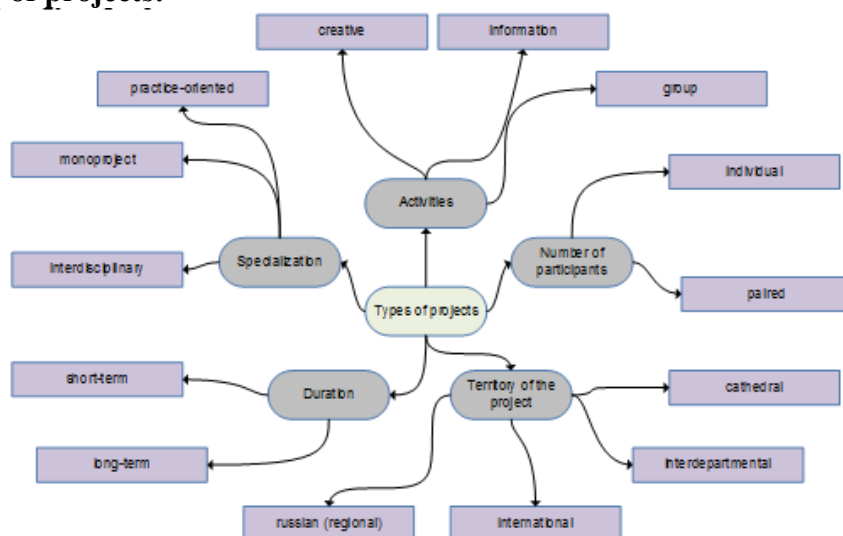
Types of project tasks

Typology of the project activity, which is based on the class of solvable pedagogical tasks, as follows:

- acquisition of knowledge;
- any acquisition, transfer and integration of knowledge through the use of;
- problem solving / problem situations (adoption and implementation of decisions under uncertainty);
- detailed communication;
- self-organization and self-regulation;
- cooperation;
- reflection;
- formation of values and meanings installations;

- formation of ICT competences (CT Competency Framework for Teachers, или ICT-CFT) .

Typology of projects:



Steps for creating the project

The algorithm for creation a project:

1. Formation of the project and its name, drawing annotation and the results expected from the project
2. The wording of the difficult issue of the project, its goals and objectives
3. Design phases of the study, indicating job stage and the presentation of results
4. Creating methodological support for the project
5. Create survey questions for reflection, as well as criteria for the evaluation of works of the project participants

Project Manager functions:

- Organization of project participants (formation of participants);
- Preparation of the project description;
- Develop milestones;
- Develop a list of relevant sources of information, resources to work on the project;
- Preparation of data for the final analysis (reflection);
- Development of evaluation criteria;
- Securing and external evaluation of the project;
- Consultation work in forums, blogs, etc.

Technical and technological requirements

Technology capabilities Wiki:

- presentation, extension and annotation training materials. Electronic version of the submission of training materials gives the student the opportunity to trace the connection between the texts. The system allows us to trace back links from what reference materials are turning to this author;
- the creation of a collective of creative works;
- the creation of collective teaching and student encyclopedias.

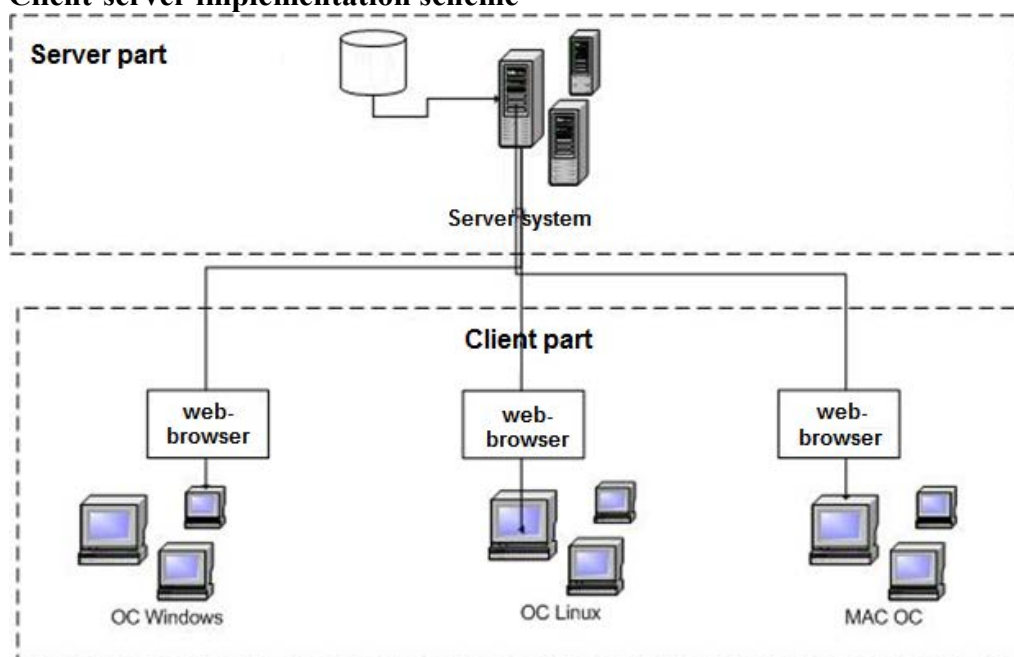
Technical and technological requirements

Providing cross-platform:

- GNU / Linux, in particular: PSPO5, ALT Linux, Ubuntu, EduMandriva browsers can use Mozilla Firefox, Google Chrome, etc.;
- Microsoft Windows, in particular: Windows XP, Windows 7, Windows 8 can use the browsers Mozilla Firefox, Google Chrome, Microsoft Internet Explorer, etc.;

- Mac OS X can use the Apple Safari browser, and others;

Client-server implementation scheme



Conclusion

Using this Framework to enable the project activity: simply and effectively solve organizational problems encountered when working on projects, pay more attention to the content of the projects to be able to post information about projects in popular social networks.

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ANALYSIS OF ABILITY NETWORK PROTOCOLS IN CONCEALING THE INFORMATION

Noskov, A.N.

Yaroslavl state university, Yaroslavl, Russia Federation

The subject of the paper - is the analysis of network protocols, the ability of hiding information in network packets. The goal is to analyze the headers of data protocols for redundancy (reserved field) and the possibility of using the fields in undocumented way for future use of detected vulnerabilities to inject the information. Within article reviewed the protocol headers of two levels: network and transport. We going to review network layer protocols (IPv4, IPv6) and transport layer protocols (TCP, UDP). Next, we going to review the protocols and the possibility of manipulate them in more detail.

Keywords: Networking, protocols, security

Introduction

On TCP / IP networks to transfer huge amounts of data. Quite natural that the participants of communication want their interaction was safe. Usually, encryption have used for security purposes, particularly for confidentiality. Data encryption can prevent unauthorized access to secure information, but it does not allow forwarding this information quickly. The content of the encrypted message remains a secret, but hide the fact of the contacts and the data is quite difficult. Steganography provides discreet data, for example, together with the open and completely innocuous content to form a stream of secure communication in networks.

The flow of information hidden in the intercomputer exchange can divided into two classes:

«Passive» – stream of packets with the corresponding parameters between hosts generated by standard network services (mail exchange, DNS requests / responses, HTTP exchange, etc.). Changing of this reserve or unused fields with the correction of checksums;

«Active» – stream of packets generated from the corresponding parameters and predetermined specially fields transmitted between hosts.

Intercomputer exchange

Computer network exchange have based on Reference Model Open System Interconnection OSI. The study of hidden information flows with-computer interaction in the networks we will be interested the service information that have added to the data for transmission over the network. Within article reviewed the protocol headers of two levels: network and transport. We going to review network layer protocols (IPv4, IPv6) and transport layer protocols (TCP, UDP). Next, we going to review the protocols and the possibility of manipulate them in more detail.

IPv4

IPv4 – it is a network level protocol, detailed information in RFC – 791.

The IPv4 header size is 20 bytes, it can be increased using specialized headers filed- option field. If size of header less than 20 bytes, it is corrupted.

Analysis of IPv4 protocol header's fields shows the following results:

Internet Header Length field. Ability to increase the value of the Internet Header Length field, for the extension of the original header. Given change enable append data to Options and Padding field.

Type of Service field

Bits from 0 to 2 (Priority) and from 6 to 7 (reserved).

0-2: Value "111" does not appear in provider networks, only in local area networks; as a result, the fact of capturing this value in the provider network is a sign of the injection of information.

6-7: On standard, these bits are reserved and must be set to zero, as a result, an indication different value is fact of injection information.

Identification field.

You can change the value of the Identification field. The fact that the field used for the correct assembly after fragmentation, but there is a service flag DF (Don't Fragment), which deny packet fragmentation, hence if the flag is set to "1", the identifier is not necessary, therefore, that field can be used for data transfer.

Flags field.

As standard requires, the first bit is reserved and must be set to "0"; if result is different, it is fact of injection information.

Fragment Offset field

It is possible to change the value of the Fragment Offset field. It is better when the service flag DF (Don't Fragment) is set to "0", since the fragmentation strategy designed so that unfragmented datagram in all the fields associated with fragmentation have zero values (MF = 0, fragment offset = 0). That is, if the flag prevents fragmentation, we can still implement these in the Fragment Offset, but the fact of the identification manipulation becomes clearer.

Source Address field

It is possible to change the value of the Source Address field.

We must inform, that the manipulation is only possible on condition when the package have formed by hidden source data. Because if the manipulation will made not by source of information, the receiving site could not properly assemble packets.

Destination Address field.

Encapsulating IPv4-in IPv6-header is a possibility to use the Destination Address field of the IPv4 protocol for the injection of information into it. In this case, the IPv6-header will be responsible for the delivery of the package.

Options field.

Value of the options field _ are limited in IPv4 header, the result of the analysis is try to identify an arbitrary Filling in this option field. We can try to identify the incorrect filling of this field, whose appearance indicates a possible injection of information.

Padding field

Manipulation with the field padding is one of the most interesting. The Padding field begins after the byte 0x00 in the Options field, the value is an option EOL (End of Option List - end of the field option), and lasts up to 32-bit boundaries of the header. The interest of this manipulation is that, after the option EOL equipment does not parse the header to 32-bit boundaries, that is, these bytes are a kind of invisible to the network equipment and sniffer. Although that the analysis of this field is simple enough, on standard after the option field, EOL up to 32-bit boundaries of the header have been set to "0", as a result, any different value of this field indicates the fact of the injection of the data.

Result of injection.

Standard size of IPv4- header with options and padding fields is 320 bits. It is necessary to consider two different options:

IPv4 is a carrier; it is responsible for addressing packet. Because of manipulation, it is possible to use 182-bit, 56.88% of the total number of bits. This volume allows you to inject in a header 22 characters of 8 bits in ASCII encoding. Therefore, after the calculations we obtain a value equal four bits. This residue is part of the next 8 bits of the transmitted symbol.

IPv4 is a passenger, it is encapsulated IPv4-header to other headers, for example, in IPv6, or GRE. In this case, it is possible to use method to implement the field Destination Address. As a result, it is possible to use the manipulation bits 214, 66% of the total number of bits. This volume allows you to implement a header of 26 characters of 8 bits in ASCII encoding. Thus, after the calculations to obtain a value of the residue 6 bits. Treated residue was included in the next 8 bits of the transmitted symbol.

IPv6

Traffic Class field

It is possible to change the value of the Traffic Class field. This manipulation cannot be detected by analysis.

Flow Label field

You can change the field value Flow Label. This manipulation cannot be detected by analysis.

Payload Length field

It is possible to increase the value of the Payload Length field, which will append data to the end of the original IP packet. Similarly to IPv4. This manipulation cannot be detected by analyzing.

Source Address field

You can change the value of the Source Address field. Similarly to IPv4. International standards introduced IPv6 addresses cannot be used as a source address.

Destination Address field

With IPv6 in IPv4, encapsulation header can use Destination Address field of the IPv6 protocol for the introduction of information into it. In this case, the IPv4-header will be responsible for the delivery of the package.

This manipulation cannot be detected by network analysis.

Result of injection

Standard size of IPv6-header with options and padding fields is 320 bits. It is necessary to consider two different options:

IPv6 is a carrier, that is, it is responsible for addressing the package. Because of the manipulations described above it is possible to use 156 bits, 48.75% of the total number of bits. This volume allows you to embed a headline of 19 characters of 8 bits in the ASCII character set. Thus, after the calculations to obtain a value of remainder of 4 bits. Treated residue was included in the next 8 bits of the transmitted symbol.

IPv6 is passenger and carried by IPv6-encapsulation header to the other headers, for example, in IPv4 or GRE. In this case, it is possible to use method to implement the field Destination Address. Because of the manipulations described above, it is possible to use 284 bits, 88.75% of the total number of bits. This volume allows you to implement a header of 35 characters of 8 bits in ASCII encoding. Therefore, after the calculations we obtain a value equal four bits. Treated residue was included in the next 8 bits of the transmitted symbol.

TCP

Transmission Control Protocol (TCP) – transport layer protocol. TCP is oriented to establish the logical connection, that is, initially hosts negotiate and establish the session and then start the data transfer. For each package sent out a sender host waits for an acknowledgment of delivery. This protocol standardized by RFC - 793.

Source Port field

You can change the value of the Source Port field. Manipulation is possible only in condition what the packet formed for hiding source of data. Because of the manipulation producing at the source, the receiving party cannot properly assemble packets. This manipulation cannot be detected by network analysis.

Destination Port field

You can change the value of the Destination Port field. Manipulation is possible only in condition what the packet formed for hiding source of data. Because of the manipulation will producing at the source, the receiving party cannot properly assemble packets. This manipulation cannot be detected by network analyzing.

Sequence Number field

You can change the value of the Sequence Number field. Manipulation is possible only in condition what the packet formed for hiding source of data. Because of the manipulation producing at the source, the receiving party cannot properly assemble packets. This manipulation cannot be detected by analyzing.

Acknowledgment Number field

You can change the value of the field Acknowledgment Number Manipulation is possible only in condition what the packet formed for hiding source of data. Because, if the manipulation will produce at the source, the receiving node is not able to properly assemble packets.

Data Offset field

Manipulation is the following: increase the value of the Data Offset field, thereby extending the header TCP, add the option field. In the options, you can implement data after byte 0x00 EOL.

On standard after the byte 0x00 EOL must be bytes with a value of "0" as a consequence of some other value indicates that the data injection were produced.

Reserved field

You can change the value of the field Reserved.

As standard all the Reserved-bits must set to "0" because of some other value indicates that the data injection produced.

Window field

You can change the value of the field Window. Manipulation is possible only in condition what the packet formed for hiding source of data. Because of the manipulation producing at the source, the receiving party cannot properly assemble packets.

Urgent Pointer field

You can change the value of the field Urgent Pointer. This manipulation is possible only if all flags URG.

This manipulation is possible only if all flags URG. Thus, if the Urgent Pointer filled, and the URG flag is not set, it means that the Urgent Pointer used incorrectly.

Options field

You can change the value of the field Options. In the options, you can implement data after byte 0x00, because after this byte header data are not considered. Values of the TCP header options are limited, as a result of the network analysis is try to identify any filling out the option, that is try to identify the incorrect filling of the options or unknown options, whose appearance suggests a possible injection of information.

Padding field

It is possible to fill the field of arbitrary Padding.

Should note that the Manipulation is possible only in condition what the packet formed for hiding source of data. Because of the manipulation producing at the source, the receiving party cannot properly collect packets.

Manipulation with the field Padding is one of the most interesting. The Padding field begins after the byte 0x00 in the Options field, the value is an option EOL, and lasts up to 32-bit boundaries of the header. The interest of this manipulation Contains in the following, after the option EOL equipment does not parse the header to 32-bit boundaries, that is, those bytes are a kind of invisible to the network equipment and sniffer. Although that the analysis of this field is simple enough, on standard after the option field, EOL up to 32-bit boundaries of the header must set to "0", as a result, any different value of this field indicates the fact of the injection of the data.

Result of injection

Size standard TCP-header field with the options field and fill is 192 bits. Because of the above manipulations, it is possible to use 150 bits, 78.13% of the total number of bits. This volume allows the implementation of 18 characters in the headline of 8 bits in the ASCII character set. Therefore, after the calculations we obtain a value equal six bits. Treated residue was included in the next 8 bits of the transmitted symbol.

UDP

User Datagram Protocol transport layer protocol. Not oriented to set the logical connection before start the transfer. This protocol is far less reliable than TCP, but is faster than TCP. This protocol standardized by RFC - 768.

Source Port field

You can change the value of the Source Port field. Manipulation is possible only in condition what the packet formed for hiding source of data. Because of the manipulation producing at the source, the receiving party will not be able to correct interpret the datagram. This manipulation cannot detected by analyzing.

Destination Port field

You can change the value of the Destination Port field Manipulation is possible only in condition what the packet formed for hiding source of data. Because of the manipulation will producing at the source, the receiving party cannot properly assemble packets. This manipulation cannot detected by analyzing.

Length field

You can change the value of the field Length. By increasing the length of the field, the size of package increased and thus we are able to modify the Data Octets field by appending data to the end of the datagram. Manipulation is possible only in condition what the packet formed for hiding source of data. Because, if the manipulation will produce at the source, the receiving node is not able to properly assemble packets. This manipulation cannot detected by network analyzing.

Result of injection

UDP-header size is 64 bits. Because of the manipulations described above it is possible to use 32 bits, 50% of the total number of bits. This volume allows you to implement a header 4 to 8-bit character in the ASCII character set.

Conclusion

In this paper, we set the goal to make ability to generate a bit stream in order to organize the secure communication. Software written for packets manipulation, which considered in this paper. It provides secure communication over a network. The main part of the programs model is a network traffic detector for analysis of packets investigations. The analysis consists of checking the headers for compliance with RFCs standards, which carried out to identify unauthorized values for specific fields.

It should be noted that TCP is a reliable delivery protocol, but after manipulation proposed above TCP-header lost reliability of protocol, that is used by TCP-header.

In the developed program model, one-packet transfer implemented, that is, the entire message embedded in the headers in a single datagram. To implement the highest possible transmission of messages we have chosen the following protocols: IPv4, IPv6, and TCP (TCP-encapsulated IPv6, IPv6 encapsulated in IPv4). Clarity results TCP-header data not embedded in the Fragment Offset. Therefore, a result of a manipulation offered use 603 bits in programming model, 74.04% of the total number of bits in the sequence of the three headings. This volume allows introducing 75 characters of 8 bits in ASCII encoding.

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E-LEARNING: QUALITY BASED ON STANDARDS

Pozdneev, B., Sosenushkin, S., Sutyagin, M.*

*Moscow State Technological University “STANKIN”, Corporate Institute of “Gazprom”**

The article presents modern trends in e-learning standardization and quality assurance. The ISO/IEC IT LET international standards implementation is recommended for providing quality guarantees. The fundamental role of the ISO/IEC 19796 standard for e-learning systems quality management is proved.

Keywords: e-learning, quality, standardization, certification.

At the turn of the third millennium, information and communication technologies have become a catalyst for the development of national and international educational system, the transformation of traditional technologies and teaching methods, new forms of e-Learning and the formation of cross-border and transnational educational structures of a new generation. Analysis of the best practices in different countries and development of additional national and international standards are particularly relevant in this dynamic area [1].

The use of international standards for the development and certification of e-Learning is the basis for competitiveness and integration of educational systems.

Below (Figure 1) shows the general scheme of the interacting bodies, organizations and consumers, as well as key process and outcome, ensuring the quality and competitiveness of the e-learning.

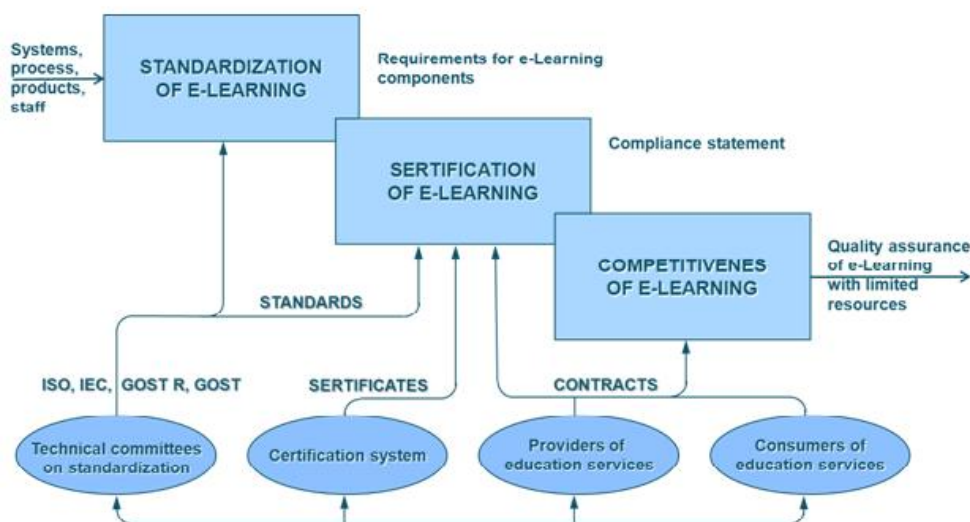


Figure 1: E-learning Quality and Competitiveness Assurance based on Standardization and Certification

Creation of the information society and the development of cross-border education necessitated the rapid adaptation of the Russian system of education to the globally recognized rules and standards for quality assurance, standardization, accreditation, licensing, conformity assessment and mutual recognition of test results [2].

The International Organization for Standardization and the International Electrotechnical Committee jointly develop international standards in the field of information technology within the framework of the First Joint Technical Committee (JTC1), which includes from 1999 36th Subcommittee (SC36) «Information technology for learning, education and training». Currently, the SC36 operation involved representatives from 45 countries in the seven working groups. They ensure the development of international standards in the field of terminology, technology, training, content management, quality assurance, e-learning, etc. The structure of international standards ITLET presented in Figure 2.

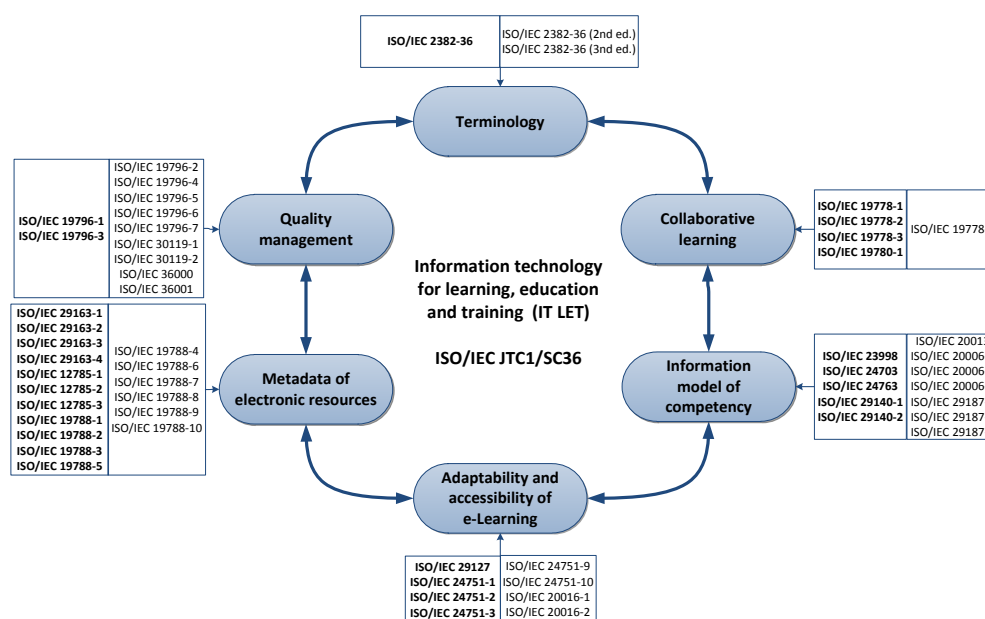


Figure 2. The Structure of International Standards in the field of ITLET

From the Russian Federation the functions of a permanent national working body of ISO/IEC JTC1/SC36 performs TC 461 "Information and Communication Technologies in Education", established in 2004, and uniting the six subcommittees of over 100 high-level experts from educational and research institutions, the leading domestic IT companies and other interested organizations. Since 2006, the Russian national delegations (TC 461) actively participate in the work of ISO / IEC JTC1/SC36, contribute to the development of international standards for terminology, metadata structure, quality management and harmonization of the standards of e-learning [5-8].

Important to ensure the quality of e-learning are the fundamental principles and basic concepts of TQM standards ISO 9000 [16-18] and ISO/IEC 2382-36 [19-21].

Quality — degree to which a set of inherent characteristics fulfills requirements

Quality management (QM) — coordinated activities to direct and control an organization with regard to quality

Quality assurance (QA) — part of **quality management** focused on providing confidence that quality requirements will be fulfilled

Process — set of interrelated or interacting activities which transforms inputs into outputs

Product — result of a process

Learning — acquisition of knowledge, skills or attitudes

Training — development of skills and/or understanding through procedurally defined **learning activities** focused on a specific application

Web-based learning — on-line learning that uses web technologies and Internet-based technologies

On-line learning — learning enabled via connection to an IT system

Blended learning — combination of e-learning with face-to-face or offline learning

Learning management system LMS — software system designed for the purpose of performing administrative and technical support processes associated with e-learning

Learning content management system (LCMS) — system that is used to create, store, assemble, and/or deliver e-learning content

Learning technology system (LTS) — information technology system used in the delivery and management of learning

For a systematic approach to quality assurance of e-learning in the development of the series of international standards ISO/IEC 19796, being developed in the fifth working group "Quality and Structure Description" of the ISO/IEC JTC 1/SC 36 is of great practical interest. In the original version the international standard ISO/IEC 19796 was to include six parts (see Table 1), which are defined in a systematic way: the general approach, quality model, reference methods and metrics, best practices, guidance on implementation, application guide for Part 1, the model of conformity assessment of part 1 of the standard. By now taken the 1st and 3rd parts of the standard, and in 2013, it is expected to complete the 4-th and 5-th part of the ISO / IEC 19796. In September 2012 at the 25th Plenary Meeting of the SC 36 (Busan, Republic of Korea) discussed the prospects for completion of the remaining 2nd and 6 parts with the significant change of conceptual understanding of the role of the standard. First, the ISO / IEC 19796-1 was invited to consider a closer relationship with the standards of ISO 9000, and, above all, to the ISO 9001 standard [9-11, 14, 22-27].

Table 1: Structure of the International Standard ISO/IEC 19796 «Information technology — Learning, education and training — Quality management, assurance and metrics»

Part of the Standard	Title of the Part of Standard	Note
19796-1	ISO/IEC 19796-1 «Information technology — Learning, education and training — Quality management, assurance and metrics —General approach»	Adopted in 2005, the main provisions will be included in a new series of ISO / IEC 36000
19796-2	ISO/IEC 19796-2 «Information technology — Learning, education and training — Quality management, assurance and metrics —Quality Model»	Development stopped, the main provisions will be included in a new series of ISO / IEC 36000
19796-3	ISO/IEC 19796-3 «Information technology — Learning, education and training — Quality management, assurance and metrics —Reference methods and metrics»	Adopted in 2009 r.
19796-4	ISO/IEC 19796-4 «Information technology — Learning, education and training — Quality management, assurance and metrics —Best Practice and Implementation Guide»	The work must be completed in 2013
19796-5	ISO/IEC 19796-5 «Information technology — Learning, education and training — Quality management, assurance and metrics —Guide «How	The work must be completed in 2013

	to use ISO/IEC 19796-1»	
19796-6	ISO/IEC 19796-6 «Information technology — Learning, education and training — Quality management, assurance and metrics —Conformity Assessment Model for ISO/IEC 19796-1»	Development stopped, the main provisions will be included in a new series of ISO/IEC 36000

Fundamental to ensuring the quality of e-learning is the first part of the standard ISO/IEC 19796-1 «Information technology - Learning, education and training - Quality management, assurance and metrics-General approach», where a common approach to quality management and quality assurance in relation to the area learning, education and training with the use of information and communication technologies is defined. The area is in a generalized form can be defined as e-learning in educational institutions at all levels and in organizations that provide training and retraining. The main provisions of the standard applicable to different forms of organization of e-learning (mobile, network, self-mixed, joint, etc.) and types of distance learning technologies.

In accordance with the provisions of the standard development of a common approach to quality for the organization, which provides educational services with the use of e-learning should include the following steps:

- a) integration of approaches to quality with the standards and profiles, and best practices;
- b) the analysis and comparison of approaches to quality-based standard for describing the structure of approaches to quality (RFDQ) and standard quality criteria (RQC)
- c) development of a harmonized model;
- g) the localization and adaptation of a harmonized model in accordance with national, industry and corporate requirements.

Development of a common approach to quality must be performed on the basis of the application of fundamental principles and requirements, taking into account the relationship approach to quality based on standard structures:

- a) Total Quality Management;
- b) ISO 9000;
- c) regional and national standardization documents;
- d) regional and national associations and organizations in the field of education and e-learning;
- d) regulations of educational institutions and corporate structures.

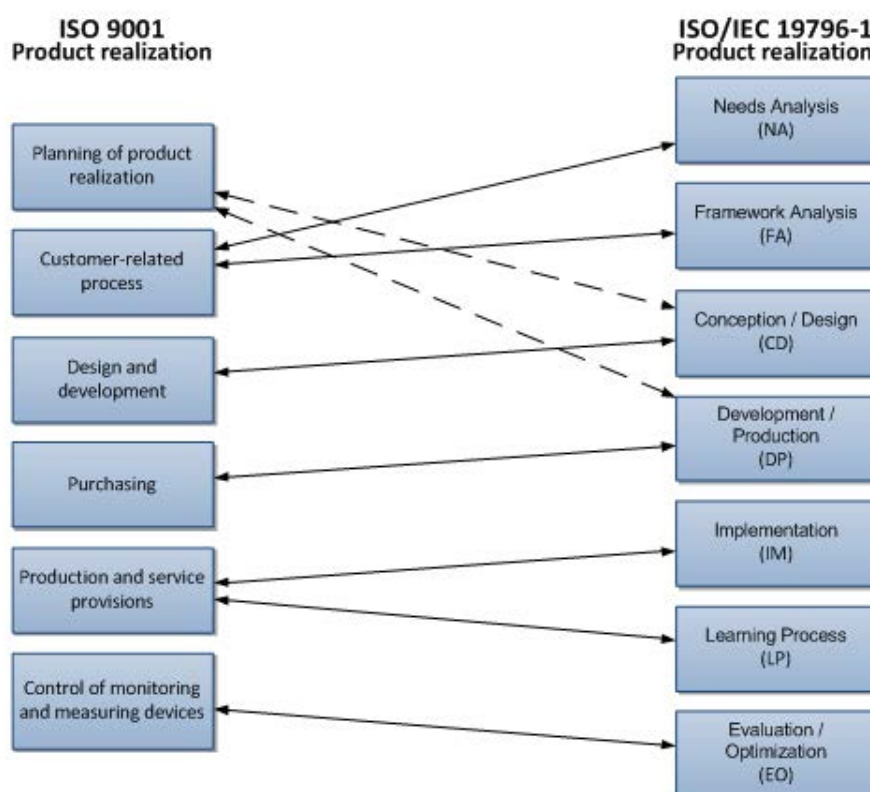
This made it possible to use a harmonized process model of e-Learning (see Fig. 4), in which the quality management system (QMS) of an educational institution includes four groups of processes according to ISO 9001, and the life cycle of e-Learning has seven basic processes of ISO/IEC 19796-1.

Ultimately, this will allow more effective use of terminological and methodological basis of the ISO 9000 series of standards, not only for the development of ISO/IEC 19796, but for dozens of standards developed by the ISO/IEC JTC 1/SC 36.

Second, approval was obtained from the management of JTC1 and ISO secretariat to develop a new series of three international standards (ISO/IEC 36000), which will be further reflected aspects of creating a harmonized process model and quality management system specific to and quality assessment and the possibility of certification of the main components of e-Learning (systems, processes, resources, personnel, services). In this approach the standards of ISO / IEC 36000 will be the basis for the formation of the profile system

requirements for e-Learning systems with the standards in the field of systems engineering, functional safety, risk assessment, ergonomics, environmental management, etc.

Comprehensive certification systems and components e-Learning in this approach does not cover all aspects of quality assurance, it does not include procedures for assessing the content of educational resources, methodology and didactic point of view, as well as compliance to the requirements of national educational and professional standards. Therefore necessary to develop a comprehensive approach to assessing the quality of e-Learning in accordance with the best national and international practices, including in conjunction with an independent examination and accreditation of public.



*Figure 3: Interconnection process structures «Product realization»
ISO 9001 and ISO / IEC 19796-1*

ISO/IEC 19796-1 defines the procedure for developing a process model, which is a process-oriented structure for the description, comparison and analysis of approaches to quality in organizations performing educational activities using distance learning technologies and the various forms of e-learning.

Development of a common approach to quality for the organization, provides education using e-learning must be in accordance with the following steps (see Fig. 3):

- Integrated approach to quality, with the standards and profiles, and best practices.
- Analysis and comparison of approaches to quality on the basis of the reference structure for describing approaches to quality and standard quality criteria.
- Development of a harmonized model.
- Localization and adaptation of a harmonized model in accordance with national, industry and corporate requirements.

ISO/IEC 19796-1 defines the procedure for developing a process model, which is a process-oriented structure for the description, comparison and analysis of approaches to quality in

organizations performing educational activities using distance learning technologies and the various forms of e-learning..

Development of a common approach to quality for the organization, that provides education using e-learning must be in accordance with the following steps (see Fig. 3):

- Integration of approaches to quality from different standards, profiles, and best practices.
- Analysis and comparison of approaches to quality on the basis of the reference structure for describing approaches to quality (RFDQ) and standard quality criteria (RQC).
- Development of harmonized model.
- Localization and adaptation of harmonized model in accordance with national, branch and corporate requirements.

In the construction process model of e-Learning the provisions of the ISO 9001 standard were taken as a basis. ISO 9001 standard defines the process approach, 6 processes of life-cycle of products or services. To account for the features of e-learning life cycle processes of e-Learning have been identified in accordance with ISO / IEC 19796-1, which defines seven life cycle processes. This approach is defined in the German standard DIN PAS 1032. An alternative French approach identifies five life cycle processes (AFNOR Z76-001). The process model ISO/IEC 19796-1 includes the relevant processes within the life-cycle of information and communication systems for learning, education, and training. The process model is divided in seven parts. Sub-processes are included referencing to a classification of processes.

Table 2: RFDQ process model

ID	Category	Sub-Processes
NA	Needs Analysis	Classification
FA	Framework Analysis	Classification
CD	Conception / Design	Classification
DP	Development / Production	Classification
IM	Implementation	Classification
LP	Learning Process	Classification
EO	Evaluation / Optimization	Classification

In forming process model was necessary to determine the relationship of e-Learning processes, an input-output control actions and resources needed.

The most important aspect of the quality of the model is the choice of methods and metrics for quality assessment, as defined in ISO / IEC 19796-3.

ISO/IEC 19796-1 focuses on aspects of quality approaches and on a process-oriented framework in order to design, plan, understand, manage, and evaluate quality in an organization and within sectors or markets in which information technology systems are used for learning, education, and/or training. ISO/IEC 19796-3 provides ITLET stakeholders with more detailed reference information regarding methods and metrics that are aligned with ISO/IEC 19796-1, and may be used to help in the design, development, implementation, and evaluation of an ITLET quality management system.

Together quality metrics and methods may be used to assure quality for stakeholders and to fulfill an organization's quality objectives.

The main purpose of this ISO/IEC 19796-3 is to facilitate the concrete implementation of quality approaches by providing implementation methods and metrics for measurement. Attributes and data elements are used to facilitate the documentation, analysis and comparison of different quality approaches for the development and use of information technology within learning, education, and training.

In addition to being useful for evaluating, auditing, goal setting and improving quality approaches in e-learning, quality methods and metrics can be used to define quality requirements to a detailed and substantial level. The communication and agreement on quality requirements and approaches beforehand using ISO/IEC 19796-3 could help to evaluate and ensure the effectiveness of information technologies in meeting the teaching and learning needs of ITLET stakeholders.

A comprehensive list of reference criteria for the assurance of quality of learning products is provided in the criteria catalogue. The catalogue contains as well functional as media and learning psychology related reference criteria. Furthermore, it includes criteria related to data security and (special marked) criteria related to national laws in the area of distance learning.

These criteria can be used for assessment and evaluation within the process model. Only criteria which are suitable for a certain context should be used. Hence, the criteria just provide a comprehensive list – when implementing a quality management or quality assurance system, adequate criteria can be chosen from this list.

The reference catalogue shall provide a common basis to build country and domain specific catalogue profiles. These profiles contain a relevant selection of criteria and can specify priorities e.g. by marking criteria as “must-criteria”. Such a criteria profile based on the reference catalogue is deployed in the evaluation of processes based on the process reference model. For this purpose each process specification in the process reference model contains a reference to the relevant section of the reference criteria catalogue. Furthermore the reference catalogue can be applied to create criteria profiles

- which allow comparisons of learning products,
- which support certification of learning products (according to quality standards).

When learning products are software products, ISO 9241 applies to the learning product. For that reason the 213 criteria of ISO 9241 are building the first section of the reference catalogue. Additionally, 480 criteria were collected, which are specific to learning products. The list of reference criteria is structured into catalogue sections, to allow easier access to certain criteria. Each criterion appears only once in the catalogue. A criteria profile however may use another structure. Criteria of ISO 9241 are evaluative. The reference criteria of the other sections are however evaluative and descriptive.

As a result of the advanced development of national standards Russian developers of leading IT companies and universities have a competitive advantage for the establishment and practical application of e-Learning. Besides, the Russian system of voluntary certification (INKOMTEHSERT and INFORMIKASERT) started to develop test methodologies for basic components of e-Learning, in accordance with the structure of standard quality criteria (Table 3) recommended by ISO / IEC 19796-1.

Table 3: Reference Quality Criteria (RQC)

Section №	Section/Category	Number of Criteria	Number of Descriptive Criteria	Number of Estimation Criteria
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Section №	Section/Category	Number of Criteria	Number of Descriptive Criteria	Number of Estimation Criteria
1	Ergonomics	213	0	213
2	General conditions	101	32	69
3	Technical aspects	103	23	80
4	Data storage & data processing	37	14	23
5	Functional area	69	29	40
6	Theoretical aspects	80	17	63
7	Information encoding	59	3	56
8	Special modes of presentation	31	0	31
	Total	613	118	495

At the meeting of WG5 ISO/IEC JTC1/SC36 experts from Germany, Portugal, Russia, Japan, South Korea, Luxembourg, France, China and other countries have repeatedly discussed the development of standards for the quality of e-learning. The experts concluded that the need to change the standard, similar to the standards of ISO 9000. Changing the structure of the standard was approved by ISO and IEC. The revised standard forms a series of standards ISO/IEC 36000. The prospect of the standard ISO/IEC 19796 is shown in Fig. 4. The new version of the standard is based on the relationship of the principles of TQM and ISO 9001 process approach allowing for the e-learning.

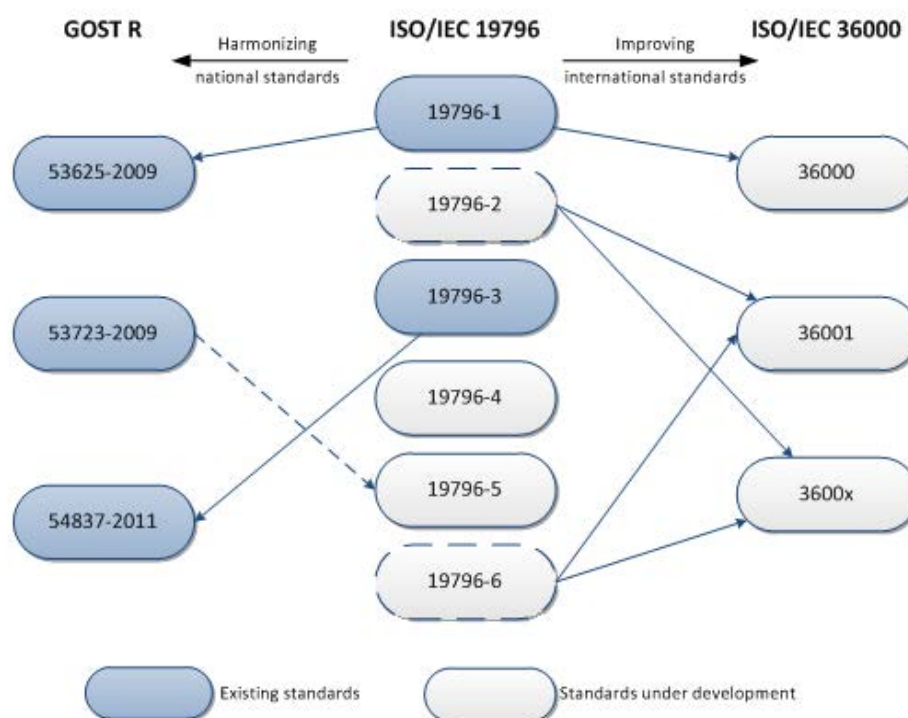


Fig. 4: The prospect of ISO / IEC 19796 and the Russian experience of its application for e-Learning

Many countries have already adapted the ISO / IEC 19796 for country-specific. This standard is used in Europe, Russia, Canada, Japan, South Korea, etc.

At present, Russia has adopted three national standards (GOST 53625-2009, GOST R 53723-2009 and GOST R 54837-2011), which are modified versions of the relevant parts of

the international standard (see Fig. 4) and take into account the specifics of Russian law and the national education system. These standards can be used to create management systems and educational organizations for the certification of these systems [3].

ISO/IEC 19796 is of fundamental importance for the development of e-Learning, because it describes the structure of the processes of e-Learning.

The evolution of the standard ISO/IEC 19796 has led to a new series of quality standards ISO/IEC 36000, which is based on the relationship of the principles of TQM and ISO 9000 process approach. The structure of the new series of standards will be structured according to ISO 9000 standards, and the content part will be adapted from the standard ISO / IEC 19796. In the long term can be extended process maturity model CMM and CMMI.

In our view, the series of standards ISO/IEC 36000, along with standards for terminology ISO/IEC 2382-36 will be the basic document for the development of international standards in the field ITLET.

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INCREASE OF DEGREE OF READINESS OF TEACHERS TO CARRYING OUT OF REMOTE COMPETITIONS ON COMPUTER SCIENCE BY MEANS OF INTERACTIVE TECHNOLOGIES.

Belchusov, A.A.

Cheboksary, The Chuvash state pedagogical university

Article is devoted use of interactive technologies during the organisation of remote competitions on computer science. Among the teachers holding remote competition at the school, there are teachers of computer science, the teacher of initial classes, deputy directors on information etc. Each of these groups has the level of possession of information technology, and, means, to it there should correspond the certain level of interactivity realised on a site of remote competition.

Keywords: remote competitions, interactive technologies.

Remote competition on computer science is a form of after-hour activity of the pupils, having competitive character at which organizers and participants spatially and in time are removed from each other [1]. Spatial and time remoteness distinguishes remote competition from the classical Olympic Games in which course any participant, be it the pupil or its teacher accompanying always directly can address in organising committee for an explanation of those or other questions. Besides one of organizational actions of the classical Olympic Games is general meeting on which there are teachers and pupils, thanks to it the parenthesis of organising committee and the subsequent course of discussion are accessible to all simultaneously. Important is as also that fact that the contingent of the teachers preparing the pupils to the classical Olympic Games, as a rule, is stable also the general course of the Olympic Games it is known.

Participation in remote competition and course of its basic stages should be intuitively clear to each participant and not to cause any additional questions that dares at the expense of the detailed instruction and the videoclips showing correct actions of the participant in those or other situations. In particular the organising committee of competition "Infoznaika" prepares rollers from which it is possible to learn: how to be registered on a site, how correctly to specify the mailing address, how to make an application on game and to pay it, how to fill the form of gathering of answers etc.

The contingent of the teachers which pupils take part in remote competition, can strongly change year from a year. Considering the big variety and a different thematic orientation of remote competitions, this year can be interesting and expedient to participate in one competition, and next year in other. So the analysis of a contingent of teachers taking part in competition "Infoznaika" has revealed that every year it is updated approximately on 20 % that in absolute expression speaks practically about 1000 new teachers who should acquire rules of carrying out of competition. We consider that process of mastering of rules should occur a natural way, i.e. before error fulfilment.

The decision of the given problem sees in use at the organisation of remote competitions of interactive technologies. In Wikipedia we meet following definition of interactivity.

Interactivity is a principle of the organisation of system at which aim is reached by an information exchange of elements of this system. In information systems interactivity is an ability of information-communication system, actively and adequately to react to actions of the user. Such property is considered a sign of that the system "clever", that is possesses any intelligence.

In «the Explanatory dictionary of terms of the conceptual device of information of formation» interactive dialogue is understood as «interaction of the user with the program (hardware-software) system characterised (unlike dialogue, assuming an exchange of text commands, inquiries and answers, invitations) realisation of more developed means of conducting dialogue (for example, possibility to ask questions in any form with the limited character set and so forth); possibility of a choice of the maintenance of a teaching material, an operating mode with it is thus provided. The interactive mode of interaction of the user

from the COMPUTER is characteristic that its each inquiry is caused by reciprocal action of the program and, on the contrary, a remark of last demands reaction of the user» [3, with. 9].

Considering resulted above definition, we will consider process of carrying out by the teacher of remote competition at the school, as process of interactive training of the teacher who is carried out by organising committee, and realised during dialogue between the teacher and competition organising committee, as directly (e-mail), and by use of intellectual information agents, forms of feedback presented on a site.

In the given context the site created and supported by organising committee of competition "Infoznaika", acts as the tutorial of the teacher which have solved for the first time to take part in this remote competition.

The concept "interactive" can be carried to all sites having the forms of sending of messages, online questionnaires and polls, registration forms, counters of visitings, forms for online orders and other similar elements.

We have allocated following criteria which have laid down in a basis of classification of interactive technologies applied at the organisation of remote competition:

- Interactivity degree;
- Level of support of the user;
- Conformity to level of possession of information technology.

From the point of view of interaction degree under interactivity it is possible to consider following cases (levels):

- Linear interaction, or absence of interactivity when the sent message is not connected with the previous messages;
- Jet interaction when the message is connected only with one immediately previous message;
- Plural or dialogue interaction when the message is connected with set of the previous messages and with relations between them.

In our context we will start with the assumption that interactivity degree depends, from quantity of variants with which help it is possible to receive feedback, from speed of its reception, from quantity and quality of sources of reception of the information.

On a site of remote competition of Infoznaika following interactive technologies are realised:

- Questioning in the form of gathering of answers;
- Mailings about necessity of performance of certain actions;
- Discussion in communities of social networks;
- оставление responses;
- Message sending by e-mail
- Dialogue with ИНФом (the intellectual information agent);
- Sending of messages on acknowledgement of actions carried out on a site;
- The guide-instructor in a private office;
- An estimation of tasks of competition;
- An interactive card.

Questioning in the form of gathering of answers, allows each teacher, to estimate organising committee actions, to express the relations to those or its other decisions, and also to give the wishes, recommendations and remarks in organising committee. As the questionnaire settles down in the form of gathering of answers its sending on processing, occurs together with sending of answers of pupils and demands from the teacher of additional efforts.

In spite of the fact that the schedule of all actions of competition is placed on the main page of a site, and also is accessible to downloading in the form of a separate file, experience

shows that it is necessary to remind each teacher of actions which it should make at approach of this or that date. This purpose is served by post mailings.

Considering that fact that almost all people verify the decisions with opinions of the colleagues, use councils of the acquaintances, and many teachers consist in network pedagogical communities, we have placed on a site of the reference for transition in social networks and groups to which there is a discussion of competition [6].

Keep of responses it is realised by means of service of feedback of Reformal. By means of this service the organising committee can collect and structure responses of the teachers visiting a site of competition. Teachers can faster and inform more effectively the opinion to organising committee. Advantage of Reformala before other similar systems consists in possibility to discuss, категоризировать responses and to vote for them.

The number of participants of competition is great, and it raises probability of occurrence of the non-staff situations demanding an individual approach, besides the personalised dialogue raises degree of confidence of the teacher in the actions. Therefore on a site electronic addresses of members of the organising committee responsible for the decision of those or other questions, and also phone are placed.

The intellectual information agent (IIA) is created on the basis of the technology developed by company Nanosemantika. It is possible to train it, using special templates, to group similar questions. Answer IIA can contain both the text and references and images. Well trained IIA can even conduct with the user small conversations [5].

In view of high percent of the teachers who for the first time are taking part in competition, Organizing committee confirms the actions made by the teacher on a site, the additional electronic letter containing an estimation of these actions, and in case of need recommendations about correction of the arisen error.

The private office of the teacher is created right after registration of the teacher on a site and exists until requisites of the participant completely are not removed. One of important functions of a private office is delivery of instructions at what stage of competition there is a user at present and that it should make further [2,7].



Fig. 1. An interactive card дистанционной games of Infoznaika.

Each of teachers has possibility an estimation of the task of competition "Infoznaika" by following criteria: clearness of a statement of the problem; complexity of the decision; originality of statement of a problem; conformity to a school course of computer science; the problem has developing character; the problem has training character; the problem has educational character; it would be desirable more than such tasks.

The interactive card located on a site of remote competition by Infoznaika is intended for coordination of participants of game. By this time representatives of all regions of Russia take part in game, however, new participants interests, who from their region takes part in game, for them and this card is created. The card is based on technologies Google map, all mailing addresses of schools are connected with card co-ordinates, and at prompting on a card appear automatically.

Let's analyse speed of reception of feedback for each of possibilities which are given the user on a site of competition "Infoznaika".

Table 1. Speed of reception of feedback

Speed	Used technologies
The low	- Questioning in the form of gathering of answers; - Mailings about necessity of performance of certain actions;
Average	- Discussion in communities of social networks; - Keep of responses; - Message sending by e-mail
The high	- Dialogue with ИИФом (the intellectual information agent); - Sending of messages on acknowledgement of actions carried out on a site; - The guide-instructor in a private office; - An estimation of tasks of competition; - An interactive card;

Comparison of technologies by quantity of sources of the information allows to allocate following groups.

Table 2. The sources of the information given
Used technologies

Information sources	Used technologies
One	- Mailings about necessity of performance of certain actions; - Sending of messages about acknowledgement of actions carried out on a site; - The guide-instructor in a private office; - An estimation of tasks of competition; - Message sending by e-mail; - Dialogue with IIA (the intellectual information agent); - Questioning in the form of gathering of answers; - An interactive card;
A little	- Discussion in communities of social networks; - Keep of responses;

Level of support of the user of a site can be estimated on depth of a prediction of its actions and adequacy to delivery of the corresponding help in case of difficulties, namely:

- Reaction to errors;
- Informing on a current condition;
- Recommendations of the future actions.

Conditions of maintenance of high efficiency of the organisation of remote competition:

- The guidebook, the help what action now is expected from the user (the guide on passage of stages of competition);
- An estimation of actions of the user on each of competition stages;

- Intuitive clearness of stages of competition;
- Fixation of the beginning and end of the basic stages of competition which there should take place the user.

Teachers of computer science, the teacher of initial classes take part in remote competitions, teachers combining teaching of the basic subject (the physicist or the mathematician) and computer science, and also occupying supervising posts, in particular deputy directors on information, teaching and educational work, uchebno-methodical work, on scientifically-methodical work, assistants on information. Each of these groups has different level of possession of information technology [4] which means certain level of interactivity necessary for it for effective carrying out of competition at the school and works with a competition site.

Table 3. Possession of information technology

Level of possession of information technology	Categories of users
The low	Teachers of computer science, assistants to directors for information
Average	The teachers of initial classes teaching computer science, the mathematics teacher and the teacher of physics in addition having hours of computer science
The high	Class teachers, methodologists, assistants to directors for a science and teaching and educational work

So that to raise degree of readiness of teachers to carrying out of remote competition organising committee should realise on a site support of interactive technologies providing high speed of reception of feedback, задействующих some sources of the information, allowing to predict actions of the user on sufficient depth, giving out an adequate help material, and corresponding to level of possession of information technology, for each category of participants of competition.

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INFORMATION AND COMMUNICATION TECHNOLOGES IN ECOLOGICAL TRAINING OF STUDENTS

Aksenova, O.V. , Guzenkova, A.S.
Moscow, MIEM HSE

ICT application in ecological training of technical disciplines` students is considered, also with use of Learning management system (LMS) HSE, simulative models in practical course, presentation materials for laboratory and practical courses, review audio lectures, computer systems of knowledge control.

Keywords: Sustainable development, simulative models in practical course of ecology, life safety, ICT in laboratory works, computer systems of knowledge control, ICT application in ecological training.

In the final document of the III-d Sustainable development conference RIO+ 20 (June 2012), named “The Future we want”, the economic and social meaning of industrial development for human needs and future generations is recognized with compulsory considering eco-restrictions for keeping stability of ecosystem.

The important component of preparing engineers is a formation of student`s modern ecological outlook and ecological culture , understanding personal involvement in solving problems of environmental protection for sustainable development society.

ICT integration in eco-preparing of technical disciplines students we consider as a way to improve the efficiency of training and professional competence of future engineers.

The following forms of information and communication technologies are used at Physical chemistry and ecology department, HSE:

- Learning management system
- Simulative models of processes (practical training in ecology and life safety)
- Presentation materials of lectures
- Review audio lectures (the possibility of distance self-education)
- Presentation materials for practical training
- Program systems of knowledge control (tests)

Learning management systems (LMS HSE) gives students and teachers convenient instruments for learning process. All necessary materials are published in LMS system: lecture notes, presentation materials, home tasks, discipline tests, literature, that gives student the opportunity of preliminary self- studying and analysis of placed information.

Presentation materials with photos, description of used equipment and stages of experiment are placed in LMS before carrying out laboratory works in «Life Safety» and «Ecology». In that case students can easily imagine the coming laboratory experiment and prepare to it.

The student`s projects and homework are collected and rated in LMS, also gradebook is carried out there. The system gives the opportunity of chat forum on the

discipline and informing students. Students can ask teacher questions arising in the learning process. A feedback with a student is necessary to a teacher in preparing new lecture materials, practical and laboratory tasks according to actual scientific interest of students of various specialties to carry out individual approach.

It's necessary for modern specialist in electronic technologies to predict the consequences of planned work and introduction of new technologies, know the features of behavior of various substances when getting in atmosphere, water, soil and to estimate their influence to the environment.

Implementation of practical works is an important part, necessary for environmental disciplines profound assimilation. We have developed "Compilation of practical tasks on ecology", containing tasks to the main sections of the course.

Performing individual tasks, students with specific examples evaluate anthropogenic pressure on environment, learn about rationing pollutants, study methodology for monitoring and calculations.

The use of ICT lets significantly reduce time required to perform complex mathematical calculations and focus student's attention on understanding the overall picture of processes as a whole. As an example lets take the practical work on the course «Ecology»-«Simulation model of the region» and a simulation model, we have development for the course «Life Safety» -« Evaluation of the radiological situation», which are carried out in computer labs.

The practical work «Simulation model of the region» has its aim to get practice in managing of complex systems. As a result of carrying out the practical work students analyze the possible impact of economic activity on the environment, study to take into account along with economic factors the environmental ones at the stage of planning economic activity, thus carrying out eco-design.

The practical work «Evaluation of the radiological situation» is devoted to prediction and assessment of emergency situations (assessment of the extent of radioactive contamination). Initial data to identify the radiation environment in the first place are radiation levels measured in a place of future work and time of measurement relative to the moment of ejection, protection coefficients of buildings and protective structures and also established permissible dose for facility personnel and population.

Solving problems on the computer is performed in interactive mode with providing the learner the necessary formulas and tables on the screen and also the opportunity of choice of relevant data in menu mode. When data entry errors are detected, the computer tactfully warns a student, gives a short help and proposes to carry out re-entry. Results of the work can be printed to further discussion with a teacher.

The carrying out laboratory works is the important component of ecological cycle disciplines. Laboratory works of environmental issues are exploratory and investigative. Measuring devices, used in laboratory practice of course "Ecology" give the opportunity of outputting the experimental data to the monitor, saving and processing results, preparing a report on the work.

The degree of students' mastery of educational material is estimated by testing, which is carried out either in computer labs or remotely in LMS. Also students can pass pre-trial testing and determine the extent of their training.

Thus, practical, laboratory works and testing with use of ICT give new opportunities for fixing sections of studied disciplines "Ecology" and "Life Safety".

LMS (Learning management system) of HSE provides students the opportunity of preliminary self-acquaintance with lecture notes, the procedure for upcoming practical and laboratory works and also with tools and equipment.

Solving practical problems and problem situations with use of ICT, laboratory experiment data processing allow students to participate actively in learning process, teach observe scientifically, work independently, check solutions and make conclusions.

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INFORMATION TECHNOLOGIES IN THE PROJECT TEACHING OF ENGLISH

Strinyuk, S.A.
Perm, HSE

The use of information technologies in teaching English is being broadly discussed. They provide learners of English with a variety of efficient tools to improve their language level. This paper gives an account of implementing information technologies and e-learning tools in teaching English by means of project activities.

Keywords: teaching English, project, information technologies in teaching

Dramatic shifts in information environment have occurred on the contemporary stage of society development. Information flows formed by mass media and the Internet in particular have fundamentally changed both the pattern of information consumption and university education development.

Formulating the main goals and tasks of education process it is vital to take into consideration various factors connected with the objective characteristics features of the environment as well as the frame of reference of the central participants of educational process – students and professors. Availability of information sources is one of the key characteristics of educational environment on the contemporary stage of society development. Fast change of educational paradigm makes students regard traditional education methods and techniques with scepticism. The gap between a dramatic social change and conservatism of university education formed to satisfy needs of industrial production has become obvious in postindustrial age. Much has been said about it in the works of education theorists [1].

We witness not only a dramatic shift of teaching paradigm but also the change of learning patterns. Students realize to a greater extent the objective limitations of knowledge they get at universities. Priority must be given to providing them with tools and instruments of gaining knowledge, enhancing motivation and use interest to the subject to the benefit of higher level of education [5].

Desire to get the maximum amount of information within a short space of time prevents students from critical evaluation of information sources. It makes them “omnivorous” consumers of information; moreover, they stop thinking critically and form a very specific way of information assessment – according to its position in the Internet search results. If the source is at the top ten of search results it is automatically considered as

valuable. Needless to say that neither libraries nor academic networks are regarded as trusted sources of information. Former school leavers are typically used to writing long papers uncritically compiling them from randomly chosen sources and giving no references to them.

At the same time, information redundancy, unlimited availability of information sources and cursory pre-university educational patterns form educational habits and models which do not allow to acquire complex analytical study skills. Students often fail to make a sustained effort, demonstrate analytical reading skills, evaluate and analyze information, undertake a study task and find the most efficient ways of solving it.

Taking into account objective conditions we suggest formulating critical characteristics of educational process and students' expectations, after that we will set the goals of using information technologies and digital educational tools in the project teaching of English and set educational tasks on their basis.

First, availability and redundancy of information lead to inefficiency in reading and processing information sources, difficulties with selecting most relevant sources according to a criteria set. In addition, practice shows that preparing papers for their majors students try to avoid plagiarism and give proper references while making reports or presentations in English they do not even bother to solve the ethical problem of quoting other people's works and giving references to the sources. In this case impunity causes copyright abuse and creates ethical threat.

Second, students on the one hand tend to criticize a teacher-centered approach at the lesson (teacher ranking adds to the problem) on the other hand they are always ready to blame their failure on professors. Students often regard skeptically excessive professional theoretical background provided by profound university education and reject traditional teaching approaches but paradoxically they tend to rely heavily on teachers support and judgment. The factors mentioned form "educational consumerism" and seriously afflict students' educational activity.

Third, a traditional subject-object teacher-oriented educational paradigm and reproductive tasks and activities drastically limit the effort of the students; they do not provide them with instruments of self-development and efficient achievement of educational tasks.

From the above reasoning we set a goal to modify to a certain extent a teaching approach to English so as to adjust it to a new educational environment and to benefit from the use of information technologies and digital e-learning tools. The concept was implemented in Business English for Business Informatics (second year undergraduate students).

We assume that it is important to organize learning in a way which allows to achieve the main goals set by fast developing educational environment. We prioritized sharing with students responsibility for mastering the English language, gaining and implementing academic skills and special educational strategies. The project teaching of English was chosen as a tool to achieve these goals. It is important to introduce e-learning tools provided by The Higher School of Economics Learning Management System in particular to carry out the project teaching of Business English. In addition, various e-learning instruments and information sources are implemented in learning process. For the sake of convenience we divided them into two groups: information resources (library and media sources – Jstore, EBSCOhost, etc. and access to the Internet and personal computers) and language e-learning tools: various dictionaries on CD-ROMs. Functional significance of the digital dictionaries for the project teaching will be discussed later.

Unfortunately, quite often the use of information and technological tools are given priority at the expense of achieving educational tasks. Practically unlimited opportunities provided by PC should not end in themselves; in our opinion, computers should be used only to efficient achieving educational tasks.

Last three years Business Informatics students of Perm regional campus of National Research University the Higher School of Economics are involved in the project activities. By the project teaching of English we mean organized incremental learning activity which allows to teach students to set study goals and tasks, organize pre-project preparation focused on possible solutions to the tasks, making record of the project, developing the project per se – multimedia educational products and presenting the project. Project activities are designed to form academic and study skills which are the instruments to solve similar tasks independently in future (please refer to the works of Polat, Sapugol'tseva and Yanchenko) [6], [7], [8], [10]. We assume that in the project teaching competency and individual approaches to teaching are realized successfully. On the one hand, the project teaching is based on individual approach as on each stage students rely on their own values and interests and improve their skills, on the other – they regularly assess their language level using CEFR - the *Common European Framework of Reference for Languages: Learning, teaching, assessment* [2]. The significance of competence and individual approaches integration is discussed in A.Verbitskyi's works, for details refer to [9].

The project in our case is a multimedia educational product, consisting of three parts: the text with hyperlinks to the glossary, the glossary and power point presentation of the project. A detailed look at each element gives us its description. The text up to 5000 thousand characters and B2-C1 level at least (approximately the level of popular science journal), should be written in a formal academic style, compilation from several sources is allowed but references must be provided; the text should present the topic chosen by students and contain target topic vocabulary. The glossary includes vocabulary valuable in terms of grammar, terminology, or be suitable to improve the level of the language competence in general. Several selection criteria were defined: terms; collocations; nouns, adjectives and verbs with prepositions; phrasal verbs, etc. The text refers to the glossary through hyperlinks. The forms of organizing the glossary may vary; students can choose any suggested by the teacher or create their own system. The presentation is a short report (five - seven minutes) meeting several criteria. It should reflect the content of the project (the text), be well structured, logically organized and properly formatted.

The main stages of the project are marked and discussed with students; broad topic fields leaving space for creative adaptation are prepared; proposed outcome of the project is described; goals and tasks are set and assessment criteria are given. The projects are managed through the LMS, regular file and materials exchanged via the LMS and corporate e-mail. Learning Management System allows to organize fast and efficient work on the project for students and teachers as well.

Topics are formulated broadly deliberately so as to give students opportunity to research most timely issues of the field. The list of topics refers to the course book *New Market Leader (Intermediate)* [4]. In the second term students are offered topics on Quality, Ethics in Business, Leadership, etc. On the first stage students are to formulate research question, make literature review and highlight most timely problems in the field. It makes students prepare a research question and focus on a particular problem, for example, in a broad field "Ethics" students after research and discussions have chosen the research question "Could business be ethical?"

Allocation of duties comes after formulating the research questions. Given that the project teaching is a process activity and takes a lot of time to be completed it is natural to assume that collaboration requires mutually beneficial respectful complementary relationships and fair allocation of duties. It is worthy of notice that students seldom have difficulties with effective communication, as a rule the most charismatic student takes responsibility and becomes the leader of the group, providing gradual movement to success. Thus, in the project

teaching students can show their socially significant features of the character: tolerance, respectfulness, ability to find compromise, etc.

The next stage is creating the text of the research addressing the research question. For this stage selection of the most valuable information resources and literature is essential. The text as it was mentioned above may be a compilation from several resources with references provided and it is one of the final multimedia products.

Text processing and highlighting the most valuable language items are carried out on the next stage of the project. Typically, marking target vocabulary, describing it through the means of e-dictionaries and creating a glossary are the most challenging tasks for students. Practice shows that students find implementing criteria of selection and evaluation of target vocabulary difficult. This stage requires serious support of the teacher as students are only getting used to improve their language consciously. Regular file exchange and active collaboration within the group and teacher's support help students overcome difficulties. We selected collocations as a valuable option due to the fact they are a serious obstacle to mastering English especially for students with low language awareness. All language items are later on studied with e-dictionaries.

Using e-dictionaries in the project teaching of English requires special explanations. The general idea is that the use of bilingual dictionaries is the only possible option while learning a foreign language. We regard this opinion as quite disputable. Teaching how to use study and special dictionaries is critical for learners' independence. Advanced learner's dictionaries, defining business English dictionaries, thesauruses and dictionaries of synonyms and collocation dictionaries are at any HSE - Perm student's disposal; all dictionaries are available in the library and can be installed on personal laptop computers [11], [12], [13], [14], [15]. Moreover, students are informed and instructed how to make use of the most quality and efficient online dictionaries (graphical dictionaries inter alia re recommended) [16], [17], [18], [19], [20], [21], [22], [23]. These digital sources bring synergy effect to the learning process providing more than sufficient level of information support to achieve educational goals. If students have a high level of study skills and demonstrate ability to set research questions and formulate tasks working with dictionaries usually does not pose any challenge. It must be noticed though, much attention is usually paid to train students to use monolingual dictionaries properly.

It would be useful to run through a particular example of the article to show the technology of text processing. Students chose this article as one of the sources for their project "Could business be ethical?" We have taken a short piece from the article of Jonathan Steel «Corruption in the third world is our problem», published in «Guardian» 13 December 2000 to illustrate the technology of text processing: «You bribe a foreign official to give your company a contract. It works and you get the business. You escape prosecution in Britain because corruption performed abroad is not illegal here. Better still, the British government gives you a tax break because "commissions" paid abroad are accepted as a deductible expense. Not bad going, and in the fourth year of New Labour's tenure there is still no action to change things. The tireless Clare Short made a big issue of corruption in the Department of International Development's white paper on globalisation this week, but much of her fire was directed at kickbacks taken by foreign officials from their compatriots rather than from foreigners» [3]. This piece provides us with a range of language items according to several criteria:

- **“terminology”**: bribe, corruption, prosecution, tax break, commissions, tenure, white paper, to explain terms Oxford business English dictionary is recommended;
- **“synonyms”**: bribe – kickback – commissions; Oxford learner's thesaurus: A dictionary of synonyms can help identify synonyms and explain the choice in any particular case, etc.

Various monolingual dictionaries offer invaluable help; they explain the use of words and collocations, sentence samples are provided, common errors are identified and explained, information of the proper use of prepositions with these words is given; in case students struggle to pronounce these words electronic dictionaries have sound services. This painstaking work takes a lot of time and effort but gives key language study skills, forms study independence and builds the basis for future self-improvement.

The glossary is created with the items selected from the text and then hyperlinks to the text are made so it could serve as an electronic reference on this topic. This shared resource helps other students to study the topic and prepare for the exam. After that a power point presentation with the notes taken from the text is created. The presentation is given in the lesson at the end of the time period allowed to study this topic.

Making presentations students should take into consideration principal rules and criteria implemented for their assessment. For instance, students learn how to make presentations of different styles (more or less formal), learn how to affiliate correctly, to use elements of corporate style (style guidelines – HSE brand book). Paradoxically, students usually enjoy preparing presentations but the quality on the first stages are typically rather low, that is why it takes time to improve presentation skills.

The most serious problems students face with creating and presenting their presentations may be divided into some categories: content, “technical” and language problems. Content problems are caused by careless considering the topic of the project and uncritical material use. “Technical” problems (to be more exact, insufficient presentation skills because evidently Business Informatics students rarely have “technical” problems with their presentations if any) appear due to a low level of presentation techniques: students sometimes underestimate their nervousness in public, fail to prepare and learn the text of the presentation properly, underestimate importance of pronunciation; these factors cause low assessment results.

Peer assessment is a vital part of the project teaching. Students should not only demonstrate understanding the rules and guidelines of creating and assessment criteria but treat other members of the group with tolerance and respect. To assess presentations standard criteria are applied:

content: relevance of the content to the task;

language: fluency, accuracy;

structure: coherence, cohesion, design;

communicative skills: material delivery, hesitation time, answering questions, communication with the audience;

visuals: number of slides, quality of visuals, correctness of the text use on the slides, correctness of the corporate style and other elements of design.

Inasmuch as the project teaching proposes regular evaluation students have to assess their group-mates as well as themselves. One of the serious assessment skills is self-evaluation of the results achieved by the students themselves. Language progress should be evaluated properly, i.e. students should be able to answer clearly the question: was there any progress subsequent to completing the project?

An on-line resource englishprofile.com offers a very interesting service which might be used in evaluation. As a rule students hardly ever critically consider the level of the language they use and sometimes fail to understand the criteria of assessment. Englishprofile.com gives clear examples of different language levels and demonstrates how this level might be improved. For example, students normally express meaning “important” in English with the same word “important” and hardly ever use “critical” or other synonym. Englishprofile.com marks the word “important” as a key vocabulary of basic level – A1 – B1, according to the particular meaning, but the word “critical” being checked gives B2.

Obviously, we are not so naïve to use this complicated resource only for such a basic routine, students are informed that the level of the language is measured by various means and speaking is assessed applying a set of criteria from pronunciation to complexity and efficiency of sentence structure. Nevertheless, students may benefit from using this tool on starting stages of a long and difficult process of language improvement and even such “mechanical” means of language evaluation matter since they help relieve the monotony of basic language.

To summarise, the project in English as being used in our practice is a multimedia educational product; while making the project students improve academic and special study skills they already have and gain new ones, they learn how to benefit from implementing e-learning tools and information technologies; moreover, they gain independence and self-confidence. Collaboration teaches students – members of study groups to be tolerant and respectful, at the same time it gives an insight into significance of peer assessment and regular progress evaluation. The project teaching of English gives students valuable experience in complex task solving as to complete the project a deliberate self-motivated learning activity, goal-setting and collaboration are necessary.

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23. <https://www.visualthesaurus.com/>

INTERNET RESOURCES FOR BUILDING A PERSONAL LEARNING NETWORK AND TEACHING ENGLISH. BASED ON THE EXPERIENCE OF PROVIDING TRAINING ON FURTHER PROFESSIONAL DEVELOPMENT FOR SCHOOL TEACHERS OF THE ENGLISH LANGUAGE

Korenkova, M. M.

National Research University Higher School of Economics Nizhniy Novgorod

The aim of this paper is to provide a review of internet resources for teachers of the English language and to help them navigate through them with the purpose of building a personal learning network and using these resources in their teaching work.

Keywords: multimedia, personal learning network, personal development, classroom environment

Multimedia – curse or blessing?

A customer called the Canon help desk with a problem with her printer.

Technical support: Are you running it under Windows?

Customer: 'No, my desk is next to the door, but that is a good point. The man sitting in the cubicle next to me is under a window, and his printer is working fine.'

The level of computer literacy could be defined as high as how funny these kinds of jokes seem to be for a person. However in spite of the fact that computers have become an inseparable part of our everyday and professional life, the modern volume of information exceeds our ability to navigate through it skillfully enough.

The methods of teaching in general and teaching languages in particular have changed greatly. It is important to create a linguistic environment with all possible means available for a modern teacher. We can't escape from IT penetration into teaching processes. The teacher as well as his student lives in the information society, and it is important for him not only to master the methods of obtaining, processing and storing information, but above all he must learn to use information and information technologies to sustain and upgrade his professional potential and improve the quality of the teaching process.

It is especially important for the teacher of the English language to know about and use the opportunities of the Internet for his professional development, because such a teacher

possesses a very important tool – the knowledge of the English language, since the majority of the online materials is in English.

In recent time Web 2.0 found its wide application in teaching foreign languages. The term of Web 2.0 is used to define projects and services that are being actively developed and improved by users themselves: blogs, wikis, social networks and so on. Web 2.0 is a complex approach to organizing, providing, and supporting Web-resources. It is an interactive process of accumulating information which differs greatly from Web.1.0 technology – where there is a one way flow of information. Transition from Web 1.0 to Web 2.0 can be described as the progress from a personal page to a blog, from a mere publication of the material to its active discussion. How is it all connected with teaching? Directly. All these new technologies have opened for us an access to a very wide choice of resources. Web 2.0 – is a technology that provides us with the opportunity to collectively present, obtain and exchange information. Thousands of teachers exchange their experience, achievements, failures, encouragement and constructive criticism.

But on the other hand there is a danger to get lost in this informational ocean, come across nonprofessionalism, unqualified recommendations or advice, which doesn't really work in practice. You can spend nights wandering through links and sites with the help of searching engines like Google and Yandex and not to find anything useful. The aim of this publication is to highlight reliable resources that have been tested by the teaching society, which provide high quality material that is worth teachers' attention from the point of view of being used in the classroom as well as for personal professional development.

Internet resources for teaching the English language.

The means of multimedia allow putting into practice the principle of visualization and creating the linguistic environment close to the authentic one in the classroom at a high quality level. This writing has a practical aim to provide teachers with reliable teaching sources of the Internet that is why the place and the importance of the multimedia use in the classroom will be only briefly discussed. Videos and podcasts are irreplaceable when practicing pronunciation, speaking, listening and body language. Internet news video resources can be used as a warm up activities at the beginning of the lesson. Another advantage of using the Internet at the lesson is when the teacher works with texts. It is especially acute since there are many sites nowadays that have been developed to support the existing textbooks with online tasks to the texts contained in these textbooks. Vocabulary and grammatical online exercises can be given as a part of homework in order to consolidate the knowledge provided at the lesson. Videos at the lesson can be also used as a basis for a discussion platform in pair work or group discussions.

The list of the sites with useful teaching resources is as follows:

<http://www.visualthesaurus.com/vocabgrabber> - a site for working with vocabulary;
<http://www.multimedia-english.com> – a collection of videos, presentations and songs, the majority of which have tapescripts and tasks;
<http://www.real-english.com> – topical video lessons of the English language;
<http://www.teachers.tv> – educational videos;
<http://multitrans.ru> - online dictionary;
<http://www.elllo.org> – a collection of videos with text support and tasks;
<http://www.bbc.co.uk/worldservice/learningenglish> - fragments of lessons on different topics developed by BBC, audio materials with text support;
<http://www.teachertube.com> – educational programs;
<http://bogglesworldesl.com> – a high quality, multifunctional resource for teachers, which contains lesson plans, articles, handouts, games and so on;
<http://www.starfall.com> – English for younger learners;
<http://www.englishmedialab.com/index.html> - learning English through games.

Professional development

Internet resources give teachers an opportunity to build their own personal learning network. A teacher asks himself a question: what can I offer to my colleagues and what can my colleagues offer me? Katasonova N.V. in the frames of the webinar “Multimedia in teaching English” introduces the following formula of professional development: experience + reflection + experience exchange = professional development, where reflection is a thoughtful and responsible attitude of a teacher to his work, based on constant awareness of his activities and their results for the sake of the interests of other people. Joint exchange of the experience together with other teachers, collective drawing of conclusions, ideas exchange, solving problems together in the virtual dimension on Web 2.0 platforms can have different forms. They can be individual, such as blogging, electronic portfolios – topical or skill-oriented, collections of topical videos, subscription to educational sites, podcasts; and group - exchange of the information in common blogs, participation in professional forums, wiki-sites, social book-marking, social networks, web-conferences, webinars. creating a personal learning network teachers save time on having at hand the information and material of their specific interest which has a positive effect on their students since lesson planning becomes easier and faster. In order to give practical assistance to teacher bellow follows a list of sites that can become the basis for personal learning networks for teachers of the English language and their short description.

<http://www.classroom20.com> - a site that gives an opportunity to take part in webinars which are given by English teachers from different countries;

<http://www.etprofessional.com> - an internet journal which allows teachers to exchange new information;

<http://englishtips.org> - a site that gives reviews of new textbooks, methodology, lessons, exercises;

<http://www.britishcouncil.org/ru/russia.htm> - the site of the British council that provides access to education, scientific and creative ideas from Great Britain and to international collaboration;

<http://www.youtube.com/user/britishcouncilrus> - a collection of videos of scientific and practical seminars;

<http://scottthornbury.wordpress.com/2009/12/12/a-is-for-articles-1> - a collection of articles by methodologists and teachers.

This list can be expanded and developed, but it can be done later by each teacher who starts to surf the Net with the purpose of enriching his teaching process with online resources. This list is a sufficient guide, enough to gain the first experience of communication in the community of colleagues, to build one's own personal learning network and to improve professional development.

As it was precisely put the society now is divided not into poor and rich, but into computer literate and computer illiterate. Those teachers who belong to the first group not only have means to facilitate the teaching process, but also find respect and popularity with their students. A modern learner is an active user of the Internet, and his skills of computer technology go far beyond the frames of the technical knowledge to the level of social life skill. That is why the teacher today should be able to rip the benefits that the Internet provides not to fall behind his students and to speak with them in the same language.

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POTENTIAL AND PRACTICAL POSSIBILITIES OF HTML5 AND RELATED WEB TECHNOLOGIES FOR CREATING VIDEO-COMMUNICATING SYSTEM

Ishmukhametov, B.R.
Moscow, MIEM NRU HSE

The aim of this paper is to discover possibilities of different technologies for creating web based video-communicating system. One of the most important factors is that the system must be available on all operation systems and platforms, including mobile platforms such as iOS and Android.

Introduction

History of videoconferencing starts 23 Aug. 1962 with the first direct video conference between USA and Europe. A few years later, video conferences were commonly used by TV broadcasters.

Since this time technology has made a big step on the path of the progress. With the advent of the Internet there appeared a lot of video broadcasts through the net. Due to vanishing of Adobe Flash, the main multimedia platform of the decade, new technical solutions have appeared to create unified video communicating system, which can replace equipment of TV broadcasters just by notebook with connection to the net and web camera.

Background

Current state of the area

Today a lot of different programming products provide the chance to start your own broadcasting, but they are mostly oriented to the needs of individual consumers. However, there are no solutions for companies or universities.

Existing solutions, like Skype or Google Hangouts, do not have necessary functionality. To have access to the full range of features required in their work, TV broadcasters need to carry a huge package of different devices.

Viditory

Initially Viditory [1] platform was developed to broadcast lectures and conferences, including distributed sessions. This platform has all functionality, needed by broadcasters, but it is based on Adobe Flash technology, which is not supported by mobile platforms anymore.

For the purpose of crossplatforming, we need to investigate other technologies, which can be used to create video communicating environment.

Scope of work

The main purpose of this study is to create video communicating crossplatforming environment, which would work through the net.

Client side application sends video stream from screen and camera to the Wowza media server. Address of the streams from all of the distributors then is sent to the server side application with preview. Director can choose, which streams would be sent to the customers using commands. Thereafter, the chosen streams would be sent to the players on the customer's devices.

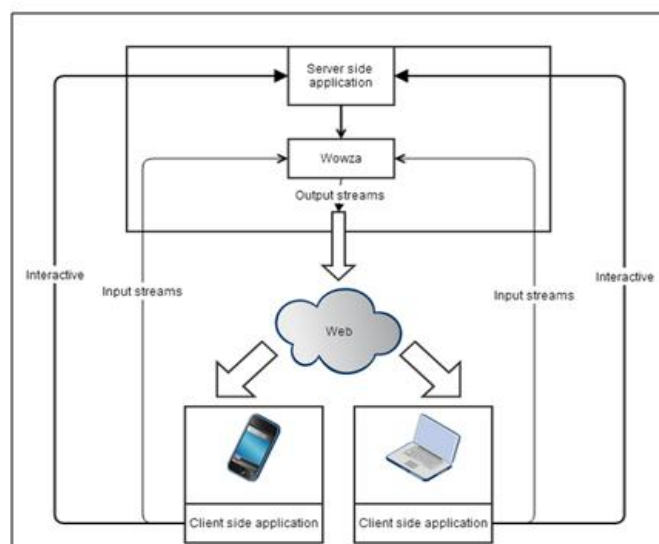


Figure 1: system's block diagram

Fields of the application

During real-time translation there can be a lot of various tasks, which can be too hard to fulfill just by the powers of one person, so there definitely should be possibility to delegate rights of the director to others. This can be performed by creating special menu in admin's account, where he can control distributing of rights between clients and make some of the directors if necessary.

In addition, there can be the need to paste titles or captions in video streams to represent delegates or start ticker with required information. Therefore, we should add the appropriate function to make it easier for directors to perform their duties and eliminate the need of external software and hardware.

During the broadcast the director is able to change the template of representation of input streams. Also, he should be able to create his own templates with built-in editor. So, in our video environment there should be the possibility to store and create templates, which can when be used by director to change form of representation of streams on the customer's devices, and this should be kept in mind during the research.

At the same time, during the event there can be the need to send a message to others. Clients may want to send a message to the global chat, to the group of people (for example just to directors) or for specific person. So, we should also investigate how current technologies allow this and what restrictions (if any) there can be.

Sometimes quality of Internet connection is far from ideal, so customers may want to change bitrate of input and output video streams. At the same time, in some situations they should be able to choose from which exactly source (for example from which web camera or microphone) client side application would take video and/or audio stream to the server. It means that we should also provide need to change quality of input and output video streams and source of output streams during the event.

After translations it is often necessary to reconstruct the event, so recording of the meeting definitely should be available on the disk or on cloud storage.

Used tools

As media server in our system we use Wowza Media Server for reason of his usability and crossplatforming. This server is used for streaming of live and on-demand video and audio over public and private networks to desktop, laptop, mobile devices, tablet computers

and other network-connected devices. The server is developed on Java and work on Windows, Linux, Mac OS X, Solaris and Unix.

Wowza Media Server can stream simultaneously to the different type of devices and clients, including Adobe Flash Player, Microsoft Silverlight player, Apple QuickTime player and iOS devices (iPhone, iPad, etc.) and 3GPP mobile phones (Android, Symbian, etc.). In addition, this server is compatible with all kind of streaming protocols: RTMP, RTMPE, RTMPS, RTMPTE, HDS, HLS, MPEG-DASH, RTSP, RTP, Smooth Streaming, MPEG2, MPEG-TS, and ICY. [2, 3, 4, 5]

For server side and client side applications, we choose Python language because of its crossplatforming and simplified work with the net. Also we chose FFmpeg libraries.

FFmpeg supports a huge amount of protocols: IETF standards (FTP, TCP, UDP, Gopher, HTTP, RTP, RTSP, SDP, SFTP (via libssh)), Apple-related protocols (HTTP Live Streaming), RealMedia-related protocols (RealMedia RTSP/RDT), Adobe-related protocols (RTMP, RTMPT (via librtmp), RTMPE (via librtmp), RTMPTE (via librtmp) and RTMPS (via librtmp)) and Microsoft-related protocols (MMS over TCP and MMS over HTTP).

Platform for real life testing is Amazon EC2 (T1 micro instance).

Amazon Elastic Compute Cloud (EC2) is a central path of Amazon's cloud services. It allows users to run their applications on virtual computers, which they rent on Amazon platform. One of his benefits is elastic web-scale computing, which allows your application scale capacity up and down depending on needs.

Micro instances provide small amount of CPU resources and allow you to increase capacity in short bursts. Applications are expected to consume just a certain amount of CPU resources in a period of time.

Conclusion

Minimal requirement to the system is its ability to broadcast to the customers some of incoming video streams and ability to choose which exactly streams would be connected to the clients. The main goal of this research is to discover the possibility of realizing cross-platform video communicating system, which imposes limitations on the range of available tools.

Wowza Media Server is the most appropriate media server with wide range of available options and functions. Also it has a huge pack of supported streaming protocols and video formats, which can be helpful for creating special separate output streams for mobile clients.

As for now, there are not any applications, which support streaming not just one composite video stream, but an amount of separated streams with video from web camera and screencast. So, we should write our own application. Most appropriate language for this purpose would be Python language because of its crossplatforming and simplified work with web.

However, to work with media on required level we should use external tools, and the FFmpeg libraries with their ability to work with huge amount of video formats, would be the most appropriate in this situation.

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EXPERIMENTS WITH LEGO MINDSTORMS NXT 2.0 ROBOT IN EDUCATIONAL PROCESS

Karchevskiy, V.P., Trufanova, M.K.

*Stakhanov Training Scientific Institute of Mining and Educational Technologies (Stakhanov)
of Ukrainian Engineering and Pedagogical Academy (Kharkov)*

In the article the authors propose to fixate the variants of robot Lego Mindstorms NXT 2.0's behavior while conducting various experiments with it. A variety of sensors and their signals processing algorithms as well as the character of the environment and its changes should be used. For the students' cognitive activity stimulation the found robot's various behavioral acts are combined in a presentation show. The show organically includes the lecturers' actions, environmental changes, robots interaction with each other and their interaction with computers and peripheral devices.

Keywords: robot, Lego, Mindstorms, sensor, program, script, creating, experiment, education, learning, presentation.

Robot is more and more often next to a man. Humanitarian purpose of a robot, as well as many other technical devices, is to relief, simplify and preserve human life. Today robot is an automatic device with anthropomorphic action that partially or completely replaces the human in life-threatening conditions, provided by relatively inaccessibility of objects in interaction or for other applying, such as training. Innovative society development is not seemed possible without robots [1].

Functions of human and robot are gradually merging and closely interweaving in the labor process during the evolution. Circumstances lead to the necessity of human's adaptation to the robot, that is learning rules of robot's behavior and treatment, developing skills of robot's operation, studying communication, safety precautions, monitoring and manual robot's control [2].

In accordance with active introduction of new technologies the need for highly qualified professionals is constantly increasing. Therefore, there is a possibility and a necessity of continuous education in the field of robotics. Computer programming with all its usefulness for mental abilities development is much inferior comparing with stand-alone device programming acting in a real environment. Just as computer games concede to real games in their usefulness.

Opportunity to touch the world of robots is a very powerful incentive for the learning of the new and formation the desire to the own creation. With external behavior appeal, robots can be meaningfully filled with interesting and challenging tasks which engineers will inevitably face with. Their decision will lead to the students' confidence development and knowledge horizons expansion [3].

Many specialists of robotics consider it to be a new pedagogical technology, directed to familiarizing students with technical creativity, skills development design, modeling and programming in the frames of educational robotics [4].

Thereby, nowadays robots are naturally used as objects of study in educational establishments.

The Ukrainian Engineering and Pedagogical Academy develops another type of robots use - robots pedagogy. The main essence of robots pedagogy lies in the fact that both in human society and among the robots operational and long-term knowledge should be distributed. It gives possibility to talk about the origins and development of "robots (including people) - lecturers for the robots". Therefore, the robots learning, their instruction and education, including robots themselves, are becoming an important trend in the development of future humans and robots community [1].

The tasks of pedagogical robotics and robots pedagogy are interconnected to a certain extent. Researches in one field make it possible to solve the problems and to improve the results in another field.

Consider a script with experiments to demonstrate the capabilities of robot Lego Mindstorms NXT 2.0, which is presented in Figure 1.

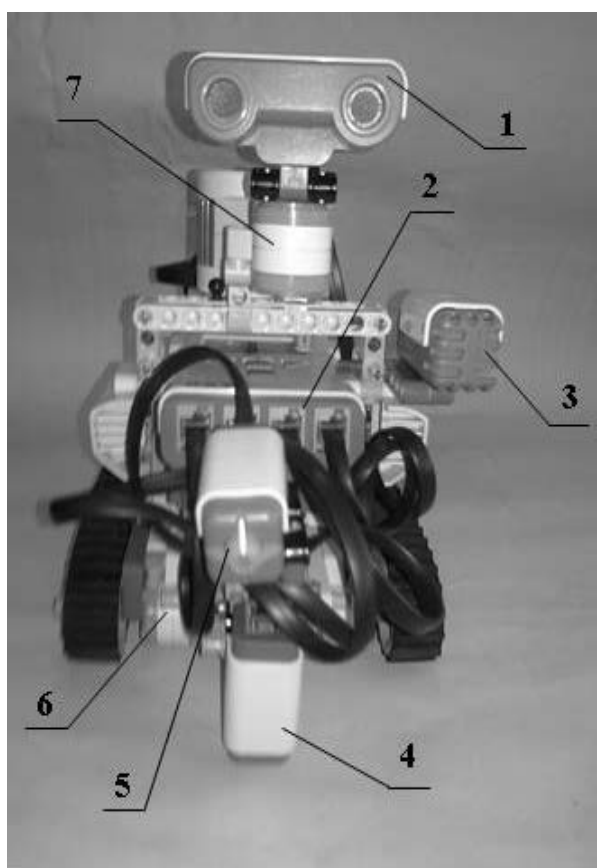


Figure 1 - Constructive version of the robot

1 - ultrasonic sensor, 2 - sensor ports, 3 - sound sensor (microphone), 4 - colour sensor, 5 - Touch sensor 6 - servomotor tachometer right track 7 - servomotor tachometer ultrasonic sensor

The above variant of robot's design comprises four types of sensors, which are shown in the Figure. The company field and computer software for the robot's movement along the line are known. The flowchart of this program is shown in Figure 2. The robot in this case needs a chromaticity sensor (position 4 in Figure 1).

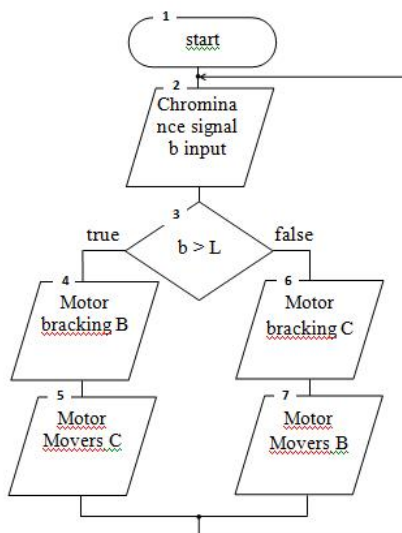


Figure 2 – The flowchart of the robot's motion along the line

Figure 3 shows the extended algorithm of robot's functioning. It contains the whole robot's movement algorithm (Fig. 2) represented by a subroutine (block 4). This modified algorithm includes additional blocks: input colour data (block 2) and unit for condition checking (block 3). The 5-8 blocks allow the robot to respond to the touch to some obstacle and to the distance to an obstacle.

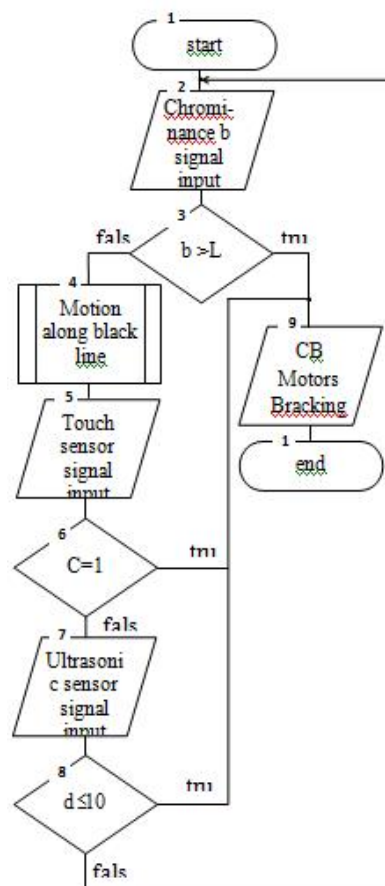


Figure 3– The flowchart of the motion along the line using the touch sensor and the ultrasonic sensor

The robot's behavior for the extended algorithm can be described as follows. The robot moves along the line as much as long, but if a sheet of red paper, for example, is put on it the robot will determine colour and stop. Further it is possible to provide the robot's reaction on the touch sensor state. Lecturer at some moment sets the barrier on the robot's path; in this case the robot will stop the engines' work by touching the obstacles.

When ultrasonic sensor is connected to the processor the robot will be able to stop, depending on the sensor configuration, at a certain distance before reaching of the barrier.

The students' interest can be caused by the development of an algorithm and a program for the robot's bypassing obstacles, located on the motion line. Before reaching the line, the robot must turn into the area bounded by the motion line, find the line again and move on along it. Direction "inside" might mean the obstacles detour on the right or left. It depends on the robot's clockwise or counterclockwise movement along the line.

Robot's motion in the maze is also interesting. It is important that for the robot's transition from the movement along the line to the next experiment - movement in the maze, it is possible to put a white sheet of paper with a line leading the robot to the maze on the company landfill. With the help of ultrasonic sensor the robot determines the distance to obstacles and seeks for possible ways out of the maze. There is a variety of options for passing the maze. One of these rules is the rule of "one hand" - to move left or right relatively to the encountered obstacle. Once detected an obstacle, the robot tries to find the way out of the maze and turns right again thereby checking the situation and making a decision. The robot moves forward, if there is no any interference on its way. The robot's design allows the ultrasonic sensor rotate and search for the barriers

The program of the robot's movement in the maze is popular. Annually robots international competitions are held. Participants face certain conditions, like criteria for selection of robots and mazes for the robot to move in. The following form of the maze shown in Figure 4 is possible.

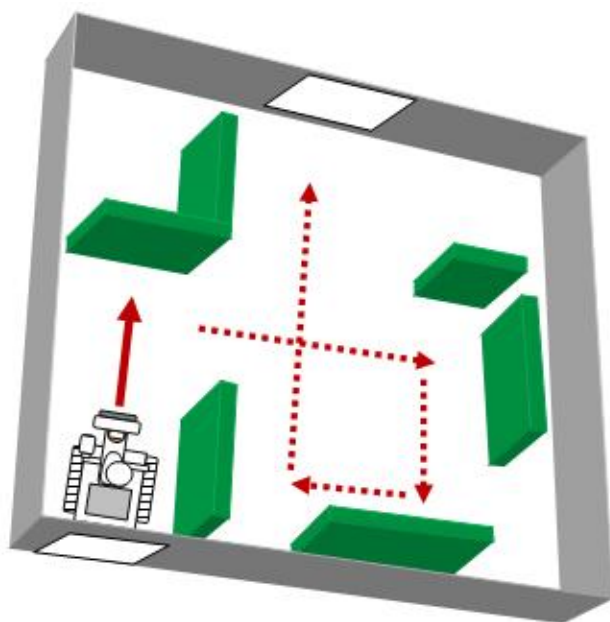


Figure 4 - Maze and robot's motion path

The presentation script execution of the robot's capabilities may be started by clapping or saying the keyword. To do this, the microphone is set on the robot (position 3 in Figure 2) and the algorithm is complemented (Fig. 3).

Thus, with the company testing field and some additional objects (colored paper, image of additional line, obstacles, etc.), it is possible to make the robot behave differently. The lecturer should be creative in scripting and organizing experimental environment, as well as in algorithmization and programming the robot's behavior (based on the available sensors signals).

For the robot presentation as a learning tool the authors are also developing scripts of robots and computers joint functioning through the channel Bluetooth. In this case, the robot can control the process of program audio and video clips implementation, surf the Internet, solve various mathematical problems, etc. Students can teach the robot to demonstrate their term papers, evaluate behavior during lectures, etc. Plans of lectures, practical classes and laboratory work may be the basis of the script for the experiment with the robot.

Conclusions

The article describes the behavior presentation script of robot Lego Mindstorms NXT 2.0 with ultrasonic sensor, color and touch sensors, microphone. It is important that the script includes actions of lecturer's preparation, modification, installation of additional facilities, changing environment in which the robot is. Implementation of similar scripts activates students' cognitive activity. Scripting is a creative and nontrivial occupation.

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THE USE OF TECHNOLOGY IN TEACHING STUDENTS METAMODELING INFORMATION TECHNOLOGY MANAGEMENT

Katasonova, G.
St. Petersburg, SPbGUKI

The article examines the training of students in higher education information technology based management metamodeling.

Keywords: information technology, training, metamodeling, technical support, software.

With the rapid development of the information society is rapidly losing relevance not only to the content of teaching information technology management (IUT) in higher professional education, but also the appropriate teaching methodology, which is closely related to the content. There is a problem saving the intellectual efforts of teachers, aimed at maintaining the relevance of the content and teaching methods in the IUT. To solve this problem you can use technology metamodeling.

Metamodeling technology in education are fairly rare. Typically, they are used in scientific fields such as mathematics, science, technology. However, in recent years began to appear some scientific papers on the application of metamodels and humanities [1,2].

Metamodeling - is general scientific research method that allows for the high level of abstraction to identify underlying patterns of diverse phenomena of nature are invariant with respect to changing environmental conditions. It has been used successfully in modern interdisciplinary research involving philology, psychology, linguistics, computer science, engineering science as a catalyst for their development in the context of the nonlinear development of the information explosion and rapid scientific and technological progress. Metamodeling underlies the theory of open systems (CBT) and object-oriented (OOP) in relation to the structure and content of the teaching of modern systems of information technology management. CBT involves use to solve these problems special open systems technology. Developed teaching methods IUT will be open systems, which should be no significant changes to interact with other systems (interoperability of open systems technology) to be able to add and edit functions (technology extensibility / scalability of open systems) have the opportunity to transfer to another environment functioning (technology mobility / portability of open systems) to be able to be easily cultivated people (technology - friendliness of open systems). Required for their application of scientific and educational research to adapt to how to apply CBT IUT. Actually it is about building learning technologies IUT based open systems technology.

Neither possible nor advisable to educate all students equally IUT. Consider the problem of learning IUT associated with the differentiation of areas of study students. Metamodeling and the PLO suggest analysis systems to isolate strata of class formation, explaining the properties and functions of objects belonging to these classes. In our case, the system is the set of students of IUT in contemporary higher education. This system, in our opinion, it is advisable to be divided into three strata. The first stratum includes training areas for future managers. For them, technology management - the basis of their future careers, as TLI - a major component of these technologies. The second stratum includes training areas for future specialists in various areas of information technology (IT), as well as mathematicians and analysts [3]. This class specialist management decisions does not accept, but it directly supports management decision making managers. The third strategy we put all other directions and specialties. They are members of the modern information society, moreover, as future professionals with higher education should be aware of IT in general and in particular the IUT. Thus, from the standpoint of metamodeling we have three strata due to training areas. From the point of view of an object-oriented approach, these strata are classes with different properties and functions. These features we include: for the first stratum - Training immediate use and management technologies available to users managers IUT, for the second stratum - training participation in management decision making process as facilitators, using more sophisticated IUT inaccessible managers directly, for the third stratum - training to ensure competence in the IUT as a member of the modern information society.

Modern management techniques fall into four organizational levels: the strategic level, the level of control, the level of knowledge and performance level. These organizational levels of service are four major types of information systems: the operational level, the system level knowledge, system - level management and the strategic level. Thus, from the standpoint of learning metamodeling IUT obtained 4 strata learning technologies IUT caused organizational levels of management. The problem arises due to these three strata strata caused areas of learning that have been identified above.

Information systems support the operational level employees - Managed Operations. These employees perform basic actions. The main purpose of information systems at this level is to answer routine questions and conduct transactions flows through the organization.

Operational level is mainly related with the students of the third category. Thus, a relationship between the strata caused by areas of training and striations caused, by organizational levels of management.

Information systems level knowledge support knowledge workers and data processors, which form two strata. Knowledge workers, as a rule, people involved in science and with academic degrees, they are able to generate new knowledge (of course, on the basis of a non-trivial processing large amounts of data), which often have such professions as engineer, doctor, lawyer and scientists and handlers data - this staff directly associated with the collection, processing and dissemination of various types of data, the generation of new knowledge is not their task. Data processors - a big part of office workers, secretaries, clerks, etc. The purpose of systems -level knowledge is to integrate new knowledge into business and help organizations manage the flow of electronic document. System level knowledge students demand more areas related to the second stratum.

Level control system designed to maintain control, management, decision-making and administrative actions middle managers who take mainly structured management decisions. For each of these solutions, there is a standard procedure for its execution. Level control system is mostly associated with students directions, belonging to the first stratum.

The strategic level - is a tool help to senior level, which shall, as a rule, the so-called unstructured management decisions. Standard procedures for the preparation and execution of such administrative decisions does not exist. This procedure must be built anew for each case. This level is classified as not fully formalized management tasks. The strategic level is mostly associated with students directions, belonging to the first strategy, more particularly, to an absolute minority of them, and more specifically, it is to those who show themselves worthy to be strategic managers.

Each of the original unstructured decisions, it is important, is unique or developed techniques for their adoption. Structured solutions, on the contrary, is a recurring and regular and have a certain procedure for their adoption, that they were not considered each time, as new. Some solutions weakly structured in such cases only part of the problem has a clear answer, provided in accordance with the procedure.

Next, consider the problems and features directly related to the IUT. They can be classified as follows. On the first level of abstraction here are the two strata: the first - especially teaching IUT associated with the use of specific hardware, the second - especially teaching IUT associated with the use of specific software.

Consider the problems and peculiarities of IUT related to hardware. Analysis of a large literature allows to conclude that managers tend to use very specific technique is not such as most of the other members. Among the reasons besides having specific functions is extremely important as image- side. Businesswoman manager can not seem in the circle in a simple, budget tie and watch. Likewise, he can not use a simple laptop, a tablet, a low-speed communications network. Speaking of tablets, which are currently at the peak of popularity in the world, we can see that on the TV screen and the front pages of newspapers and magazines the powers appear, usually with tablets direction Apple. Tablets directions Android, Windows and others they are not used. Although the direction of Android tablet functionality far superior direction Tablets Apple. A direction Windows greatly exceed directions Tablets Android. It would seem to work best are the directions Tablets Windows. Why they are not popular among business managers? The fact that such multifunctional tablets are bought by people who can not spend money on items separately for entertainment and work items. For the business appears to be uncomfortable with such a tablet in society. In addition, these multiple functions are implemented with a fairly low degree of reliability of Windows and even less reliability of Android. Tablets Apple implement the minimum number of functions, but with maximum reliability and this is just what you need when working business manager.

Businessmen do not use large and heavy plates measuring 10 and 12 inches. Such tablets - almost laptops, but they do not need a businessman, they are not comfortable. They use tablets sizes 6 - 8 inches and weighing 200 - 300 grams. If we talk about laptops, the most popular laptops managers with the following characteristics : light weight (about 1000 grams) with a medium-sized screens (not less than 13 inches), as small screens uncomfortable and harmful to the eye. Used in this exceptionally high quality with high matrix (FullHD) resolution of 1920 x 1080 and above IPS, Retina, and others. High functionality - powerful Intel i7 processor using a computer which does not have to "slow down." Such light powerful laptops now called ultrabooks . As one example of a fashion laptop sustainable in the modern business world adopted MacBook Air. This is not a Windows- laptop, it is characterized by exceptional technical reliability and the reliability of software, but the software for it much more expensive than Windows-based applications. In the U.S., laptops in this direction (true MacBook Pro) are very widespread in education. The reason - a special policy of Apple 's products in relation to the U.S. education.

Widespread netbooks - is usually low cost laptops, low weight, low functionality, small (10 inches) screen, a cheap matrix with low resolution of 1024 x 600. Due to the low cost of these devices are very popular among students, who are a significant obstacle to the installation of modern software and affect health.

For business managers also characterized by using only expensive, but also extremely fast communication networks, the use of expensive toll secure cloud services associated with obtaining business information. Data protection in these networks require specific expensive means and methods of protection.

Techniques such a level in an amount commensurate with the number of students in a modern university (not necessarily Russian) can not be in principle. The fact that education from an economic point of view - is one of the businesses in the area of service and services. A major characteristic of the business - it is profitability. Not profitable business can not exist.

If a university student comes from a very well - off family, he has, as a rule, are expensive hardware, but they are focused on entertainment and everyday household needs. What need expensive hardware to do the job manager does not know, and also university can not directly give him the money. Where is the solution to this problem? Complete solution of this problem has not.

Perhaps students from wealthy families will buy gadgets such by their parents, and install them, appropriate software will only HIGH SCHOOL provide wireless Internet access.

Partial solutions can offer. For example, here is one such an expensive laptop or tablet at the department that all teachers show students. The alternative - a theoretical study of this kind of modern technology on the basis of the Internet. Since the publication of paper books takes so much time that the relevant materials they quickly become obsolete and lose their relevance, and for a businessman to appear in public with a laptop is not the latest model - not prestigious. Requirements analysis GEF VPO to the structure and content of training managers in state and municipal government show that the image component for business managers and even more important than the business elite of the Western countries [4].

Problems and features of the IUT associated with specific software. Stratum associated with specific software is offered in turn subdivided into six strata lower level. These six strata classification associated with the respective software, which includes the following six types of software.

Thus, in an article based on metamodeling and the theory of open systems have been proposed solutions to the following problems:

1. Problems of differentiation in teaching students of different IUT professional orientation.

2. Problems identifying the link between levels of government in business and identified in differentiating groups of students.
3. Problems learning IUT related features hardware support them.

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THE APPROACH TO DEVELOPMENT OF PRIVATE ACADEMIC-STYLE MOOC

Kolbe, A.S.

Moscow, MIEM NRU HSE

Both growth of Massive Open Online Courses (MOOC) and society's needs (contributors , platforms, learners) [1] pose the problem of the university-based courses creation on a large scale. Mentioned courses should be produced in a short term. This paper aims to develop a technological style for video lectures, which gives multithreaded feed for educational content. The technology was approved during implementation of the "Computer Graphics" course. The printable version of a textbook was simultaneously developed.

Keywords: MOOC, MOOC creating , MOOC platform, video production, academic course, screencast, narration recording, Camtasia Studio.

1. Introduction

The main goals of under-developed technology are negotiability and stream-producing of video-lectures. The under-development technology aims to a streaming production implying a limited budget and resource supply, that include expected lack of technical experts.

MOOCs are usually produced by universities and private authors or commercial companies. Development of academic courses usually brings a force of experts in that area

and resources of the university for a better presentation teaching materials in MOOC format. Also, academic courses are valuable for future employment and current training and usually proved by certificates. Academic MOOCs can also be accepted for university credit charge if the certificate is verified in certification centers [2].

This paper reviews personally created courses, developed on author's initiative and placed on open platforms.

2. Analysis of existing MOOCs experience

2.1 Means of course production

Using MOOC platforms, the course can be represented in various ways [3], but there are popular tools:

- **Screencast.** Quick way to generate live video capture in a ready to view form. This is simple, speedy, visual, but also flat and boring. So, there is the risk to lose viewer's attention and concentration.
- **Talking head.** Easy production makes it popular, but, being the closest analog of real (world) lectures, it is primitive and undemonstrative. In addition, either the teacher has to speak smoothly without mistakes all the time, or a teleprompter is required. If the teacher is concentrated on speaking to camera and operating on the screen, it results in uneven lecture flow.
- **Video episodes.** E. g. experiments, outdoor video shots, guest lectures.
- **Interactive extras.** MOOC platforms usually allow multimedia and interactive content besides the main video, such as attaching files to videolectures, comment fragments of materials, interactive quizzes, etc.
- **Tool specific features.** All-inclusive tools like Camtasia, allow captioning, displaying key presses to monitor, focus on some area of screen by zooming.

These tools are usually combined during one lecture, but not in one video file.

While composing video for the courses it is important to pay attention to screen layout. It is well-known that video overlaps the presentation layer but side zones are left empty. Therefore, we can see that authors often ignore guidelines and use low-efficient software for production.

3. Solutions

Among the popular MOOC platforms, Udemy is the most suitable for the needs of the course and its features are taken into consideration when planning the course items.

Udemy guidelines[4] recommend 16:9 aspect ratio, while slide presentation often are 4:3 that results in enveloping. It is not crucial, but why all the space could not be used? Actually, we can. The solution of this problem might be found using correct layout. For example, a presentation could be placed on one side of the screen and on the other side we can place webcam record or some extra information. It is simple but it works.

In order to save time, we can use minimal set of general purpose tools like Microsoft PowerPoint or Adobe Photoshop that allow animation of objects. Thus, the projects keep compact within very few software packages.

While creating MOOCs, the developer should consider psychology of perception. First of all, we should always remember that a human cannot concentrate for a long time, even for a minute. Static picture is inexpressive. The layout should be changed regularly regarding common graphic style of the scene.

One lecture should normally expose one complete idea. The recommended length of the video is from 3 to 20 minutes, however, we believe that it is better to be about 3-7 minutes to avoid fragmentation from occidental interference into learning process.

Finally, a student would probably be outdoors or in transport watching course video on mobile devices, and switching from video presentation with narration to text document would cause him to postpone the deal.

Thus, the main means of production are:

- screencasting of presentations (related to the text of the lecture materials);
- practical examples and experiments, live-recording;
- file sharing;
- integration with books related to the course.
- the creation of layouts samples is needed to make the future work easy.
- At the same time, we have some reasons to create two-language versions of the course: Russian and English.

4. Hardware & Software

4.1 Software

Software commonly used for lecture recording is represented by a variety of free tools for screen recording, some non-linear video editors (NLE) and commercial software packages both general purpose NLE and special lecture capture software for combined recording of screencast and web-camera video with following editing in the editor included. Generally, there should not be any need to work in complicated NLE systems to produce such technically simple video products as we intend. Also, special software features are demanded in this type of video: cursor highlight, keystroke display, subtitles, contexted zooming. As a result Camtasia Studio[5] was chosen for its capabilities in capture and non-linear editing and reasonable price.

Media content needs to be produced precisely to keep global screen elements static through all videos. Multi layer composition can be derived in sets of flat images to provide sequences of frames for contextual video accompaniment. Adobe Photoshop is a standard graphic tool for this purpose, though other graphic editors (e.g. Gimp, Corel PhotoPaint) can be used regarding their limitations.

We refused to create visual background in Microsoft PowerPoint in favor of more powerful Photoshop to keep less work formats. PowerPoint could be required in case of live screencasting technology. Working with high context dependable content means that live recording is difficult and editing is anyway required.

4.2 Hardware

There is a huge gap between consumer and professional market equipment, interfaces and peripherals resulting in poor compatibility in case of mixed use. Professional hardware is potentially more efficient and reliable, but requires higher qualification and usually bulky and heavy. This is inevitable for pro-video projects but, fortunately, optional in our case. Modern computers, cameras, lightnings, microphones and other tools produce decent quality product and can be recommended, though compatibility and quality tests should be run carefully to detect possible problems before production stage.

There are minimal requirements for equipment from the platforms, such as:

- Video camera resolution should be at least 720p;
- Light for video record should be white balanced;
- Voice recording should be loud and clear.

4.3 Narration

Though the main channel of perception for humans is the vision, video-lecturers should first keep in mind the priority of sound quality: narration should be loud and clear, voice undistorted. That does not require high dynamic range vocal recordings, vice versa, sound needs to be compressed and normalized to be distinguishable on low volume and in noisy environment.

The workflow, equipment and software for recording are a challenging decision. Using built-in microphone of the laptop is highly not recommended: keyboard, fan and other sources of noise are closer, than speaker's head.

Some testing was required to choose the best set of microphone, recording device and

recording software.

	Windows Dell laptop	Mac Mini	iPad-1
Built-in mic	Noisy	n/a	Loud and clear, no hissing.
Web camera (Logitech HD)	Noisy, records all surrounding		n/a
USB Headset (Logitech)	Loud, but hoarse	Moderate, but hoarse	n/a
Audio-Technica AT8531 wired mic (lapel microphone) -- analog input	Low level	Non-standard input, not tested	n/a
XLR-2-USB cable digital input	Slightly low natural level, boosted signal hisses	Low natural level, no boost slider, amplified signal hisses	n/a
Shure mic (handheld microphone)	Low level	Non-standard input, not tested	n/a
XLR-2-USB cable digital input	Low natural level, boosted signal hisses	Low natural level, no boost slider, amplified signal hisses	n/a
Cheap voice microphone for XLR analog input	Low level	Non-standard input, not tested	n/a
XLR-2-USB cable digital input	Very poor	Very poor	n/a
iPhone headset	Microphone wheezes and hisses	Loud and clear	Loud and clear

As it is seen from the table above, professional microphones are hardly compatible with the consumer computers – while XLR connectors with balanced signal are easily converted to unbalanced microphone inputs of computer's soundcard, signal voltage remains insufficient.

Using XLR-to-USB cable-converter should have solved all quality problems, specifications allow up to 48 kHz sampling and 16 bit quantization, but real-world tests show that both consumer market USB headset and this cable give slightly hoarse sound, comparing to simple iPhone headset and built-in iPad microphone.

Thus, we have at least one solution for every platform tested:

- **Windows** laptop works with amplified lapel microphone connected to XLR-2-USB cable adapter. Slight hissing is heard, but this microphone gives rich sound with minimum external noise.

- **Mac** computer and iPad tablet work fine with iPhone headset, which is powered from host, unlike as on PC. That is why this headset's microphone fails in this case.

Windows version of Camtasia was chosen for this project. Narrations can be recorded either locally on Windows, or (either) on iPad or Mac to a cloud folder to quickly transfer the files between participants.

Workflow:

- Voice is recorded on iPad (built-in or headset microphone)
- Files are available over Wi-Fi, stored to cloud folder (Google Disk)
- Edited in Camtasia Studio for Windows.

5. Workflow

As a sample we took university course of Computer Graphics (8 weeks). Our project includes a paper book, which is being created at the same time. The following presentation illustrates the work with the first chapter of the book “The physical basics of computer graphics“. First steps were taken to produce course content:

- **Collection of source materials.** After the topics are chosen, initial materials need to be adopted to the MOOC format.

- **Structure.** The Udemy format implies to be organized by sections which include consequent lectures. Thus, the adaptation of materials also consists of cutting them to sections and to short and logical lectures.

- **Scenario** planning is a common practice in video production normally presented as a table consisting of narration text, description of media content and features of video.

- **Text**, written for a book, spoken on lecture and presented in video lecture differs in length of phrases, structure complexity and vocabulary. To make narration legible, sentences need to be cut to shorter pieces, simplified and read with pauses.

- **Demonstrations** were recorded to video to facilitate comprehension and to make the material vivid and memorable. It was a simple explanation of the experiment, so preparations did not take long, though the same animation could be done faster using computer animation. The goal here was to provide the course with diverse video material.

Thus, all media objects, imported to Camtasia Studio project, are assembled, but some time has been spent to learn how to plan the cuts of voice and video or presentation before sound recording.

Nevertheless, scenario usage could solve even these problems, because it allows to fulfill the next sequence:

1. Place a soundtrack and mark according to scenario.
2. Place video episodes (cut, delete extras, change the clip speed etc) according to scenario
3. Sync sound and video tracks.
4. Place images on the timeline. We decided to use still images instead of screencast of presentation, but change them as it is required following the sound track.
5. Add some advanced effects if it is necessary.

6. Conclusion

In this paper we presented and tested a sample technology of MOOC creation. By trial and error we found the appropriate solutions, which are based on existing experiences and developer’s guidelines, capable of generating content quickly and efficiently.

- **Software:** Camtasia Studio for Windows for capture and assembly, Adobe Photoshop for graphic content;

- **Hardware:** any PC to run Camtasia and Photoshop, iPad or Mac computer with

iPhone headset for voice recording, also possible use of lapel microphone with XLR-2-USB converter;

- Workflow: suggested workflow and formats are tested and succeeded in real life production.

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IMPLEMENTATION OF MOOC METHODS TO UNIVERSITY CLASSROOM COURSES

Korolev, D., Pavolotsky, A.
MIEM NRU HSE

Electronic support of higher education is a popular trend in distance education, but classroom studies lack information support and therefore depreciate comparing to MOOC versions, having advantages in real-life workshops and possibility of personal contact with teacher and other students.

This paper describes educational experiment in convergence of educational models conducted at MIEM NRU HSE in 2013 and the factors that made it possible and allow for wide implementation in the universities.

Keywords: MOOC, blended learning, academic course, assessment, grading system, peer review

Introduction

Blended learning historically refers to using technical resources available in universities and rare or impossible at households for personal use, such as computers (in 1960-th), data communication broadband channels (till late 1990-th), specific peripherals. But most of the learning content is represented by lectures (notes and presentations), quizzes and classroom practices (workshops) followed by homeworks and do not require any specific equipment nowadays. Furthermore, using own computers in classrooms is a growing trend known as "BYOD" (Bring Your Own Device) (S. Emery Factors for Consideration when Developing a Bring Your Own Device (BYOD) Strategy in Higher Education // University of Oregon, Applied Information Management Program. July, 2012. <http://urlid.ru/bk4i>).

MOOCs are considered to be mostly lecture and quiz format oriented and thus believed to be a poor substitution to engineering and natural sciences courses, where workshops are essential. IT-related disciplines also lack infrastructure of university laboratories in some cases. But this common case meets few but growing number of courses with offline activities.

Most of the buzz around MOOCs concerns distance learning and two main

implementations -- "lifelong learning" and earning online more credits for offline university programs, that became possible recently but still now widely. These cases are widely discussed, but in this paper we refer to the methods and tools of MOOC implemented in classroom studies and the issues arising.

There are two scenarios of implementation of the electronic support for higher education, that were tested recently:

1. Use MOOC course as a part of a classroom course and, optionally, consider the results in course grades.
2. Use the idea of MOOCs and implement the methods of network-based learning as supplemental for ordinary classroom course to engage and facilitate students to an intensive learning and keep them in-touch instantly rather than once a week, as supposed by syllabus.

Blended learning features

Teaching large groups makes personal communication with students almost impossible: few minutes after lecture and a chance to get attention of the teacher on the workshop in case of a problem are not to count. Often teachers do not bother themselves to answer emails or answer formally. Comparing to modern MOOCs with their numerous organised societies and communication infrastructure, it will not be falsely to claim that ordinary student is more often left alone with his problems and misunderstandings in his campus, than an online user living in any place of the networked world.

To get most of the technologies we should first acknowledge the following:

- Services for the course should be presented clearly, work reliably and predictably. Blogs, e-mail, chats, file and online document hostings should be transparently usable, not a quest for the student.
- Relying communication to online tools predictably results in growth of time spent on e-mails, blog posts, comments and chats. The problem is that this growth sometimes unpredictable and it is the teacher's responsibility to establish the "protocol" of communication. There are simple tools that help to reduce routine work with gathering submitted files and other tips, described in this paper.
- At least small automation skills are required. The teacher, or at least the assistant, should know the basics of data processing and representation in electronic spreadsheets. Network data collection reasonably implies almost real-time mode.
- University infrastructure, students and teacher should be technically and culturally ready to work in blended mode.
- Students' mutual communication is very important for educational process and teacher should push them to meet online on the forums and discuss arising question between each other first.

Involvement and interactivity

There should be enough **feedback activities** during the course to make it continuous in students' perception. University syllabus highly fragments student's time between a dozen of simultaneous and thus extrusive disciplines that results in very low efficiency from lecture format: every intention to digg the topic learned, or try something that was spoken about, born in student's head while one lecture, is extruded by the next lecture. Keeping students in touch between the classroom studies, that usually have weekly period, may be a challenge and here we have the first benefit from online supported course syllabus: essays, tests or any other activities may have deadlines between the classroom dates and this returns students to the topic.

Another involvement activity that also ranges the students very clearly, is taken from MOOC arsenal: it is **peer assessed essays**. This is a very delicate and powerful gear in educational mechanism and should be used carefully with all needful preparations. Peer assessed assignments consist of two phases: writing and assessment. It is very important to

give clear tasks to writers and benchmarks to peers. For this purpose it is better to split final mark to components having form and contents graded separately, highlighting desired properties in separate marks. The scale should not be just "poor to excellent", every level should have clear description so that the peers could refer and be responsible for their decisions.

Responsiveness of the teacher

The more distant is the teacher in educational process, the more important is the feel of responsiveness that a student has while studying. Well organized information support helps both the teacher and all the students to avoid writing personal e-mail correspondence to clarify common things like the terms or requirements for home tasks.

Anyway, the teacher should be involved to network communication, be of those modern people that do not make an effort to express their thoughts in text form using any of acceptable services.

The choice of services to use in the course is significant in getting things done well, not just formal. LMS, provided by the university is not always an appropriate tool and, in some cases, it would damage the whole idea being unstable and sluggish. If the university stands for quality of education, then the role of the teacher as the only person to be responsive for the course should also meet the idea that the others are the infrastructure to make teacher's work effective.

Implementation experience

New approach was implemented fall 2013 on "Computer Graphics" course: eight weeks, eight lectures, three workshops and one planned home work. This syllabus promised to make the course absolutely lightweight, leaving the majority of the audience uninvolved. At the same time the number of students grew from 30-40 to 122 and will grow to 190 next year, that leaves no chance for any individual work with students. No course project was planned and could not be done in such a short time.

Course organisation

The plan to get students involved and compete for their attention with other, more scary, courses was the following:

1. Flexible grading system gave the opportunity to choose whether to accomplish minimal set of required assignments and sum of marks could give high final mark, or do required assignments as they go, but pay more attention to creative and optional assignments such as essays, home tests and peer assessment.
2. All terms were set to binary status: same way as passenger taking a train has only two states (to "take the train" and to "be late"), all tasks had a deadline and no excuses were accepted. Deadlines were set to different dates, often other than lecture days.
3. The only face-to-face control, except the final testing, was applied on the workshops and had two goals: check the residual knowledge on the topic and prove the presence of the student in the classroom.
4. Home tests are optional and were open after the lecture till the next one to return the topic and have minimum weight in final score. There is no need to verify the authenticity of the answers, the main goal is to "check the pulse" and refresh student's memory.
5. Essays are creative works in this course and were optional. There are strict rules of proofing, academic writing and referencing and the assignment assumes a survey with analysis and systematization.
6. Peer assessment is also an optional activity, but assessment system forces students to do this job. Each student was assigned to grade three essays twice during the course.
7. Format of workshops was taken from previous years. Some examples are shown in the classroom and a more complicated task is assigned for homework, report is sent to the teacher. This format caused the most of bustle and does not fit well to mass teaching.

Assessment system

According to university rules and common sense, students should be informed on the course syllabus, requirements and assessment system. Normally it is expected that this system is just a sum of marks for different activities with coefficients:

$$S_{total} = \sum_i \alpha_i \cdot S_i, \text{ where } S \text{ stands for marks and } \alpha \text{ — coefficient.}$$

This simple formula grows up to a more complex one when specificity of assessment is considered, including motivation and work style differentiation criteria, but in general it is just a sum of all marks, where the marks have different ranges, including negative "bottom" level, some of them are blocking, others are optional, and "optional" does not mean it cannot be negative by default. Final mark is an integer number from 0 to 10. For accuracy, intermediate course marks have 100% scale (100% = "10" final mark).

Values of the intermediate activities during the course:

1. Home tests, 5 maximum 2%, optional;
2. Workshop tests, 3 maximum 5% , required;
3. Home tasks, 3 maximum 30%, required;
4. Essays, 2 maximum 20% starting from "-5"; optional, "0" if not submitted;
5. Peer grading, 2x3 -3%...+6% each; optional minding negative mark.
6. Final testing, 1 -10%...+20%, optional for excellent students.

This variety may seem too sophisticated and overrated, but it was designed for real-life cases, often met in university. Following calculations show typical behaviour models of students:

Sample 1. Swot.

Student completes all required assignments in time and pays attention to doing them well. He also does not have much time for optional assignments with unpredictable time and complexity, so we need to count this student's maximum possible mark earned for required tasks only:

1. 3 workshops tests = 15%
2. 3 home tasks = 90%
3. 6 Missing peer grading = -18%

If the resulting mark is not sufficient for excellent level (75%), final testing gives up to 20% more. Totally 87...107%. These marks are rounded arithmetically when converting to university standard 10-scale. It means, to earn maximum final mark one needs at least 95% and he has up to 12% above for errors. This is for doing just the required assignments.

Sample 2. Artist.

Student is a creative person disclaiming the formalities of old-style education model and seeking fresh air in stuffy academic environment. He wants self-expression in personal, original work, public assessment.

We will still ask this student to complete the required tasks, and even creative optional assignments contain much of formal elements, but his final score will mostly depend on other activities and formalities can be minimized in favor of content.

Optional activities (added to score):

1. 5 Home tests = 10%
2. 2 Essays = 28%
3. 6 Peer gradings = 36%

Totally +74% that could let the student concentrate on interesting tasks, also resulting in possible publications and further research.

Sample 3. Bummer

This student avoids any intellectual job, keeping afloat by doing monkey job. Writing essays or carrying out intensive home work assignments is too much for him and he balances between moderate marks and minimum activity. Home tasks and workshop tests are required, but are not excellent and we will count 50% (it is minimal allowed mark for workshop test).

Same profile could be applied to hard working students, who have no time to deal with university tasks and have to save every possible minute and minimize the risks of failure.

In this case we do not count essays, but reduce negatives and convert them to positives: grading without writing is possible. The whole picture then is:

1. 3 Workshop tests = 8%
2. 3 Home works = 45%
3. 6 Peer gradings = 36%
4. Final test = 20%

Total score = 109%.

As we can see from the models above, all kinds of students have chances to earn maximum grade and their real grade depends on their efficiency inside the model they have chosen.

From real life experiment some disbalance was understood in scoring peer grading against essay writing: peers were overweighted, writers underweighted, this will be fixed next time.

It worth to notice that the only mark set by teacher remains homework assessment, all others are either automatic or peer-graded. Peer grading system is always a subject of discussion and has its weaknesses. Coursera CEO Daphne Koller statistically proved (Daphne Koller, TED Talks <http://urlid.ru/bk43>) correlation between peer grades by students and teachers assessment, but the case we are reviewing, is specific and quantitative estimation of activities, taken before the course started was nearly correct because of taking in consideration the psychology of students.

If it is stated that a task is optional, it goes contrary the typical school model that is repeated in Russian universities.

Another typical behaviour is the fear of negative marks. It is unusual for students that work done can explicitly subtract the score. This makes student consider essays as a tricky thing even before they look carefully the grading rules, and facilitates them to do peer grading. Before we refer to negative part of essay's mark, let's see the statistics of both essays and peer grading:

Table 1. Peer grades.

122 students	Essay 1	Essay 2
Topics	12	5
Received works	28	17
Accepted works	23	12
Involvement	19%	9%
Average mark	14,2	14,1
Minimum mark (Five works, rejected for plagiarism, are not counted here, their final mark is "-5")	9,2	11,5
Maximum mark	16,4	16,7

Table 2. Peers statistics.

122 students	Peer grading 1	Peer grading 2
Total	262	271
Accepted	249	264
Average per work	10,8	22

These tables show that number of peers significantly exceeds the number of writers and this allows statistic methods to be used and it reduces the limitations of the method.

Essays grading system

Assignments include measurable values and qualitative characteristics, that can be verified with no deep introspection to the topic and need no qualification above common sense.

There are two categories and two scales in each of them:

Contents:

- Completeness (1-6). This includes
- Validity (1-6)

Form:

- Exemplatiness (1-4)
- Page proofs (1-4)

Total score: up to 20, that, starting from "-5" gives maximum 14% to total grade. Negative "bottom" is used to limit those students, who would send incomplete works to ears at least something, loading peers' time and attention. Also, this is a good warning to plagiarists, their works are graded with minimum marks. This measure is a kind of denoise filter and policy wanting to keep number of peers exceeding the number of writers.

Those students, who were scared of negative marks for their honest attempts should have paid attention to minimal values in grading system: there is no chance to get less than "4", that results in "-1%" in final scale, and this could possibly be an empty document.

Peer grading issues

Peer grading is often a subject to criticise for giving unqualified people the right to judge. But soon we will see the limits of this method implementation and reasons why it remains reliable in this case.

1. Peers have strict guidelines: the table with description of every mark in all categories. There are no "poor-excellent" labels, every cell is a description like "Sufficient references (>10, >2 foreign, but sources are not authoritative, <25% are scientific articles or books)".
2. Peers are controlled by the teacher. Teacher does not grade the essays, but his expert evaluation is needed to judge uncertain cases, that are detected statistically.
3. The number of works accepted is limited by a reasonable floor. Some measures are taken to limit junk flow and reject plagiarists. It is important that total number of works could be theoretically possible to check by the teacher or assistants using the guidelines for peers.

Here we can see why this method cannot be directly used in real MOOCs and why, at the same time, it is safe for limited, though numerous groups of students in universities. It is not fully automated in cases, when peer grades are not consentient.

How to detect faulty grades among hundreds? Every peer submission is represented by a string in a table, where we find just 4 digits and optional comments. Also, peers are asked to fill formal statistics about the work assessed, e. g. number of references and other numeric measurements to check if they have at least opened the file.

For every given work average mark from all peer grades is counted and each grade is compared. Deviation is recorded to a table for every peer assessment and highest deviations are taken to manual check.

All essays, that were assessed with high deviation among the peers, are assessed by teacher and all marks are compared to teacher's with a definite threshold of confidence interval, which was ± 1 for each of four marks. E.g. in the scale 1-6 or 1-4 and teacher's mark "3", marks 2, 3 and 4 would be accepted. If at least 50% of marks are accepted, peer submission is accepted and rated (+6%), otherwise it is rejected (-3%). It means that successful peer grades should have at least 2 of 4 marks in confidence interval, based on expert opinion.

Thus, amount of essays for teacher's assessment depends on deviation of peer grades and not on the initial quantity of submitted works.

Tools

The course was completely based on public services and was absolutely open. The following tools were used:

1. Google Blogger to provide a course site (<http://cg-2013.blogspot.ru/>)
2. Google Forms for tests and submissions
3. Google Spreadsheets for data collection, processing and representation
4. Google Disk and SlideShare to place course materials to be linked to the site.

In-group communication was not fine with Google Groups and mailing lists, students prefer social networks, specifically VKontakte. Next time this course will be based on Blogger+VKontakte groups/chats for better information support.

Conclusion

1. The main goal to separate teaching and assessment is achieved.
2. Exit questionnaire has shown that almost all students were happy with the style and tools of information support for this course, found them informative, comfortable and user-oriented comparing with university's LMS.
3. At the same time, grading system caused some confusion among a part of students, mostly from "bummers" group: they missed the point that ignoring peer job results in reduction of final score. Next time this should be presented more clear in introduction.
4. Public services are quite helpful and much more flexible and reliable than locally provided by university. Anyway, to automate processing completely some scripting is required.
5. Lack of public peer review/grading tools results in complexity of manual implementation. This time authors' names were open, normally they should be hidden.
6. Though all slides and full text were published before every lecture, full information support is better represented by MOOCs and will be delivered in the same volume: video lectures, supplementary links and reading, forum/group conversations. Also an electronic printable book and instant communication with the teacher will be provided.
7. There could be many unhappy students after rejections of submitted works. But after detailed explanations proved by links and digits their dissatisfaction turned to loyalty -- they claimed, that it was the first time they got a clear explanation of grading.

Future work

First iteration was relatively successful, but took too much time on monkey job with data processing.

Next time peer module should be automated and classroom lectures and workshops doubled with MOOC platform based video-lectures (Udemy) and printable book based on full-text lecture files.

DYNAMIC MODEL OF STUDENT'S GENERAL DIDACTIC CULTURE DIAGNOSTICS AND FORMATION

Krasnova, O.V., Meshcheryakov, A.S., Plotnikov, K.A.
Penza, Penza state university

The goal of the article is to publish the results of the team's long-term research work investigating the problems of diagnostics and formation of university student's general didactic culture on the basis of the 6 step model originating from the theory of pedagogical interaction system functioning and development. The authors compare diagnostic data of 2003-2004 and 2012-2013. The data being one of the important parameters may be considered as an indicator of inefficiency of the reform of the educational system of the Russian Federation, fallacy of directions thereof and the methods chosen.

Keywords: general didactic culture, value of education, general study skills, diagnostics, formation, components, levels, steps.

Vast experience of teachers of both secondary and higher education indicates that the percentage of students lacking the methods of study activity self-organization, adequate to higher education content and requirements, is high. This applies not just to extracurricular work, but also to motivational and tool work, to activity at laboratory and practical classes and to perception of lection material. Without said types of work and activities it is impossible to establish teacher's bilateral activity, and, accordingly, the achievement of educational goals planned by a teacher is also impossible.

Unfortunately, the official sustained and conventional, at the present time, system of teacher-student relations appears to be as follows: a teacher sometimes is unable to fulfil his/her primary function – to deliver knowledge and manage the learning process of students that have a necessary general didactic training level. Students lacking the said training are not expelled and, as a rule, do not master such skills on their own, but “lag behind” slowing down the activity of a whole group and a teacher.

University teachers practically have to fill up the said gaps which is not the function imposed on them: teaching fast note taking, picking out the significant from the material, structuring and marking out interrelations of the content, classification, speech or research planning; operation of general scientific terminology, not to mention the correction of student's incorrect spoken and written language and terms misuse.

All mentioned above requires expenditure of study time to the detriment of educational subject volume, development of methods and technologies of mastering general didactic skills, differentiation of students by the level of said skills, which means it requires practical models of diagnostics.

Guided by the knowledge of the theory of functioning and development of the pedagogical interaction system (O.V. Krasnova) [3 - 5] and by research of separate axiological (O.V. Krasnova, A.S. Meshcheryakov) and technological (O.V. Krasnova, A.I. Leshchenko) components of didactic skills in the framework of the order by the Ministry of education and science of the Russian Federation, we have established a model of general didactic culture of a personality, which appears to be a sub-system itself of the more global formation – information culture of a personality.

The model includes 6 levels of general didactic culture: *indefinite, disorganized, manipulative, pragmatic, optimal* and *autonomous*. Structural description of the axiological and the technological (or the procedural) components of the general didactic culture enables teachers and students themselves to determine the level of the analyzed education quickly and without formalities and to plan the activities to fill up the gaps corresponding with the level.

The model may be presented as a table.

Table 1

Model of student's general didactic culture diagnostics

№	Levels names	Axiological component (value of education)	Technological (procedural) component (occurrence of didactic skills)
I.	Indefinite	The student has an underdeveloped sphere of values and motivation, sometimes has a wait-and-see attitude (“I don’t know whether I need to study, worry my head off”, “bother myself or not”, “aspire or not”), behavioral component includes indifference and negation of responsibility to others up to careless attitude towards expenses and efforts of parents intended for student’s education.	Lack of interest or “passive interest” towards studying, lack of basic learning skills, in classroom activities may be often characterized as “if he/she had dropped from the moon”, lack of expressed anxiety about this fact; low grades, lack of educational structure understanding, mental activity or subjectively generated approaches in studying.
II.	Disorganized	Anxious-timid attitude to education, lack of experience of successful self-education or successful results, conflicting emotions about correlation of his/her external image (what he/she demonstrates to others) and abilities self-appraisal, fear that “I’m not going to make it”, “I don’t have the brains” etc., possibility of “envy” and “revered-admiring” attitude to excellent students and those successful in education and science.	Attempts to “do right” are not successful, lack of education self-organization knowledge and skills, discomfort and constant procrastination of studying activity start, negative grade expectation, low motivation of studying activity, “fall short” of even the middle level, avoidance of expected situations in studying as failure situations.
III.	Manipulative	Compelled, burdened or “humble” attitude to education, knowledge, lack of educational value as such, self-education is out of the question, “encounter” with education only if necessary, when forced from “above” (“I need to learn, but only what I like, everything else – only if it is impossible to except”, “Every person should as far as possible receive education at least of the parents’ level”, “Since secondary school I haven’t really enjoyed studying, just don’t want to be worse than everybody else”, “In	Diligence and application influenced by external factors, attendance of all classes, however narrow-mindedness regarding understanding of both the structure of studied subjects and the structure of activities of mastering these subjects, strong dependence on guiding and appraising activities of a teacher (need for instructions, examples, prompting); lack of individual style of self-management of study activity and any ideas hitherward.

		studying the motive power is often the ambition”).	
IV.	Pragmatic	Attitude to education as to a decent life provision means; education capacity and expenses are determined by economic and social (in terms of obtaining one or another status) expedience, education means hard work, not a pleasure, but “for the cause, to be competitive it is worth my while”, “not to be a dilettante”; as a rule, aspiration to narrow specialization and lack of broad interest in other fields (for example, “I don’t need your pedagogics”, “I don’t want to be a programmer – why do I waste my time studying programming language”, “philosophy is a talking shop” etc.)	Probability of less diligence, compensated, however, by understanding the structure of the studied subjects the studies activity itself, motivation, sufficient for satisfactory mastering of the study programs, aspire to optimize by various approaches (including borrowing the results of creative activity of others) own study activity without significant loss in results (focus on exact results diagnosed by a teacher), presence of a pragmatic goal in subject mastering, which is mostly limited to approval or no reprimand from a teacher and the nearby society, or to achievement of the level, sufficient for getting the desired employment; to such students slyness and studying fatigue are not alien.
V.	Optimal	Sincere, family- or educational institution-founded interest in studying and learning, keenness on reading, regular attendance of study and hobby groups, classes, aspire to personal communication with teachers, education for education, not for achieving any goals, diligence, motivated by cognitive interest and leading, provided sufficient base, to study success and adequate self-regulating in case of failure; aspire to cooperation in the fields of interest, love for knowledge, travel, intellectual communication.	The goal of mastering the subjects includes not just the pragmatic component, but the cognition interest as well as the desire for self-perfection, development of his/her skills together with the desire to deserve an excellent grade and approval of the people around, capability of optimal study and leisure time management, enjoy interesting communication with classmates, their and own reports, enjoy discovering one or another law validity, enjoy investigating his-/herself using obtained knowledge etc., effective work with literature, provided competent guidance the student is capable of creative conversion of material.

VI.	Autonomous	Subjectively positive attitude to education, experiencing positive emotions in cognitive activity, turn for self-consistent goal-setting, self-education problem definition and solution; life-long learning is “a personal necessity”, “one may wither without it”, vivid, creative approach to live, pronounced creativity, “eagerness” or pedantry to everyday consumption of new information, need to learn new “for the soul”.	Demonstrate exclusively unusual “own” style of study activity, express individualism in studying any topic, often prefer books and other information sources to teacher’s explanations, at times shocking the latter with intimate anticipatory knowledge, have own strategies for both studying separate sciences and reporting relations with a teacher, demonstrate calm or exalted interest in every studied subject, always find something interesting in it – insufficiently explored or controversial problems, unsuccessful experiments, biographic data or information about scientist’s personality etc., material is apprehended in structural form, turn for graphic scheme usage, search of formulas, connection between phenomena distant from each other, boldly suggest their ideas, for class and group mates and colleagues may be both role models and sources of interest and knowledge and “breakers of the educational process normal flow”, reaction to a teacher depends on their level of manners and teacher’s competences (neglectfully, with irritation or enthusiastically, in a friendly way).
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Thus, the table demonstrates the main problems to be solved by teachers regarding improvement of didactic skills of students, the level of which is practically proportional to the level of educational process effectiveness.

However, it is necessary to admit that, in practice, the axiological, reflecting the status of education as a value for a subject, and the procedural, reflecting the level of capabilities of effective studying activity, components not always coincide regarding the level of development thereof: the axiological component is often ahead of the procedural. It is proved by the general statistics (it is revealed that, in general, the axiological component is more developed than the procedural):

Table 2

General didactic culture of PSU students, 2003, 2013 гг..

	Part in component sampling (по результатам опроса преподавателей)
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Diagnostic levels	2003-2004 гг.		2012-2013 гг.	
	Axiological (value of education)	Procedural (general study skills)	Axiological (value of education)	Procedural (general study skills)
I	0,47%	29,15%	5,33%	6,67%
II	5,90%	23,48%	10,67%	14,67%
III	48,45%	6,88%	46,67%	48,33%
IV	23,45%	22,27%	28,33%	21,67%
V	18,17%	17,00%	6,00%	6,00%
VI	3,57%	1,21%	3,00%	2,67%

This fact also becomes apparent in the pattern of student's individual characteristics.

If we designate the level of general didactic culture with a pair of indexes (i, j), i, j = 1, 2, ..., 6, respectively designating the levels by the axiological and technological components, the most problematic from the point of view positive dynamics will be the cases, when i or j are less than 4: even highly motivated students with the developed education value, but lacking adequate general didactic base from the secondary school experience, as a rule, have difficulties, and the work with them is not always successful. The experience of forming activity with students, demonstrating such features, proves objective impossibility of improvement of the general didactic culture to the level, required by a university: their skills and belief systems (as a rule, infantile) are insufficient for their flexible transformation in the course of university studies. (Table 2 also demonstrates that in time, due to inefficient educational system reformation, known to us, the situation with general didactic skills of students and pupils has become worse, and teachers from time to time have to work with students that frankly do not meet the corresponding university level requirements. Recent and widespread example – a complaint from a mathematics teacher: "1. I had a graduate 2 years ago. She COULD NOT understand the textbook necessary for her diploma work writing, when she read HERSELF. When I read the said text for her with expression and pauses without special explanations, she understood it quite WELL. WHAT WAS IT?" 2. My students. I give a lecture (3rd year course) and say: "Let's make some lecture notes and mark the key information. For example, in the definition you need to single out the DEFINED notion and the one that helps us to define it. ONLY TWO-THREE STUDENT WERE ABLE TO SUCCEED.")

However, the suggested model allows to determine general target characteristics in the activity of improvement of general didactic culture of students of each diagnostic level.

Table 3

Formation of general didactic culture: objectives for each stage

Stages	Axiological component (value of education)	Technological (procedural) component (display of didactic skills)
I→II	Propaganda of education as a value in the modern world; lectures, discussions, possibly, about the life of remarkable people, about educational success of people with disabilities. Main objective is to overcome indifference	Work with student of this level, according to researchers (A.I. Leshchenko, 2003), is pointless, since such students feature omission relating to sensitive period of personality's cognitive sphere formation (preschool and school age), that may not be made up pedagogically.
II→III	Main objective is to overcome lack of self-confidence and fear of difficulties,	Need to make a student believe in his/her strength by introducing him/her into such

	fear of educational process being beyond concrete subject's strength.	study activity where he/she could achieve success, formation of basic study skills; forms – individual and group practice accompanied with instruction.
III→IV	Presenting education as “a tangible asset” and “an intangible asset”, as an instrument of obtaining a status, lameness of human life content without education, researching of education and scholarship problem abroad; developing a strategy of one's life and determining the place of education therein.	Individual and group work on testing of various methods of study labour, joint analysis and subjective estimation of the effectiveness thereof; training of the developed skills; studying the structure of study activity, contemporary ideas on goals and paradigms (technological and searching) of studying, estimation of one's subjectivity level in studying.
IV→V	Necessity to turn the attitude towards education to the humanistic stream, in the context of the interest in life, interest of others in one's personality, to personality's self-actualization, creative events and work form at the classes, staging, self-educating programs competitions etc.	Practical development of individual strategies of study activity self-management, improvement of one's own model of study activity together with a teacher, individual consultation, conferences, group methods of intellectual activity activation.
V→VI	Vivid creative intercourse between students and teachers, meetings with scientists, main method is by personal example of a teacher, parents, traditions, established in families, school, university.	Focus on creative approach to studying-cognitive activity, encouragement and promotion of any displays of creativity, studying the styles of cognitive activity of famous scientists, studying the literature on scientific creativity etc. However, in order to transfer to the autonomous level the pedagogical effect is insufficient: here of great importance are the preconditions of the family education as well as the heredity.

Formative interactions on the problem usually reveal at least 12,5% (not less than) of students “not responding” to positive influence. Moreover, this group is not uniform. According to the 6 step mechanism of psychological-pedagogical systems formation, these are the so called stalemate cases of goal hypertrophy and goal hypotrophy. They may take place due to objective reasons relating to either negative former experience or lack of pedagogical influence, affecting student's personality structure, or relating to teacher's actions inappropriateness. Such abnormal situations as well as the 6 “normal” levels have an explanation from the point of view of the motive factors of the 6 step mechanism of pedagogical phenomena development [3]. Their functional features are as follows:

Table 4

Abnormal levels of personality's general didactic skills development

Level name	Axiological component (value of education)	Technological (procedural) component (display of didactic skills)
Goal hypotrophy	Value of education is nor formed under pedagogical influence over a	Student demonstrates “no advance” didactically, provided sufficient

	long period of time (more than 5 months), education is not a value, but an unpleasant period of life that everyone must pass;	teacher's efforts, does not consider the formation of the independent style of study activity self-management necessary, adapts to a teacher against the background of low interest in studying on the whole, does not implement knowledge in self-management practice.
Goal hypertrophy	Value of education is above all (communication, love, family etc.) propagates it any time anywhere, hypertrophic reaction to any study task, aspire to obtain second and third higher education, to self-education in all sorts of fields.	Fixation on “inventing” the effective study with prejudice to the content of the studied subject, the attitude towards any study is “How to learn easier?”, and shares his/her inventions with others, promotes and stands up for implementation thereof into everyday practice.

The experience shows that the correction of “the warp” of students belonging to the “goal hypertrophy” level may be effective if the university is capable to provide psychological aid to such students.

However, tables 3 and 4 prove that the improvement student's general didactic culture from level lower than IV should not and not supposed to be a university teacher's objective. In this connection there is a natural conclusion - the university entrants with low level of general didactic culture should not become the students of higher education institutions due to the objective impossibility for them to obtain full-fledged higher education. It means that the problem leave the pool of teacher's problems and enters the pool of estimation and selection of entrant's general didactic preparedness. Therefore it is clear that the development of the system of such selection is reasonable. The suggested model may serve as a base and be introduced in any form – interview, test, creative written work etc.

Thus, there is no doubt that the general didactic culture of students, being a considerable characteristic of a subject in education, should be taken into account and provide the required educational process quality, not being an inhibitive factor. Besides that, the educational process will not be effective without clear differentiation of university functions regarding the development of general didactic culture of students from functions of other educational institutions. The suggested model may serve as a base in development and solution of the announced problem.

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LEARNING MANAGEMENT SYSTEM LMS IN MATHEMATICAL UNIVERSITY COURSES

Kuzmina, L.I.

National Research University Higher School of Economics

Learning Management System LMS allows upgrading the educational process at the university, to intensify the independent work of students and increase their interest in the

results of ongoing work. The possibilities of using LMS are considered on the example of teaching calculus at the Higher School of Economics. A number of outstanding technical and methodological issues is discussed.

Keywords: Learning Management System, LMS, educational process, students' independent work, calculus.

Increase of efficiency of the educational process is one of the major problems of modern education. Use of Internet technologies in education allows improving the quality of teaching. Electronic learning systems help to organize the students' work with educational material, to provide methodical support of academic disciplines, quickly check the level of learning and adjust it if necessary [1].

New technologies are applied naturally in teaching "young" newly formed disciplines directly related to computers and computer science. The use of Internet technology in the "old" disciplines requires considerable effort. Mathematics - one of the most important basic discipline for engineering and economic profiles of students - has a long tradition of teaching. For centuries it would seem the content of mathematical disciplines and methods of their teaching remained unchanged. Classical textbooks and problem books are reprinted without variation for decades. The task of the student is to listen to lectures, to solve problems in practical classes or seminars, then to pass a test or exam. The task of the teacher is to lecture, to analyze a set of tasks in practical classes and to test or exam. Thus, the results of training traditionally are evaluated after the end of teaching the subject, when it's too late to change and correct anything. Of course there are the usual forms of current control of knowledge - control works and individual homework assignments, but they are also performed with delay, after the appropriate theme of the course is completed.

In the modern world the minimum volume of knowledge necessary for a qualified specialist, is growing constantly. New fields of knowledge and communication appear, production technologies are changing. To stay demanded in the labor market the specialist has to learn throughout all his life. The task of the university is not only to give students the necessary knowledge, but also to teach them to learn independently. With this purpose in the curriculum of all disciplines taught in Russian universities, at least half of the total volume of training hours is devoted to independent work of students. When using the old techniques of training students' individual work is often ineffective due to lack of planning and constant monitoring by the teacher. Students themselves, particularly at the junior courses, as a rule, are not able to organize their independent work reasonably. One of the effective tools of management of the educational process to increase the intensity of independent work of students is a point-rating system of knowledge evaluation. The point-rating system involves the structuring of each training course into separate parts (modules) and the regular assessment of the knowledge, skills and competences of students during the whole period of training. Assessment of student performance in the point-rating system is cumulative and is formed as the sum of points earned by a student in the discipline during the passage of the current and the interim control of knowledge, including the assessment of independent work. At the end of each module this assessment becomes an integral part in the final mark along with the examination results.

To increase the effectiveness of students' independent work it has to be constantly guided and controlled. If the teacher is offering classes in several student groups of 30 people each, it is almost impossible to do it "manually". New approaches and technologies are needed. This problem can be solved by e-learning management system LMS, designed for the development, management and dissemination of educational materials on the Internet. LMS provides the registration of students and teachers, the delivery of content and the sequencing of its study, various types of interaction between the students themselves and with teachers,

monitoring student's progress and educational statistics. With the help of LMS the teacher can provide students with individual projects and monitor their results and performance time, analyze the dynamics of students' progress and adjust the educational process. Tests for students posted on the LMS expand opportunities for independent work. The immediate results of testing allow students to self-assess their level of knowledge and to identify gaps in training. "Machine" rules of scoring the test results based on a clear unambiguous algorithm make the control system transparent and understandable to students. Another important advantage of LMS - the system enables the integration of advanced electronic forms of education and traditional classroom tuition.

Higher School of Economics uses LMS eFront as an informational and educational virtual environment. It is the platform of a new generation of LMS, including some functions of management and the creation of training materials (LCMS - Learning Content Management System). This system has been used in the academic course of calculus for the students of the faculty of Applied Mathematics MIEM HSE. Calculus was studied for one year; the course consisted of four modules. In each module students passed current tests, made individual homework, passed the colloquium, wrote a control work and then passed a final test or exam. Text of lectures and samples of all types of tasks were posted on the LMS. Homework and correction of some errors in the control work were performed as an LMS project with specified time frames. Colloquium was organized in a form of individual "case" tasks. An electronic grade book of academic achievement was also held and updated on-line. Regular e-mail correspondence with the teacher allows students to solve arising problems operatively. Communication between the students themselves on the system's forum makes it easier to understand the features of the LMS and enables them to resolve a number of issues in of calculus not resorting to the help of a teacher. Comparison of the students' leaning in the 2012/2013 academic year with the results of previous years of training in traditional form without LMS shows a significant increase in activity when performing independent work and in the current educational process as a whole.

Implementation of the electronic learning management system in mathematical disciplines faces some technical and methodical difficulties. The present version of the LMS eFront, used by the Higher school of Economics, is not equipped with the useful application Microsoft Equation Editor that allows to create and edit mathematical expressions and edit formulas, imported into the LMS from Word processor. This significantly increases the time of the development of tests and makes it almost impossible to create a complete testing system.

Now some words about the methodological problems of testing students. When solving test the student must choose one or more answers from the presented list. In more sophisticated tests the student must find the correct answer himself. In all cases, as a rule, it is necessary to solve a small problem using some formulas. And it generates complaints to the tests as a form of educational control on the part of teachers of mathematics. Math course is not limited to problem solving. Mathematics teaches logical thinking, students need to understand the essence of the theorems and be able to prove them. Is it possible to create tests for control of this aspect of the subject? It is required to develop a methodological framework and create a system of tests adequately describing the mathematical definitions, theorems and corollaries as well as their proof. This is a problem for a dedicated team of teachers and methodologists with extensive experience in teaching mathematics and with the skills to work with electronic learning system.

Here is another technical problem. While solving the most complex and abstract problems in multidimensional spaces mathematicians always use geometric images and examples in the plane and in three-dimensional space. Most of math problems can not be solved and understood by students without drawings. Unfortunately, the current version of

LMS eFront has no graphical editor for the creation and processing of simple drawings, as well as it has no modern formula editor.

I would like to hope that the technical problems will be solved and will not inhibit the implementation of an electronic management system in the educational process.

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SURVEY OF TECHNOLOGIES FOR CREATING CROSS-PLATFORM VIDEO-COMMUNICATION SYSTEM

Levitskaya, N.
Moscow, MIEM NRU HSE

The topic of the following research is the possibility of creating video-communication system using modern Web-technologies, such as HTML-5, Java Script and others. Important factor is that the system must be available on all operation systems and platforms. This means that the Flash-technology must not be used, because it can not cooperate properly with mobile devices. The easiest way to make the system cross-platform is to minimize usage of special software and organize the broadcasting fully through the Internet.

Keywords: video-communication system, broadcast, live video streaming.

Actualization

Nowadays network communication is getting to a new level. Size of transmitted data increases significantly and users tend to share with each other more and more data. Video transmission is becoming more popular, we can see it in development of video-blogs and simplification of video-import to popular Internet-sources.

Every smart phone holder is now a video-stream transmission unit, whose stream can be accepted by a media-server, previewed and distributed to other users. The aim of described video-communication system is to act like a powerful commutator that takes an amount of different live video-streams sent by users, shows theirs previews to editor and create the combined output video-stream or choose the only one input stream that will be showed to the audience.

Such communication instrument could be highly required in modern world. It is supposed to replace heavy TV-broadcasting systems in situations where high-quality signal is not needed, but quick channel-switching is important.

There are a lot of video-communication systems such as Google Hangouts, Skype, etc., but all of them do not give the user possibility to provide interactive features. Users have to be more independent and have more control over translation. Communication must be directed, editable and possible to define.

General concept of the system

Generally, the following system is a complicated commutator. It takes input live video-streams or screen captures from some devices: either mobile devices (smart phones, tablets) or classical desktops and notebooks. Figure №1 illustrates the process.

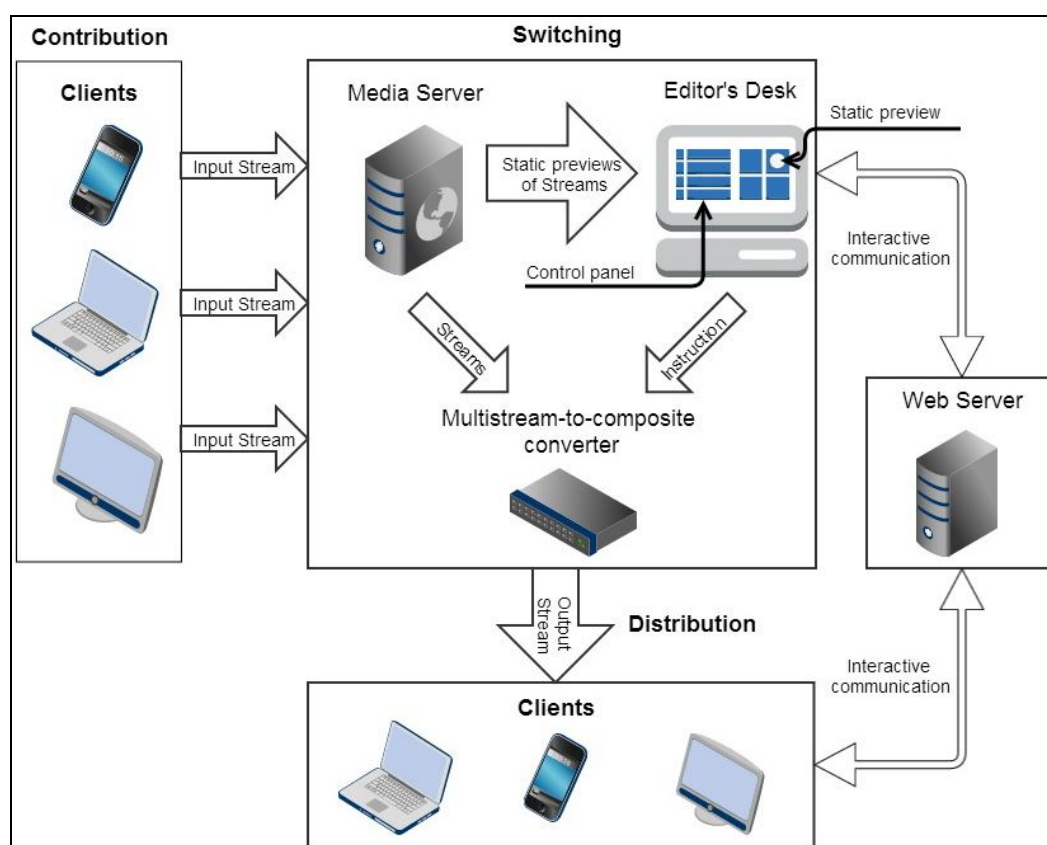


Figure 2

Input streams go directly to the media server (we experimented with Wowza Media Server) with the help of either our or third party software (for example, Wirecast). Media server transmits addresses and previews of received streams to some Internet resource (marked as Editor's Desk).

With the help of Control panel editor who works at Editor's Desk can set up broadcasting in many ways:

- to choose a local moderator who will control the translation instead of him
- to appoint a template that predesigns location of screen where streams will be input
- to add subtitles and other helpful commentaries

Editor forms the Instruction by setting the template and addresses of needed streams that will be broadcasted. Multistream-to-composite converter takes the Instruction from the resource and streams from Media server by their addresses, then converter composes it all in one output stream that will be distributed to the audience.

As we can see, users are able to communicate with the resource through the Web server. They can chat with each other, add their own templates and change transmitted picture as they like it to see. For example, they are able to resize parts of final output stream: lessen one by expanding another.

Described features are applicable to desktops and notebooks. Mobile devices do not allow to show more than one stream at the same time, because there can be only one video controller in mobile device. This fact cuts off most part of interactive communication. Users of mobile devices are more passive and can not change output stream that they have got. In addition, if local moderator uses the mobile device, he will not be able to see the stream previews in real time. Only JPEG-format screenshots, which are updated over some time, will be available for him.

There is a significant difference between the editor and local moderator. The point is that the editor sees all channels, but in static preview mode, and moderator sees the whole content in the selected channel.

Figure №2 shows the difference: the editor's work place is on the left hand, the moderator's one is on the right hand. The scheme illustrates the assignment of editing rights to moderator.

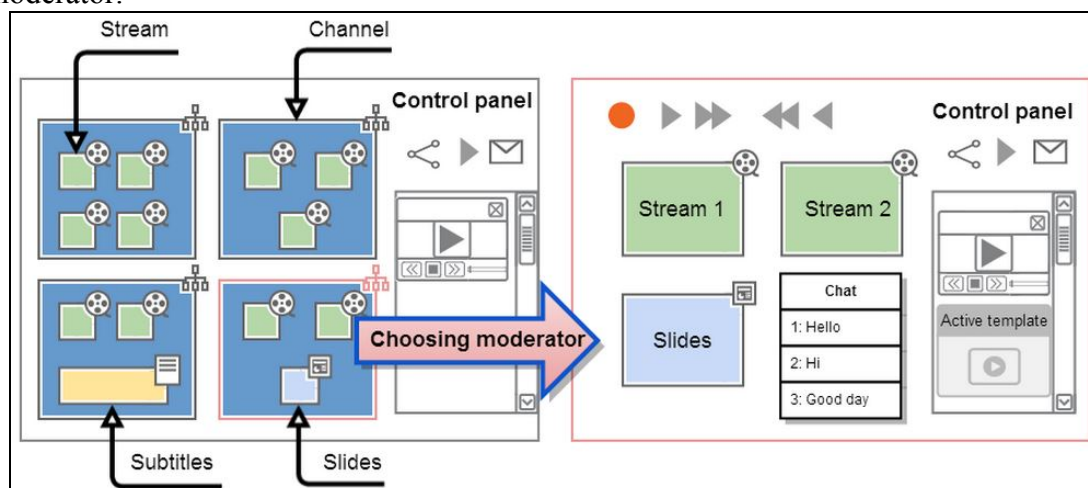


Figure 3

Work with streams

Minimum technological requirements for successful streaming are:

- application of client's device that sends stream
- streaming media server that receives stream
- web server
- multistream-to-composite converter
- player that shows final stream

Application is supposed to be developed in Python, because this programming language is appropriate for Web-development. Third party software will also suit.

Wowza Media Server is considered to play the role of streaming media server in this system. Using of Digital rights management module and Secure Sockets Layer security protocol guarantees security of transmitted data. [1]

Brief review of Wowza streaming possibilities

Wowza can stream content to IOS based devices using HTTP Live Streaming (Apple HLS) protocol; to Microsoft Silverlight cross-browser and Windows® Phone devices using Microsoft Smooth Streaming protocol. Stream has H.264 media format.

Wowza streams to players and devices that support the Real Time Streaming Protocol (RTSP), Real-time Transport Protocol (RTP), MPEG-2 Transport Stream protocol (MPEG-2 TS). Wowza supports RTP and MPEG-2 TS input and output over UDP as well as multicast. Wowza can accept live video and audio streams from encoders that support the following protocols: RTMP, RTSP/RTP, native RTP, MPEG-TS.

It is important to differentiate RTMP and RTSP protocols. RTSP is a network protocol designed for appliance in communication systems. RTSP controls streaming media servers and their media sessions between end points. Clients of media servers issue commands, such as play and pause, to contribute real-time control of playback of media files from the server. RTMP was developed and owned by Adobe for streaming media over the Internet between a Flash player and a server. The problem is that choosing RTMP protocol for streaming we can not run out of using Flash player which does not suit for mobile devices.

New international standard DASH (Dynamic Adaptive Streaming over HTTP) is also available on Wowza. DASH structure analogizes with HLS: packetized data pass to client by HTTP protocol, stream is presented in the form of packetized data and playlist contains stream metadata and references to data fragments. In HLS playlist stored in format m3u8 (extension m3u), and data fragments - in MPEG-TS (part of MPEG-2). In MPEG-DASH playlist is stored in XML, and the data fragments may have the format of MPEG-TS, and ISO BMFF (simply put, mp4). In practice, support for MPEG-TS clients is limited, so it is better to use more modern mp4. Wowza's capability to stream DASH is very useful. DASH is considered to be flexible and scalable streaming protocol that suits to all types of devices. It encodes H.264, ffmpeg, VP8 standards, that are expected to be used in described system [3]. In addition, VP9 standard is expanding now, and it will obviously be available in DASH protocol. DASH formats are applicable for multicast distribution in Multimedia Broadcast Multicast Services (MBMS). As we can see, DASH is able to support different delivery models. We considered it is suitable for the above described system. If we take video compression technologies (codecs) that are expected to be used, it worth talking about H.264, VP8 and developing VP9.

The H.264 video format has a wide application range that covers all forms of digital compressed video. Its features allow H.264 to compress video more effectively than older standards and to provide more flexibility for network media application. H.264 provides inter-picture and spatial prediction, lossless macroblock and about 20 other sets of capabilities targeting specific classes of applications (for sure, mobile devices are compatible for H.264 video streaming). This wide pattern of features helps H.264 to perform better than other standards.

VP8 codec is a competitor to H.264. VP8 video streams encodes and decodes with libvpx software library and provide slightly better quality. But comparing VP8 to H.264, StreamingMedia concluded that "H.264 has an implementation advantage, not a technology advantage" [2]. Wide implementation is a critical characteristic for the described system, so this codec is not appropriate solution for our purpose.

VP9 which has been already developed, has many improvements compared with VP8. This codec is already supported by such browsers as Google Chrome and Mozilla Firefox but it is not available for individual usage yet. To sum up, H.264 is the most appropriate video compression technology to use in our research.

The significant part of the described video communication system is the multistream-to-composite converter that presents multi stream as a composite stream, because mobile devices have limitations of amount of showed video streams. To avoid this limitation, the system should distribute to mobile client one final stream that is composed of a number of chosen streams. Final stream is predisigned by an appointed template. As we can see, incoming to the server streams must be encoded with H.264, transmitted to Wowza by DASH streaming protocol, then, if necessary, passed through multistream-to-composite converter, and, finally, distributed to customers.

Conclusion

Therefore, this study contains a description and schemes of video communication system that is available on all operation systems and platforms. The schemes illustrate the main principles of work and system management of this application. Minimal technical requirements that make commutated video translation possible were also analyzed and described.

As a result of my research, it is possible to say that broadcasted live stream must be encoded with H.264 video format and live video streaming must be conducted with DASH protocol.

Mobile platforms' limitations lead to using multistream-to-composite converter that provides creation of final composite video stream available for all types of devices.

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LOW-LEVEL API AGNOSTIC RENDERING INTERFACE FOR BRIDGING OPENGL AND DIRECT3D

Shakaev, V., Shabalina, O., Kamaev, V., *Chickerur, S.
*Volgograd, Volgograd State Technical University; *Hubli, B V Bhoomaraddi College of
Engineering and Technology*

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This article discusses viable methods and techniques for abstracting low-level graphics APIs such as OpenGL and Direct3D. To accomplish this goal, a software library is presented along with encountered challenges and implementation details. The library aims to solve some common problems occurring in cross-platform open-source graphics libraries.

Keywords: graphics library, portability, abstraction layer, OpenGL, Direct3D, C++.

Introduction

Today, software portability becomes a requirement necessity. Graphics-based applications are no exception: for instance, interactive visualization software and videogames are often released on several platforms.

Mobile videogames constitute a large portion of the market and currently are the most widespread and profitable cross-platform applications. Developers strive to write the game code once, create API agnostic content and port it to each of the target platforms. Besides, releasing the game simultaneously on multiple platforms allows game developers to increase market share.

At the present time, modern real-time graphics is based on using specialized hardware – graphics processing units (GPUs). Low-level access to the underlying graphics hardware is granted by high-performance graphics APIs slightly varying in terms of design and functionality. Currently, the most important graphics APIs for consumer-level hardware are OpenGL and Direct3D.

C and C++ are arguably the most cross-platform friendly coding languages. Therefore, this paper discusses various approaches to abstracting away low-level graphics APIs and proposes methods for doing it cleanly and efficiently in C/C++.

Considerations for Designing a Graphics Abstraction Layer

This section briefly touches techniques for creating a practical API-independent graphics abstraction. All major design decisions will hugely depend on the set of target platforms and their underlying technology. For this article, we limit our discussion to Direct3D 11 and OpenGL 4 as currently the most powerful publicly available graphics APIs for consumer-level PCs on the market. Modern graphics APIs are very similar and easy to

unify under a common interface as they are designed for the same hardware [1]. In this section we describe considerations to building an API agnostic abstraction layer over the low-level graphics APIs.

Completeness and level of abstraction. An essential goal of the graphics abstraction layer is to provide a common API-neutral interface while allowing access to all significant functionality of the underlying graphics APIs. Ideally, the user should be able to implement almost any modern rendering technique on top of the provided interface without the need to cater for API differences in the client code. Additionally, the abstraction layer should not impose its own high-level constructs and artificial constraints upon the user. For these reasons, most cross-API graphics libraries choose a fairly low level of abstraction, sometimes to the point of being a thin wrapper around the native API [2]. A cross-platform graphics library may even encapsulate the notion of a graphics material which is usually introduced in the high-level rendering code of the user application [3]. In our opinion, a good choice would be to settle on some middle ground creating an API-independent graphics interface low level enough to hide platform-specific details while not straight-jacketing the user of the library.

Usability and code organization. The graphics abstraction layer should provide a transparent and natural interface insulating the programmer from low-level details and allowing him to tersely describe drawing operations. To reduce compilation time and improve portability, the exposed graphics interface should rely on minimum dependencies (external libraries). The public header files should be compact and self-sufficient, all heavyweight platform- and API-specific headers should only be included within the abstraction layer. To avoid name clashes and to ensure clean separation between the graphics library and the client code naming conventions (e.g. project-specific prefixes) and C++ namespaces are frequently used.

Static vs. dynamic binding. The choice of the low-level graphics API could be fixed at compile-time (static binding) or selected at runtime at a certain performance cost (dynamic binding). The former is currently the preferred approach because in practice the ability to switch the rendering API on-the-fly is rarely needed — the developers can compile an executable supporting only the most performant and stable API implementation on any particular platform. Some advanced game engines often provide both options. For example, in Unreal Engine 3 the rendering hardware interface (RHI) can be either statically linked or dynamically bound depending on build configuration settings [4].

Object-oriented vs. procedural. It's possible to structure the API in an object-oriented manner (such as COM in DirectX), a plain C-style (OpenGL) or a mix of both. Object-oriented programming (OOP) and procedural approach both have their merits and drawbacks. Although for years many popular open-source graphics libraries have extensively used OOP techniques to a great success [2,4], due to various reasons [5], nowadays in programming high-performance applications object orientation is often eschewed in favor of more pragmatic and simple approaches [6]. To address the issues arising from OOP (ab)use, developers often resort to a straightforward C-style procedural API, possibly with tiny bits of "advanced" C++ features [7].

Stateless vs. stateful. The majority of open-source graphics libraries are "stateful" in that the user makes individual API calls to configure various states before performing a draw call. Although the "stateful" design has the potential advantage of reusing the same state across many rendering operations, it complicates the rendering code and may often lead to hard-to-track bugs where the previously set render state leak over to another draw call. In the "stateless" approach each submitted draw call is self-contained, independent of any previously set states and can be submitted in any order [7]. This immensely simplifies debugging and parallelization while still allowing for low-level rendering optimizations.

Interoperability. Debugging and performance measuring tools play an essential role in developing and tuning real-time graphics applications [8,9]. Many of those tools provide a nice GUI frontend for inspecting objects, viewing application call log and step-by-step debugging.

The abstract graphics interface should provide some means for supporting those tools (e.g. marking portions of the client rendering code and inserting performance counters for trapping user-defined events and calculating runtimes) with the help of vendor-specific SDKs or via API extensions.

Performance considerations. An important consideration in real-time graphics is performance. The graphics abstraction layer should incur minimal performance overhead and memory footprint compared to using the native API directly. This is achieved by employing performance-oriented programming techniques and judicious use of language features, especially in performance-sensitive parts of code (e.g. inline functions, templates, inheritance, virtual functions, exceptions) [6], avoiding expensive memory operations and off-loading heavy tasks to worker threads [10].

To increase rendering performance, it's essential to minimize or eliminate redundant state changes and avoid extraneous function calls. Render state filtering could be performed in the abstraction layer (incurring extra overhead upon each API call) and/or by the application (having the advantage of possessing high-level knowledge and possibly leading to more performance).

Summary. To sum up, we discussed various approaches to building a practical graphics abstraction layer and pointed out drawbacks and deficiencies of some popular open-source graphics libraries: many of them suffer from object-orientation abuse, support obsolete versions of graphics APIs, implement error-prone render state management based on the 'statefull' programming model, are hard or impossible to parallelize and often demonstrate insufficient level of performance. To address these problems, we implemented a cross-API graphics abstraction layer where the aforementioned issues have been partly solved.

Design and Implementation of a Graphics Abstraction Layer

In this section, we describe a Low-Level Graphics Library/Layer (LLGL), highlight the technical decisions behind it and provide some usage examples.

High-level architecture. LLGL is basically a thin and dumb wrapper over a low-level graphics API. It was largely inspired by the excellent open-source rendering library bgfx [7] and is based on ideas from [11].

LLGL can be loosely divided into two logical parts: a lean front-end and a fat back-end. The front-end provides a simple C-style procedural API and an interface for doing callbacks into the client (for memory management, I/O streams, error reporting and communication). The back-end implements low-level API- and platform-specific interactions. Normally, the back-end is organized into multiple source files for the each graphics API.

LLGL is oriented towards simplicity and efficiency allowing the compiler to inline most functions: the native API's functions get called via a slim "semi-stateless" interface. LLGL is "stateless" in that render command submission is packetized: many render states are collapsed together (to account for API differences and minimize function call overhead). However, the library doesn't sort draw calls and preserves their original submission order.

For maximum run-time efficiency LLGL uses its own data formats for loading textures (although it can load DDS files) and compiled shader code which should be prepared offline with special tools (texture compiler and shader compiler).

Resource management. LLGL operates at quite a low level of abstraction and deals with individual graphics resources: render states, render surfaces, textures, input layouts, buffers, shaders and programs. Externally, each resource object is accessed via an opaque handle — in LLGL handles are represented by small integers wrapped in C structures for type

safety. To create a resource object, the user fills in a description structure (e.g. `SamplerDescription`), passes the structure to the corresponding `Create*` function (`CreateSamplerState`) and obtains a handle to the newly created resource (`HSamplerState`). Each description structure is derived from `NamedObject` which contains the name of the resource used for debugging.

Following the Direct3D 10+ design, LLGL provides four kinds of immutable render state objects: depth-stencil, rasterizer, blend and sampler states. They control configurable (i.e. non-programmable) stages of the low-level rendering pipeline and cannot be modified after they are created. Creating render state objects is expensive and should only be done at startup. In the OpenGL backend render state blocks are emulated by packing together related state settings in structures.

LLGL treats generically all kinds of buffers: vertex, index and uniform (or constant) buffers. This approach loses the advantage of catching type-related errors like passing a buffer handle of the wrong type at compile-time, but considerably simplifies the client code. All buffer objects can be accessed by a generic buffer handle (`HBuffer`) and use the same buffer API. Moreover, modern hardware is flexible enough to permit such freedom with type-mismatch errors being caught via run-time checks and assertions (if the library is compiled in debug mode).

As in Direct3D, LLGL contains a notion of input layout (vertex formats/declarations/specifications) — a special type of graphics resource which is used for binding input-buffer data to input-assembler stage. For describing input layouts LLGL provides a hardcoded set of vertex element semantics (`Position`, `Color*`, `Normal`, `Tangent`, `Bitangent`, `TexCoord*`, `BoneIndices` and `BoneWeights`) for describing the meaning of vertex components (attributes in OpenGL parlance) and a bunch of data types each vertex element can possibly have (`Byte`, `UByte`, `Short`, `UShort`, `Half`, `Float`). However, unlike Direct3D and OpenGL, when specifying vertex structure layouts LLGL doesn't rely on user-supplied byte offsets but instead calculates them based on vertex attribute alignment and packing rules, see Listing 1.

```
VertexDescription vertexDesc;
vertexDesc.name.SetReference("AuxVertex");
vertexDesc.Begin();
vertexDesc.Add(AttributeType::Float, 3, VertexAttribute::Position, false);
vertexDesc.Add(AttributeType::Float, 2, VertexAttribute::TexCoord0, false);
vertexDesc.Add(AttributeType::UByte, 4, VertexAttribute::Color0, true);
vertexDesc.End();
HInputLayout layout = llgl::CreateInputLayout( vertexDesc );
```

Listing 1. Specifying a vertex format and creating an input layout.

Shaders. Shaders are considered to be one of the hardest things to abstract in a uniform and efficient manner across Direct3D and OpenGL [12]. Direct3D allows to freely mix and match separate shader objects, while in OpenGL shaders must be linked in a program. In creating and managing shaders, LLGL follows the OpenGL route and introduces the concepts of a shader (represents an individual shader object, e.g. vertex or pixel shader) and a high-level program (combines all shader stages used in a rendering operation). Individual shader objects are useless in isolation; they must be linked together into a program which can then be bound to the rendering pipeline.

When dealing with shader inputs, LLGL delegates high-level decisions concerning API differences (e.g. constructing proper projection matrices taking into account different clip-space conventions) to the user of the library. Unlike most open-source rendering libraries, LLGL does not rely on any built-in shader variables, does not store shader metadata at run-time and does not provide means of querying locations of shader variables. These decisions were made to keep the core runtime lean and fast, minimizing memory consumption and moving most of preparatory work into offline. The relevant shader API definitions are shown in Listing 2.

```

mxDECLARE_16BIT_HANDLE(HShader);      // handle to a shader object (e.g. vertex,
pixel)
mxDECLARE_16BIT_HANDLE(HProgram); // handle to a program object
enum EShaderType
{
    ShaderVertex,
    ShaderHull,
    ShaderDomain,
    ShaderGeometry,
    ShaderFragment,    // Pixel shader
    ShaderTypeCount,  // <= Marker. Don't use!
};
struct ProgramDescription
{
    HShader    shaders[ShaderTypeCount];
    // platform-specific data for defining binding points;
    // the data can be discarded after linking the program
    const void * bindings;    // used only by OpenGL backend
};
HShader CreateShader( EShaderType type, const void* code, UINT codeLength );
void DeleteShader( HShader handle );
HProgram CreateProgram( const ProgramDescription& pd );
void DeleteProgram( HProgram handle );

```

Listing 2. LLGL's shader API.

Initially, shaders are written in HLSL or GLSL source files. The format and layout of shader constant data (uniform variables in OpenGL terms) must be the same across both versions of shader code (and must match the corresponding definitions in the application code). To ensure matching shader inputs, for passing data to shaders we use constant buffers (uniform blocks) instead of individual shader constants, the HLSL compiler is instructed to pack matrices in column-major order, OpenGL shaders are compiled with the std140 layout and program binding points are determined during preprocessing and are fixed at run-time. An arguable decision was made for abstracting texture samplers. Direct3D separates sampler states from texture resources (i.e. in HLSL the same texture can be read with different samplers), while in OpenGL a sampler state and a texture object share the same texture unit slot. For the sake of simplicity, LLGL uses the OpenGL's approach and exposes an array of texture units where each slot can contain references to both a sampler state and a texture

resource. Therefore, in HLSL code the programmer has to manually specify binding points to ensure that the sampler and texture registers match. In LLGL, a resource object (e.g. a buffer, a texture) can be bound as a shader input via casting its handle to a generic resource handle (HResource).

For loading at run-time, shaders must be converted into an optimized API-specific form. Program objects can then be constructed from shader handles. For creating a usable program, the OpenGL backend also needs information for setting binding points. This information must be supplied by the application as a structure of type ShaderInputBindings (see Listing 3) and it is usually generated offline by the shader compiler.

The shader build process is performed using the shader compiler utility. The shader compiler transforms Direct3D shaders into device-independent bytecode, extracting and stripping shader metadata (resource names and bindings). The metadata resulting from compiling each shader is validated (resource bindings must match across all shader stages) and merged to form the program bindings. In contrast, OpenGL shaders are stored as plain GLSL source and during preprocessing they must be linked into a program for retrieving the program bindings. The obtained program bindings can later be loaded as a single memory blob and fixed-up via reflection [13]. When using übershaders, having “immutable” program bindings independently of program instances allows to conserve memory by using the same “parameter map” for all program combinations.

```

struct CBufferBinding : public CStruct
{
    String name;
    UINT8 slot; // constant buffer slot
};
struct SamplerBinding : public CStruct
{
    String name;
    UINT8 slot; // texture unit index
};
struct ShaderInputBindings : public CStruct
{
    TArray< CBufferBinding > uniforms; // uniform block bindings
    TArray< SamplerBinding > samplers; // shader sampler bindings
    UINT32 activeVertexAttributes; // enabled attributes mask
};

```

Listing 3. Structures for storing shader resource binding points.

Render commands. LLGL provides a compact rendering interface which serves as an abstract API agnostic command stream to which the user submits render operations. All submission and state setting functions take an opaque pointer to a rendering context. This would allow to easily perform multithreaded rendering in the future. When using Direct3D 11, each render context corresponds to a low-level device context (ID3D11DeviceContext) and the user can create as many of them as necessary. In OpenGL only the main context can be used.

In LLGL, there are only three submission functions: SubmitView (clears and sets render targets and viewports), SubmitBatch (passes most of the data necessary for making a

draw call) and SubmitFrame (marks the end of the current frame and returns performance counters from the last frame) as shown in Listing 4. LLGL performs moderate state filtering trying to minimize redundant state switches and the number of low-level API calls.

```
// configurable render states
void SetRasterizerState( HContext _context, HRasterizerState rasterizerState );
void SetDepthStencilState( HContext _context,
HDepthStencilState depthStencilState, UINT8 stencilReference = 0 );
void SetBlendState( HContext _context, HBlendState blendState,
const float* blendFactor = nil, UINT32 sampleMask = ~0 );

struct DrawCall
{
// shader state
HBuffer  CBs[LLGL_MAX_BOUND_UNIFORM_BUFFERS]; // constant buffers to bind
HSamplerState  Ss[LLGL_MAX_TEXTURE_UNITS]; // shader samplers to bind
HResource  SRs[LLGL_MAX_TEXTURE_UNITS]; // shader resources to bind

HProgram  program;
// geometry
HInputLayout inputLayout;
TopologyT  topology; // Topology::Enum
UINT8  _unused0;

HBuffer  VB[LLGL_MAX_VERTEX_STREAMS];
HBuffer  IB;
UINT8  b32bit;// 16 or 32-bit indices?
UINT8  _unused1;

UINT32  baseVertex; // index of the first vertex
UINT32  vertexCount;
UINT32  startIndex; // offset of the first index
UINT32  indexCount; // number of indices
};
void SubmitBatch( HContext _context, const DrawCall& batch );

void SubmitView( HContext _context, const ViewState& _view );
void SubmitFrame( FrameStats *perfStats = nil );
```

Listing 4. LLGL's submission API.

For working with profiling and debugging tools, LLGL provides three functions (Listing 5): SetMarker (sets the name and color of the current code section), PushMarker (begins a new code section) and PopMarker (restores the previously active code section).

```

void SetMarker( HContext _context, const char* name, const UINT32 rgba = ~0 );
void PushMarker( HContext _context, const char* name, const UINT32 rgba = ~0 );
void PopMarker( HContext _context );

class ScopedPerfMarker
{
    HContext m_context;
public:
    ScopedPerfMarker( HContext _context, const char* name, UINT32 rgba = ~0 )
        : m_context( _context )
    {
        llgl::PushMarker( _context, name, rgba );
    }
    ~ScopedPerfMarker()
    {
        llgl::PopMarker( m_context );
    }
};

```

Listing 5. LLGL's profiling facilities.

Summary. In this part of the article, we presented LLGL, a low-level graphics library which strives to provide a clean and efficient abstraction over Direct3D 11 and OpenGL 4. In LLGL we managed to solve some common problems occurring in cross-platform open-source graphics libraries.

Findings and Conclusion

LLGL was initially designed to be a low-level part of a game engine for teaching students 3D game programming [14], therefore, we paid particular attention to code clarity and documentation.

The presented library provides a compact interface with minimum of hardcoded functionality on top of which the user can implement his own high-level rendering code. The library proved to be easy-to-use and fairly efficient both in terms of CPU performance and memory usage.

However, the current version of the library possesses a number of limitations such as no support for many window contexts, relatively large overhead of draw call submission and render state filtering, inability to perform multi-threaded batch submission.

As the next step, we will add support for multiple rendering viewports, more texture formats, the double data type for specifying vertex attributes and some way to prevent creation of duplicate resources. In addition, we plan to develop a high-level cross-platform shader effect library for more convenient use and implement multi-threaded rendering.

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MODEL FOR SUPPORTING THE FORMATION AND OPERATION OF CURRICULUM IN THE EDUCATIONAL PROCESS

Bereza, E.O., Ignatova, I.G., Chaplygin, Y.A.
National Research University «MIET»

The article describes the basic model and the current curricula of basic educational programs NRU MIET. A brief description of the workspace of Basic Educational Programs Department within the framework of informational technological platform for supporting the realization of education in accordance with the requirements of the National Educational Standards.

Keywords: Informational technological platform; curricula; study area; pool of disciplines

Introduction

Since 2011 all Russian universities passed to the National Educational Standards of the third generation (NES-3) [1] the task is to develop the new basic educational programs (BEP). One of the requirements is to provide instructional documentation for all disciplines (modules) and also to have all of the content online or on a local network of the university. Consequently, it is needed an electronic environment of the educational process, where would be provided access to the electronic versions of discipline's educational materials. Students should have a personalized access to the subjects that are included in the curriculum under the area of study.

To automate the access for students to educational materials through the electronic curriculum in informational technological platform (ITP) NRU MIET identified two concepts of curricula - the basic curriculum (BC) and the current curriculum (CC). BC is a curriculum for educational areas that has the most common components to other curricula from the same

area of education. CC is a real reflection of students education from the starting point to the current semester. The access for educational materials is provided by CC, and students have access to the materials not only of the current semester, but to all previous semesters too.

To implement the BC and CC in the informational system of MIET there were developed models that reflect the basic characteristics (attributes) of objects in CC and BC and also the connections between other objects of the informational system.

1. Basic model of curriculum

The structure of basic curriculum is listed below. The attributes are displayed as solid lines and links to other objects are indicated by dotted lines.

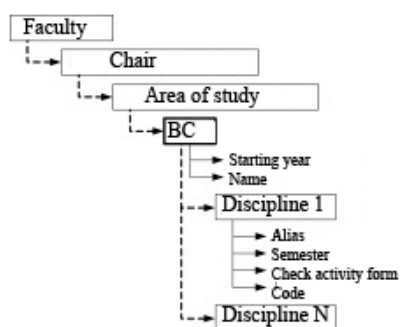


Fig.1. Structure of the BC, attributes and links

In the process of developing a model BC and subsequent implementation of this model in a software module there have been decided that for the separate area of study can be only one active BC, where starting year of action is an attribute.

Also the attribute of BC is the name that is automatically generated and based on a combination of the year (start of educational program) and Bachelor's or Master's program that is associated with BC.

Through the connection with the educational area (Bachelor's or Master's program) the link to the department and faculty is defined.

In order to avoid the noisiness of the informational flows, reducing errors and costs the direct connection to BC with the faculty, in contrast to the 1C-University [2], is not set.

Also in case of creating BC on the profile of Bachelor's or Master's program of the specific educational area, the connection with the BC and this educational area is not set too.

In 1C-University program while creating curriculum the attributes of the educational area are mandatory to fill in, but there is no connection between curriculum and department.

In this model the disciplines are the main components of a BC units and have the following attributes:

- Operational attributes:
 - study semester;
 - the form of final check;
- additional attributes that are used in the model:
 - alias;
 - code.

There are two possibilities to add disciplines to BC: the first is to add them from the directory (pool) of disciplines and the second is to add them from another BC.

The attribute of the discipline from pool has only the name that is associated with the department. Within BC discipline additionally receives all of the attributes above. The attribute's value is set for each semester discipline, it depends on the form and level of education: for Bachelor's programs the interval is from 1 to 8, the evening form of education -

from 1 to 10, for master's programs - from 1 to 4. The form of final check is relevant to Educational standards (for instance, tests, exams and etc.).

Discipline's alias is an optional attribute and it is indicated only for those disciplines that within BC should have a non-pool name. Code attribute as well as in the program GosInsp [3], is used to specify discipline to basic or optional part of BC, and determines its unique number within this part. In turn, in the discipline code, that belongs to the variable part, it is indicated that it belongs to a section of compulsory subjects, or to a section of elective courses. Additionally, in the optional discipline's code there is a logical number of groups section, where the results of the development (competencies) are similar. The particular discipline from the pool can belong to several BC. With such a possibility in accordance with particular BC it can be formed disciplines to many semesters.

If the disciplines were added from the particular BC to another the attributes of these disciplines were transferred too. Thereby, these attributes can be edited within «new» BC, without affecting their values in the initial BC.

2. The model of current curriculum from the basic educational program

The BC is not a real curriculum that students study. It is only an ideal plan for the entire educational period. For a variety of reasons in the learning process the curriculum's subjects may have a permutation of semesters, changing names and forms of the final check activity, some subjects may be replaced with similar disciplines and etc. At the same time, these changes can be unique for the different curricula's set, as well as for student groups within the same year of starting educational program.

So it is provided a mechanism to create a CC for students for each starting year of education (even for each student group, if necessary) based on the BC. At the beginning the CC is created for the first semester of study, and it is copied from the BC, and if necessary, there is an adjustment. The adjustments can be made in the following semesters too by the same method: copying disciplines from BC. Consequently, CC is a collection of disciplines that really presents the learning process of its students. Exact CC's disciplines then will get to the diploma's enclosures.

Thereby, the BC is the main source of disciplines that are involved in creating CC. Filling CC is the permanent process and the content of the CC is corresponding to the students educational process.

The attributes of the CC is:

- The year of starting educational program;
- The range of student's groups with the same CC;
- The name, that is automatically generated and consists of the starting year of education, list of student's group and area of study (Bachelor's program or Master's program) with which the CC linked through the BC.

In the process of creating and modifying CC's disciplines that are added from BC the attributes automatically receive the same values (alias, semester of study, the final check of control and code), as in the BC. But it is possible to redefine the attribute's values separately within the CC. Also in the modification process the disciplines may be added from the pool of disciplines (not a BC) or other CC of the same area of study.

By-turn the BC can be created with the CC base (e.g., based on CC that was set last year, when there have been the number of major changes that would cause changes in CC for other years of education).

3. Informational Environment for supporting the formation of BC and CC at the NRU MIET

Within the scope of the educational project process and in accordance with the requirements of the NES-3 [4], since 2013 there have been developed and rapidly progressing

an informational technological platform ODIECE (Organization of distributed information exchange in corporate environments). As a part of the platform there are workspaces for different categories of users (or entire departments of the university), including the institute of Basic Educational Programs Department (BEPD), which is developing the basic and current university curricula. Students have an access to the curriculum (CC) in their own workspace.

It is possible to work with the disciplines of pool at the workspace of BEPD (to create, to edit or delete information. Fig.2.).

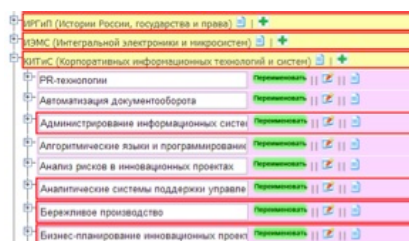


Fig.2. Interactions with pool's disciplines

Also there is a possibility to interact with BC and CC (to create, to edit or delete information. Fig.3.).

Currently, there are 100 basic curricula (45 Bachelor's programs, 55 Master's programs) and 139 current curricula (93 Bachelor's programs, 46 Master's programs).

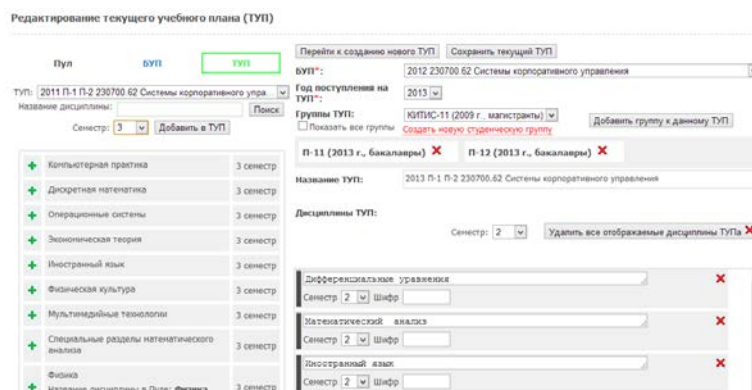


Fig.3. How to interact with BC interface

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THE AUTOMATION OF THE CHECKING STUDY RESULTS PROCESS IN ACCORDANCE WITH ELECTRONIC WORKSPACES FOR THE PARTICIPANTS

Bereza, E.O., Bogomolova, S.S., Ignatova, I.G., Koriukov, I.N.
National Research University «MIET»

In accordance with the National Educational Standards of the third generation (NES-3) that are used by all Russian universities the assessment of academic progress is determined as the current, intermediate and final certification of students. For that reasons an electronic environment is developed in NRU MIET.

Keywords: Informational technological platform: electronic workspace: student's assessment; e-journal.

In NRU MIET there is a system of monitoring and control of studying, it is named mark-rating system (MRS). One of the goals of the MRS is to promote systematic daily work, activation of classroom activity and self-study work of students during the semester, as well as increasing regularity, objectivity of testing the students knowledge and increase the teachers responsibility for the marks.

Main participants of the system of monitoring are:

- teachers who develop specific check-forms and procedures for the current and intermediate knowledge control by describing them in the structure and schedule of control events (SSCE) of the discipline and assess students' knowledge during the semester;
- students who during the semester according to SSCE perform tests and other control events to earn points and marks;
- Staff of the monitoring and reporting Dept. provides the control over the fulfilling SSCE and timely writing down points and marks by teachers, and also analyzing students progress in studies
- dean's offices, which monitor and analyze students progress within their departments, and according to the information that is received interact with teachers and students.

In the NRU MIET there is an informational technological platform (ITP) that supports the entire learning process. Also there is a subsystem that supports processes such as MRS [1]. In ITP for each category of users (teachers, students, staff and dean's offices) created their own workspace.

One of the goal of the workspace for teachers that was developed is to have the ability to create quickly and easily SSCE of disciplines(Fig. 1)[2].

Структура и календарный график контрольных мероприятий студентов группы █████ (2011 г., бакалавры) по дисциплине █████

	Учебные недели																	Сумма баллов	Сумма баллов в семестре	Балл итогового контроля					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17								
Контрольное мероприятие			КР/П				КР/П						КР/П				КР/П								
Максимальный балл			30				30						30				10						100	100	0
Минимальный балл			15				15						15				5						50	50	0

Назад к списку дисциплин... Сохранить Печать Очистить структуру и график КМ Импорт из Excel Баллы студентов...

Fig.1. SSCE module

SSCE includes weekly check events that must be attended by students during the semester. For each control check activity teacher defines the following parameters (Fig. 2):

- the week of attending;
- the title (e.g., the title of the theme, which will be checked);
- the type of check event(e.g., homework, laboratory work, test etc.);
- the range of scores from minimum to maximum point;
- the list of informational resources (IR), that student may need. As a IR can be an attached file, electronic test or reference to an external IR from the Internet

Fig.2. Creating the control event in the subsystem

When next control event is added then automatically calculates the total sum of points in the semester, and a formal validation of the correct filling SSCE is made (sum of the maximum and minimum points for all control events in the discipline of the semester must be equal to 100 and 50 points, respectively).

When SSCE is created by teacher it becomes available for inspection of Staff of the monitoring and reporting Dept in its own workspace. The workspace allows to generate automatic reports about the number of created / not created SSCE and other useful statistical information. All properly-structured and proven SSCE become available for students in their own workspace.

BM-2 (Высшей математики № 2) Осенний Узнать

Результат для кафедры BM-2 (Высшей математики № 2)

Итого нет **10** Приложений 1 из **95**
 Процент обеспеченности кафедры Приложениями 1: **89.47%**

Ошибочно заполнено **82** Приложений 1 из **85** (96.47% ошибок)

Группа	MIN	MAX	Группа	MIN	MAX
Методы математического моделирования. Специальные разделы			Статистика		
ОФ-11 (2009 г., магистранты)	-	-	ЭУ-26 (2012 г., бакалавры)	47	100
Математическое моделирование			ЭУ-22 (2012 г., бакалавры)	47	100
КФН-11 (2009 г., магистранты)	-	-	ЭУ-21 (2012 г., бакалавры)	47	100
Методы математического моделирования			ЭУ-24 (2012 г., бакалавры)	47	100
ИЭМС-11 (2009 г., магистранты)	-	-	ЭУ-25 (2012 г., бакалавры)	47	100
ИЭМС-12 (2009 г., магистранты)	-	-	ЭУ-23 (2012 г., бакалавры)	47	100
КФН-12 (2009 г., магистранты)	-	-	Специальные разделы математического анализа		
Математика			П-22 (2012 г., бакалавры)	36	100
ЭУВ-12 (2013 г., бакалавры)	-	-	П-21 (2012 г., бакалавры)	36	100
ЭУВ-13 (2013 г., бакалавры)	-	-	П-23 (2012 г., бакалавры)	36	100
Линейная алгебра			Математика (ТФКП)		
ЭУВ-12 (2013 г., бакалавры)	-	-	ЭКТ-24 (2012 г., бакалавры)	22	100
ЭУВ-13 (2013 г., бакалавры)	-	-	ЭКТ-26 (2012 г., бакалавры)	22	100
Статистика			ЭКТ-25 (2012 г., бакалавры)	22	100
ЭУВ-26 (2012 г., бакалавры)	-	-	Математика. Математический анализ		

Fig.3. Report SSCE

Thereby, the SSCE can significantly increase the effectiveness of educational process. When the SSCE is created and approved generates e-journal of disciplines automatically (Fig. 4) [2]. Teacher after each control event fill in the students scores, which are automatically available for the monitoring Dept., dean's offices and students in their workspaces.

Поиск по ФИО студентов:

№	Неделя обучения:	Тип контрольного мероприятия:	Не приступил к занятиям по истечению 4-х недель	3	7	13	16	Сумма баллов
				КР/П 1	КР/П 2	КР/П 3	КР/П 4	
		Максимальный балл	<input type="radio"/> Все приступили	30	30	30	10	100
		Минимальный балл	<input type="radio"/> Никто не приступил	15	15	15	5	50
1	██████████	Александрович	<input checked="" type="radio"/> Приступил <input type="radio"/> Не приступил	<input type="text" value="30"/>	<input type="text" value="30"/>	<input type="text" value="30"/>	<input type="text" value="10"/>	100
2	██████████	Дмитриевна	<input checked="" type="radio"/> Приступил <input type="radio"/> Не приступил	<input type="text" value="30"/>	<input type="text" value="25"/>	<input type="text" value="0"/>	<input type="text"/>	55
3	██████████	Сергеевна	<input checked="" type="radio"/> Приступил <input type="radio"/> Не приступил	<input type="text" value="30"/>	<input type="text" value="20"/>	<input type="text" value="30"/>	<input type="text"/>	80

Puc. 4. E-journal interface

Staff of the monitoring and reporting Dept. has tools in their electronic workspace to provide the periodical control of fill in the e-journals (Fig.5).

Дисциплины без оценок

Кафедра: КИТИС (Корпоративных информационных технологий и систем) Неделя: 16 Показать Сброс

Всего журналов: 27. Без оценок: 11 (40.7%)

Дисциплина	Группа
Компьютерная практика	П-21 (2012 г., бакалавры)
	П-23 (2012 г., бакалавры)
	П-22 (2012 г., бакалавры)
Разработка корпоративного портала в среде 1С	П-31 (2011 г., бакалавры)
	П-32 (2011 г., бакалавры)
Проектный практикум	П-31 (2011 г., бакалавры)
	П-32 (2011 г., бакалавры)
Мировые информационные ресурсы	П-11 (2013 г., бакалавры)
	П-12 (2013 г., бакалавры)
Информационные системы и технологии	П-31 (2011 г., бакалавры)
	П-32 (2011 г., бакалавры)
Мировые информационные ресурсы	П-13 (2013 г., бакалавры)
Информатика и программирование	П-13 (2013 г., бакалавры)
Мультимедийные технологии	П-21 (2012 г., бакалавры)
	П-23 (2012 г., бакалавры)
	П-22 (2012 г., бакалавры)

Рис. 5. The report of filled in (green color) and not filled in (red colored disciplines) e-journals

The platform allows to get a variety of different reports. So the workspace for Dean's offices can display information about the students that have not passed the check activities well (Fig. 6).

Курс	Группа	Студент	Кол-во задолженностей
2	(2012 г., бакалавры)	Павел Юрьевич	9
1	(2013 г., бакалавры)	Денис Сергеевич	9
1	(2013 г., бакалавры)	Антон Дмитриевич	9
1	(2013 г., бакалавры)	Денис Владимирович	8
3	(2011 г., бакалавры)	Сергей Васильевич	8
2	(2012 г., бакалавры)	Мария Андреевна	7
2	(2012 г., бакалавры)	Владислав Сергеевич	7
2	(2012 г., бакалавры)	Василий Юрьевич	7
2	(2012 г., бакалавры)	Тимур Рустамович	7

Fig. 6. Report about students that have not passed check activities

It can be displayed the aggregate information about the number of students with «bad» marks on the Faculty.(Fig. 7)



Красный - студенты с 3 и более задолженностями. Жёлтый - с 1-2 задолженностями. Зелёный - студенты без задолженностей.

Fig. 7. Integrated report about students

Reports in sections of departments and their disciplines enable to analyze students' performance not only for monitoring Dept. and dean's offices, but also by the departments (Fig. 8). In addition, very detailed reports are available in the context of the specific disciplines and specific student groups.

Кафедра	Дисциплина	Группа	Долгов	Количество студентов с долгами	Всего студентов в группе	Процент долгов
ЭМ	Модели, методологии и организация процесса разработки управленческих решений	П-22 (2012 г., бакалавры)		11	11	100.0
ЭМ	Модели, методологии и организация процесса разработки управленческих решений	П-23 (2012 г., бакалавры)		17	17	100.0
ЭМ	Модели, методологии и организация процесса разработки управленческих решений	П-21 (2012 г., бакалавры)		25	25	100.0
КИТИС	Программирование баз данных с помощью PL SQL	КИТИС-21 (2008 г., магистранты)		16	16	100.0
ВМ-2	Специальные разделы математического анализа	П-23 (2012 г., бакалавры)		16	17	94.1
ВМ-2	Специальные разделы математического анализа	П-22 (2012 г., бакалавры)		10	11	90.9
КИТИС	Компьютерная практика	П-23 (2012 г., бакалавры)		15	17	88.2

Fig. 8. Report for Chairs about the students and not-passed disciplines

These reports allow the dean's office and Monitoring Dept. to have the latest information about the Faculty and the University situation at large, so that it would be possible to response quickly to a variety of circumstances and make the right management decisions.

Also, in accordance with the NES-3 (requirement to provide students with the necessary resources for education), there is a separate workspace for students as a part of ITP. There are all disciplines of the curriculum and also the student's total score (Fig. 9) and all additional educational material that can be useful. Measures like this increase the transparency of the educational process and motivates students for the self-study during the semester.

Состояние по дисциплинам		Теория вероятностей и математическая статистика	
№	Дисциплина	№	Контрольные мероприятия
30	Основы маркетинга	5	Контрольная работа
29	Менеджмент	8	Контрольная работа
29	Теория вероятностей и математическая стат...	8	Посещаемость
54	Информационные системы и технологии	9	Рубежный контроль
45	Проектирование информационных систем	11	Лабораторная работа
55	Проектный практикум. Управление проектами	12	Активность
29	Базы данных	13	Лабораторная работа
90	Разработка корпоративного портала в среде 1С	15	Лабораторная работа
40	Электроника	16	Активность/Посещаемость
		17	Лабораторная работа

Fig.9. Workspace for students interface

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METHODS OF NONLINEAR DYNAMICS AND MANAGEMENT OF HIGHER EDUCATION

Petrov, L.F.

Russian Plekhanov University of Economics, National Research University Higher School of Economics

Ongoing reform of higher education in Russia is widely discussed and receives diverse, not always positive evaluation. In this paper we focus on some aspects of the reform of higher education in terms of managing a complex dynamic system.

Keywords: complex dynamic system, higher education.

Higher education institution is a complex socio-economic subsystem that operates objective regularities of complex systems. We emphasize the following main features of the behavior of complex dynamical systems [1] with respect to the analysis of management of higher education:

1. Unrecoverable uncertainties of system behavior;
2. The possibility of self-organization in a dynamic system;
3. Strong dependence on the initial conditions, which implies the impossibility of predicting the long period the exact state of the system;
4. Fuzzy relationship between control actions and reactions of the system.

Take a closer look each of these laws.

1. Uncertainty and associated elements of the chaotic behavior is inherent in the evolution of a complex system. Chaotic behavior generates new directions of development. Some of them are deadlock, but the other part realizes new direction of progress. Artificial elimination of uncertainty leads to stagnation and degradation of the system, so it eliminates the emergence of progressive development areas. These postulates are applicable to all complex systems, including the economic and social.

From the perspective of higher education unrecoverable uncertainty means the impossibility detail and formalization of the educational process beyond a certain level. For example, it is impossible to plan exactly time presentation of the material, replacing diseased teacher, discussion of relevant new information on current topics. At the same time, there are attempts to establish an excessive degree of determinism of functioning in the teaching process. For example, the introduction of standards of time writing articles, books, monographs. It is obvious that such a quantitative valuation of creative processes has little connection with real time-consuming.

It is impossible to completely abandon the planning and registration in higher education, but the level of detail cannot be overly detailed. Complex system begins to reject such influence over granular control. The realization well-known principle "Rigor ... of laws relaxed requirement of their performances" (authorship is attributed to M.E. Saltykov-Shchedrin or P.A.Viazemskii) is possible. It may appear hypertrophied effect - the system starts to reject and quite reasonable control actions. To avoid this is possible only in one way -

all control laws should be clearly limited by the level of detail in order not to "train" the system to "allergic reaction" to any control.

2. Element of the "protection" of a dynamical system from inadequate management is the self-organization. Educational system is a great example of a self-organizing system. Teacher "adapts" to the level of students preparation, their accumulated knowledge, speed of learning material. Students adapt to the teacher, the manner of presentation, their questions help the teacher to present the lesson intelligibly. And no instructions can significantly affect this self-organizing and self-regulating process. This refers to the normal learning situation where a teacher and students are synchronized common goal - to teach and to learn. The presence or absence of regulatory administrative documents has little effect on the educational process. And in this situation it is better control, which supports the principle of "do not interfere the system to self-organize."

3. The strong dependence on initial conditions (the butterfly effect), which implies the impossibility of predicting for a long period the exact state of the system in higher education corresponds to the meaninglessness of detailed planning for a relatively long time. For example, the period of postgraduate training is three or four years. Theme of the dissertation is approved at the beginning of the period of study in postgraduate school. During the period of training is very often formulation of the theme needs to be clarified or modified. Therefore, in this situation it is more logical formulate not the exact theme but the direction of research. Analogue of this situation from the standpoint of system dynamics - the senselessness of the long-term forecasts in meteorology, long quotations of financial instruments in economy, etc.

4. The complex system is characterized by fuzzy relationship between control actions and reactions of the system. J. Forrester [2] noted that "the complex systems are peculiar to specific responses - this is the reason of frequent setbacks, and failures of attempts being made to improve the behavior of the system." The same idea is perfectly formulated V.S. Chernomyrdin by famous phrase "We wanted the best, but it turned out as always." J. Forrester also notes the set of properties of complex systems: 1) intuitiveness 2) insensitive to changes of many parameters of the system, 3) resistant to administrative innovations, 4) contain points of influence in unexpected places, which are responsible for changing the balance in the system, and etc.

The practices of the higher school confirm these properties inherent to complex system.

The intuitiveness is behavior that is contrary to the intuitive idea of the system's response to the control action. An example of such behavior of the system is the public reaction to the introduction of the unified state examination. Insensitivity to change of many parameters of the system - the actual content of courses taught often slightly changes with the curriculum and strongly depends on the teacher.

The resistance to administrative innovations. Forrester notes that "Complex systems resist most administrative activities. Even in the case where the system is made considerable change its behavior often remains unchanged. The reason lies in the nature of complex systems, counter-intuitive, and their insensitivity to the parameters change." The education reform is encountered with this reaction of the complex system.

The contain points of influence in unexpected places, which are responsible for changing the balance in the system. "The complex system includes a number of points to a change in her behavior which is sensitive. Changing administrative action in one of these points puts pressure on the whole system and its behavior changes in all directions. These parameters and structural changes to which the system is sensitive do not usually self-evident. " For the higher education system such sensitive points, apparently, are the level of payment of teachers, the level of workload, the level of additional work not directly related to the educational process and the need to perform which is not apparent to the teacher. Usually it is

generated by the system management requests, plans and reports required, perhaps, for the administration, but not for the learning process.

Since 1775 the French Academy of Sciences does not consider projects *perpetuum mobile* as contrary to the fundamental physics laws. Until today, many administrative decisions accepted contrary to the fundamental laws of the operation of complex dynamic systems, including at the Higher School. Any administrative impact cannot make complex dynamic system stably operate by uncharacteristic laws. The higher school administration is the most advanced part of the control system for the realization of this fact and adaptation of administrative decisions to the objective properties of the controlled system.

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METHOD OF MAINTAINING ELEARNING SYSTEM IN THE STATE MEETS MODERN REQUIREMENTS

Polonickij, D.A.

Saratov, Saratov socio economic institute branch Russian economic university G.B. Plekhanov

The importance of maintaining information resources up to date should not be underestimated because of security and performance problems. The similarity of technological tools of software problems leads to similar ways to overcome them

Keywords: eLearning, Moodle, updating.

Software updates made when changing hardware or changing functional requirements. Typically, the updates - this is laborious and lengthy process before it perform , it is need to make a lot of fail-safe backups as system files and settings , so that in case of failure you can seamlessly restore the current state. Updating multiuser systems working in 24/7 mode, is hard, because update should be quiet and fast.

In Socio-Economic Institute REU Plekhanov in Saratov used LMS Moodle v1.9.18 as eLearning up to 2013 year. It was installed at FreeBSD server with Apache 2.2.4, PHP 5.1.24, MySQL 5.1.4. So it was not up to date and did not allow using new features. It was decided to update LMS Moodle to version 2.5, because it would be met all modern requirements. Minimal new system requirements were listed in admin panel in /Server/Environment category. It is clearly seen that updating to version 2.5 is possible from version 2.0.

LMS Moodle use institute's server with specific software. Institute has its own updating policy. For safety and reliability of the system are set only certain versions of software. So the server was installed PHP interpreter version 5.2.1 and PHP interpreter to version 5.5.3. Because PHP interpreter 5.4.* and later has not compatible with previous versions and updating needs PHP only version 5.3.*, it was decided to make new install. There was reserved disk space, data base and domain name at the server.

Data transporting has some problems. At the first is was problem of safely and clearly transporting user data. The standard way was not correct because it's should to change all users passwords. So the problem became interesting. There was developed script for LMS

Moodle 1.9.17, it created CSV file for import users in LMS Moodle 2.5.0. This is the PHP code:

```
$fp=fopen('users.txt','w');
$link=mysql_connect($h,$u,$p);
mysql_select_db($b);
mysql_query('set names utf8');
$s='select * from mdl_user';
$r=mysql_query($s);
echo "<pre>";
do{
$pr=mysql_fetch_assoc($r);
$str= $pr['id'].",".$pr['username'].",".$pr['password'].",".$pr['email'].",".$pr['firstname'].",".
$pr['lastname'].",".$pr['idnumber'].",".$pr['institution'].",".
$pr['department'].",".$pr['phone1'].",".
$pr['phone2'].",".$pr['city'].
$pr['url'].",".$pr['icq'].",".$pr['skype'].",".$pr['aim'].",".$pr['yahoo'].",".$pr['msn'].",".$pr['country'].
"\n";
echo $str;
}
while($pr);
echo "</pre>";
fclose($fp);
```

This way (to use CSV file and don't use SQL query) was really nice, because it made real all necessary operations with minimal privileging and without any ingress in data base.

Before starting of transport courses it was necessary to install all needed modules. Some of them already had new versions, but where was another that had not last, ex. Hotpot. After learning it was found that some of them work well on the new version of PHP and not so hard linking to Moodle API. For installing them it's should change in file version.php string \$module->requires = 2007101509; to \$module->requires = 2013050100 in module folder.

The second problem was transporting courses file in deferens versions of LMS. Versions of LMS are different in way of course's files storing. Files kept in server folder at ranking system in LMS Moodle version 1.9.17. Files storing in data base, which make security, licensing and ownership much better since LMS Moodle version 2.0. Text of lecture in the course had hard links to the files, so standard method of transporting was not right. It needed to update all links, so it was develops bash script, which do this task.

```
#!/bin/bash
awk '{gsub("%1", "%2", $0); print > FILENAME}' ./*
```

It was need to run this script for all course's files, because it has in parameters: old and new id course. So, after all this actions LMS Moodle is update and ready to activity.

OPTIMAL GRAPHIC LANGUAGE OF THE ENGLISH GRAMMAR

Kozlova, L.A., Trubochkina, N.K.
HSE, Moscow, Russia

The article describes the optimal graphic language of presenting and studying English grammar using information technology. Instead of sequential memorizing large blocks of text describing the rules for grammar tenses we can instantly remember simple images. A simple

language of symbols facilitates and accelerates the memorization of English grammar. Systematic tabulation of grammar rules, where each verb tense gets its finished graphic image, becomes easy to understand and quick to memorize.

Keywords: optimal graphic language, interdisciplinary study, information technology, English grammar, grammar rules, visualization, essentially-temporal processes, vocabulary and language of symbols, compression of information.

In the study of English as a foreign language it is very important to choose the right technique. There are several techniques [1-6] and the most popular are:

- **Traditional.** It relies on memorizing grammar rules, exceptions, keywords, requires mandatory compilation of stories and dialogues. This technique can be considered as fundamental, since it provides good knowledge. However, learning English with the help of this approach is a long process;
- **Alternative.** It is based on role-playing games. A disadvantage of this technique is that the knowledge is not used in practice because of being superficial. This technique is admissible if the motivation of learning English is a simple chat. Good knowledge is out of the question here. Therefore, the problem of creating new methods to accelerate and facilitate the study of English grammar without reducing the quality of knowledge has become vital. The solution was found at the intersection of English linguistics and information technology, more specifically, in multimedia (graphics + text) and computer (analysis of information) technology.

Gradual and parallel perception of information

People perceive information differently. At first reading the rules of English grammar, one reads a page of text sequentially word by word, to better understand the meaning. It can take several minutes (sequential data input). Every time it is necessary to put this knowledge into practice, people “read this information” in their minds again. The more practice, the faster playback, but still the process remains very slow.

Therefore the traditional method of learning English can be optimized with respect to time while maintaining the quality. You should replace easily formalized text rules by pictures. If the pictures are binary (computer counting system, the text in symbolic language), not only the human brain will perceive them faster. But the maximum possible formalization of the language on the computer will be possible.

Overview of symbolic languages

Symbols and symbolic languages are intermediate form between the text and graphics.

A great number of symbolic languages are known from history. They are Ancient Sumerian [7,8], ancient Egyptian [9,10] and Chinese. Each of them is supposed to relate to some object or action (Fig.1) Since the objects and actions are concrete and there are a large number of them, the formal coding will require lots of bits of information.

Modern science has also used the visualization of objects and processes, for example, a new visual programming language with a web interface Blockly [11]. The program is created by connecting blocks.

One of the main developers of this language Neil Fraser believes that the main purpose of it is "an attempt to climb to a higher level of abstraction, to deny programming caste and secrecy, to make it more natural and accessible to the widest possible range of people."

These words have their invisible, but quite clear explanation. The amount of information to store and playback is significantly less than that of textual information, where a block can be a letter, a number, a symbol or a text. So the time to understand and remember "texts" in formal visual language is reduced significantly. In mathematical logic and computer science a formal language is a set of finite words in a finite alphabet. And if it is possible to

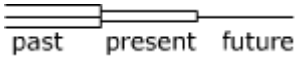



reduce the number of symbols in the alphabet without loss of understanding of the transmitted information you can get acceleration of information perception in a computer as well as ease of understanding and remembering of information by a man.

This work originated at the lessons of English grammar. It was performed at the junction of Information Technologies, English linguistics and methodology of education.

Graphic language symbols for effective representation of English grammar

To facilitate the study of the English grammar we represent a graphic language of symbols, elements of which are shown in Table 1.

Table 1. Graphic language symbols to facilitate the learning of English grammar

Elements of graphic language	Element (symbol) name	Explanations
	Timescale	The "Timeline" consists of three parts, corresponding to three time intervals: the past, present, and the future
	Event	The symbol is used to describe an event
	Process	The symbol is used to describe a certain process (an event in progress, which is still ongoing)
[]	Period	The symbols are used to fix the periods of time in which the event occurs and processes
1 2	sequential number of event or process	Number of events determining their sequence in time
	Reference	The symbol is used for the connection of events and processes, such as the description of direct speech
I, II, III	Verb forms	Verb forms symbols

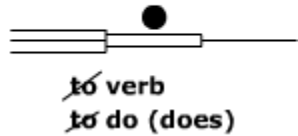
Tables 2-17 present graphic algorithms (visualization) of the British verb tenses formation.

Graphic algorithm of Present Simple (PS)

Definition of the linguist. This tense is used in speech when the action is customary, habitual, consistent, repeated, or just a fact.

Table 2. Graphic algorithm of Present Simple (PS)

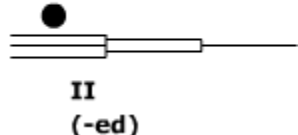
Graphic algorithm	Markers	Examples
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<p>Present Simple (PS)</p> 	every [day, morning...] always often never sometimes	They like cats. Do they like dogs? They do not like animals.	He likes dogs. Does he like cats? He does not like horses.
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Graphic algorithm of Past Simple (PsS)

Definition of the linguist. This tense is used in speech when an action was consistent, single or regularly repeated, finished in the past.

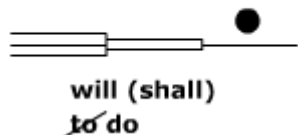
Table 3. Graphic algorithm of Past Simple (PsS)

Graphic algorithm	Markers	Examples	
<p>Past Simple (PsS)</p> 	five days ago last year (month) yesterday in 1992	They went to work. Did they go to school? They did not go home.	He went home. Did he go to work? He did not go there.

Graphic algorithm of Future Simple (FS)

Definition of the linguist. This tense is used in speech when a single, repeated or sequential action is going to happen in the future.

Table 4. Graphic algorithm of Future Simple (FS)

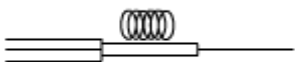
Graphic algorithm	Markers	Examples	
<p>Future Simple (FS)</p> 	Tomorrow next year in five years in 2035	They will play tennis well. Will we join them? They will not do the work.	He will come soon. Will she have a test? He will not be right.

Graphic algorithm of Present Continuous (PC)

Definition of the linguist. This tense is used in speech when the action is a process that occurs at the moment of speech.

Table 5. Graphic algorithm of Present Continuous (PC)

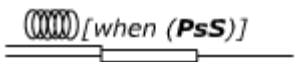
Graphic algorithm	Markers	Examples
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<p>Present Continuous (PC)</p>  <p>am/are/is + (-ing)</p>	<p>now at the moment Look! Listen!</p>	<p>They are planting trees. Are they planting bushes? Why are we quarreling? We are not quarreling.</p>	<p>He is singing. He is not dancing. Is he singing well?</p>
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Graphic algorithm of Past Continuous (PsC)

Definition of the linguist. This tense is used in speech if the action took place at a particular moment or period in the past.

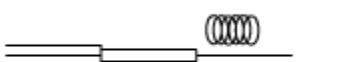
Table 6. Graphic algorithm of Past Continuous (PsC)

Graphic algorithm	Markers	Examples	
<p>Past Continuous (PsC)</p>  <p>was/were + (-ing)</p>	<p>yesterday at 5 o'clock, when you called, when the rain started, all day long, from 5 till 7 yesterday</p>	<p>They were working. Were they playing? Why were they working? They were not playing.</p>	<p>He was driving. Was he playing? He was not playing.</p>
		<p>I was sleeping when someone knocked at the door.</p>	

Graphic algorithm of Future Continuous (FC)

Definition of the linguist. This tense is used in speech if the action will occur at some moment of time or in some period of time in the future.

Table 7. Graphic algorithm of Future Continuous (FC)

Graphic algorithm	Markers	Examples	
<p>Future Continuous (FC)</p>  <p>will be + (-ing)</p>	<p>tomorrow at 4 o'clock, when we meet, from 6 till 7 tomorrow, all Sunday long, when my mother comes</p>	<p>They will be playing. Will they be singing? Why will they be playing tennis? They will not be playing football.</p>	<p>He will be sleeping. Will he be working? He will not be working. Where will he be sleeping?</p>

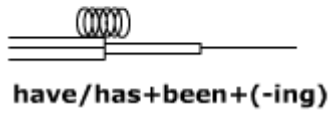
Graphic algorithm of Present Perfect (PPf)

Definition of the linguist. This tense is used in speech, when: a) the action is performed (completed) in an indeterminate past and the result of which we are now discussing, and b) the action is completed and a period of time is not yet (today, this week, this year, lifetime).

Graphic algorithm of Present Perfect Continuous (PPfC)

Definition of the linguist. The action began in the past, lasted for some time and continues now or has just finished with the obvious result.

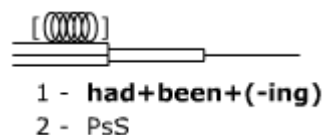
Table 11. Graphic algorithm of Present Perfect Continuous (PPfC)

Graphic algorithm	Markers	Examples
<p>Present Perfect Continuous (PPfC)</p>  <p>have/has+been+(-ing)</p>	for, since, how long	They have been watching TV. Have they been sleeping? They have not been sleeping. You smell tobacco. Have you been smoking? Has she been using my computer again? It has not been snowing here since 2000.

Graphic algorithm of Past Perfect Continuous (PsPfC)

Definition of the linguist. This tense is used in speech when the action started until a certain point, or actions in the past and was still ongoing at that moment, or had just ended with the obvious result.

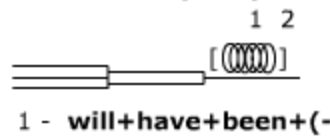
Table 12. Graphic algorithm of Past Perfect Continuous (PsPfC)

Graphic algorithm	Markers	Examples
<p>Past Perfect Continuous (PsPfC)</p> <p>1 2</p>  <p>1 - had+been+(-ing) 2 - PsS</p>	for , since, all the week, in time	We had been working. He had not been sleeping! Has she been writning a compositin?

Graphic algorithm of Future Perfect Continuous (FPfC)

Definition of the linguist. This tense is used in speech when the action began in the past, lasted for some time and will last up to a certain point in the future, including the very moment.

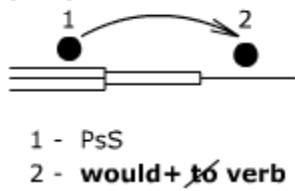
Table 13. Graphic algorithm of Future Perfect Continuous (FPfC)

Graphic algorithm	Markers	Examples
<p>Future Perfect Continuous (FPfC)</p> <p>1 2</p>  <p>1 - will+have+been+(-ing) 2 - PC</p>	by, for	I will have been living here for a week by next Sunday. I won't have been waiting for you long when you come. Will you have been living here for twenty years next autumn?

Graphic algorithm of Simple Future in the Past (FPs)

Definition of the linguist. This tense denotes a future action at a specific moment in the past and is used in speech for simple, common actions or sequence of actions in the future reviewed from the past.

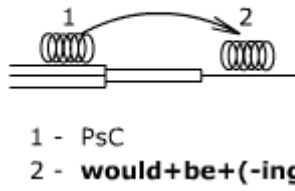
Table 14. Graphic algorithm of Simple Future in the Past (FPs)

Graphic algorithm	Markers	Examples
<p>Simple Future in the Past (FPs)</p>  <p>1 - PsS 2 - would+ to verb</p>	said (that), told (that), thought (that)	He said he would go to the theatre. 1 2 She hoped he would help her. 1 2

Graphic algorithm of Continuous Future in the Past (CFPs)

Definition of the linguist. This tense denotes a future action at a specific moment in the past and is used in speech to express a long action, which will occur at some point or period of time in the future. Both actions are related to the past.

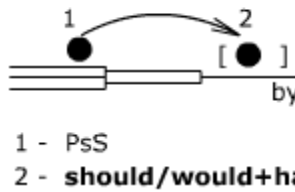
Table 15. Graphic algorithm of Continuous Future in the Past (CFPs)

Graphic algorithm	Markers	Examples
<p>Continuous Future in the Past (CFPs)</p>  <p>1 - PsC 2 - would+be+(-ing)</p>	said (that), told (that), thought (that), how	He told us how he was driving in the desert when his wife interrupted him.

Graphic algorithm of Perfect Future in the Past (PrFPs)

Definition of the linguist. This tense denotes a future action at a specific moment in the past and is used in speech to express the action which will be completed by a certain time in the future reviewed from the past.

Table 16. Graphic algorithm of Perfect Future in the Past (PrFPs)

Graphic algorithm	Markers	Examples
<p>Perfect Future in the Past (PrFPs)</p>  <p>1 - PsS 2 - should/would+have+III</p>	said (that), told (that), thought (that), how, by	We hoped we should have done 1 2 our homework by midday.

Graphic algorithm of Perfect Continuous Future in the Past (PrCFPs)

Definition of the linguist. This tense denotes a future action at a specific moment in the past and is used in speech to express a long action which will start before a certain point in the future reviewed from the past and will last up to this point, or will still continue at the moment. This form is rarely used, even in book style.

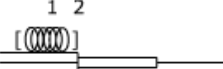
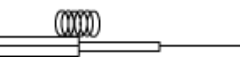
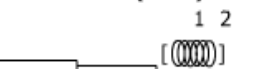
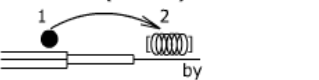
Table 17. Graphic algorithm of Perfect Continuous Future in the Past (PrCFPs)

Graphic algorithm	Markers	Examples
<p>Perfect Continuous Future in the Past (PrCFPs)</p> <p>1 - PsS 2 - should/would+have+been+(-ing)</p>	<p>(that), said (that), told (that), thought (that), how, for</p>	<p><i>He told us he would have been 1 2 working on the plant for 30 years next December.</i></p>

Table 18 presents all graphic algorithms (visualization) of the British verb tenses formation.

Table 18. Summary Table - System of graphics algorithms

The Group of Simple tenses			
<p>Past Simple (PsS)</p> <p>II (-ed)</p>	<p>Present Simple (PS)</p> <p>to verb to do (does)</p>	<p>Future Simple (FS)</p> <p>will (shall) to do</p>	<p>Simple Future in the Past (FPs)</p> <p>1 - PsS 2 - would+ to verb</p>
The Group of Continuous tenses			
<p>Past Continuous (PsC)</p> <p>[when (PsS)] was/were + (-ing)</p>	<p>Present Continuous (PC)</p> <p>am/are/is + (-ing)</p>	<p>Future Continuous (FC)</p> <p>[when (PS)] will be + (-ing)</p>	<p>Continuous Future in the Past (CFPs)</p> <p>1 - PsC 2 - would+be+(-ing)</p>
The Group of Perfect tenses			
<p>Past Perfect (PsPf)</p> <p>1 - had + III (-ed) - PsP 2 - II (-ed) - PsS</p>	<p>Present Perfect (PPf)</p> <p>have/has + III (-ed)</p>	<p>Future Perfect (FPf)</p> <p>1 - shall/will+have+III (-ed) 2 - PS</p>	<p>Perfect Future in the Past (PrFPs)</p> <p>1 - PsS 2 - should/would+have+III</p>
The Group of Perfect Continuous tenses			

<p>Past Perfect Continuous (PsPfc)</p>  <p>1 - had+been+(-ing) 2 - PsS</p>	<p>Present Perfect Continuous (PPfc)</p>  <p>have/has+been+(-ing)</p>	<p>Future Perfect Continuous (FPfc)</p>  <p>1 - will+have+been+(-ing) 2 - PC</p>	<p>Perfect Continuous Future in the Past (PrCFPs)</p>  <p>1 - PsS 2 - should/would+have+been+(-ing)</p>
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This System can be used:

- as teaching aids for English classes;
- as intermediate form for the transition to a very compact binary formalization for automated computer translation.

Conclusion

- The method of the English grammar studying has been designed using information technology;
- A list of symbols of the English grammar has been designed;
- A simple language of symbols has been designed to facilitate and accelerate the memorization of the English grammar rules;
- The time formation visualization of English has been developed and systematized and is presented in a tabular form;
- The developed method of studying the English grammar for students was tested in a group of the Intermediate level. It showed high efficiency of storing large amounts of information;
- System of graphics algorithms can be used:
 - as teaching aids for English classes;
 - as intermediate form for the transition to a very compact binary formalization for automated computer translation.

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E-LEARNING IS THE NEXT STAGE OF THE INNOVATIVE DEVELOPMENT OF A UNIVERSITY

Vlasova, E., Gossoudarev, I., Aksyutin, P.
Herzen State Pedagogical University of Russia, St.Petersburg

The article discusses the innovative potential of e-learning for the development of educational institutions. The authors describe the experience of using e-learning at the Pedagogical University.

The field of information technology is one of the most rapidly developing in the world. Beyond doubt, this influences the dynamics of these technologies' utilization for education. E-Learning integrates advanced achievements in science and technology and best pedagogical practices, and thus stimulates innovative development of educational systems. This implies the following: 1) the principles of systematic interaction of the educational process participants are changing with the accent on adaptability, collaboration and dynamics, 2) the requirements for the educational institutions infrastructure and for the electronic information-educational environment are changing, which must provide mobility, activity, accessibility and flexibility of learning while being adaptively managed by the learners, 3) the need for educators with new professional visions and qualities is increasing, 4) active mechanisms of pedagogical innovative promotion in the sphere of E-Learning are required, including corporate training of the teachers. The authors' long-term experience in utilizing E-Learning while working with students has confirmed the ideas mentioned above and allowed to outline the most significant results for the innovative educational process. The students, as well as the teachers, affirm that E-Learning is a promising type of learning, which provides rapid access to the resources and educational services, their exchange and productive collaboration of the educational process participants. It allows to increase the efficiency of learning and save time spent on it, directs teachers and researchers towards the implementation of the innovative methods, technologies, development tools and ways of utilizing E-Learning solutions. It also facilitates learning individualization, online content modernization, saving learning time due to lecturing hours reducing. This is especially important and relevant, the new generation of the educational standards being introduced, which force teachers to reduce the classroom hours, to extend the forms of individual study, for organization of which E-Learning provides essentially novel opportunities. At the Herten university there has been accumulated long-term positive experience of E-Learning implementation while working with bachelors and masters, who take the course of "Pedagogical education", including the master of education program "The technology and management of E-Learning". The information and communication department staff have developed for that purpose the E-Learning management system, which allows to adaptively manage the process of students' training and the mobile creation of the relevant educational content (modified, adaptive, social and interactive). The system includes the repository of the relevant educational resources as well as the connecting metadata. In order to use it the teachers are supposed to apply the methods of handling the active electronic tools of collective communication created by them, which provide for interactive and active study of the content. The system is part of the interactive electronic information-educational environment of the department [1], created with the aid of the cloud technologies. While working with students, the teachers make use of the wide range of E-Learning technologies; synchronous and asynchronous methods of E-Learning communications; collaborative technologies; relevant and constantly updated content, stored within the repository. The materials of the repository are used to form the courses, adapted to the learners' needs, and to

arrange the individual routes of the knowledge obtaining. The content, the structure and the arrangement of the courses is aimed at providing the attention span control, maintaining dialogues with the educational process participants based on the intellectual dialogue concept, organization of the dynamic feedback via the questions and tasks. The lecturers and instructors of the ICT department are concentrated on the design and the development of the E-Learning models [2] with the purpose of their further implementation to teach the students [3] according to the modules and courses of the educational program. The students' surveillance (about 3000 participants), has showed, that they appreciate E-Learning as a modern innovative teaching tool, means of their professional and individual efficiency development. The students stress upon the fact that it is aimed at their self-development and self-improvement. Among its advantages they, in the first place, mention the fact that the students, as well as the teachers' interaction with the student, are in the focus point of E-Learning. During several years (2008-2013) an experiment was performed aimed at understanding, how and to what extent «The technology and management of E-Learning» program assists the innovative training of the teachers. The results were processed with the aid of the main components method. The characteristics of the main components were analysed and the most significant components were separated, which influence the studied process. It turned out that the first main component gave the most significant contribution. It characterizes the students' ability to generate new knowledge and solve problems according to multiple scenarios, based on the interdisciplinary knowledge and being capable of learning activity arrangement and management. The second main component describes the ability to interact in the professional environment. The second main component underlined the ability to reflex their activity with the aid of innovative methods, and the last component characterizes the ability to design one's professional activity. The described results, mathematically interpreted, highlight the significant professional qualities important for a modern teacher, who uses the E-Learning technologies. They should be utilized to implement adaptive control impact on the students, on the teachers and other staff of the higher education system, who are subject to corporate training in the sphere of E-Learning with the aim of innovative self-development and the development of their educational organizations.

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PROGRAMMING AND COMPUTER SCIENCE TEACHING IN HIGH SCHOOLS AND COLLEGES IN INITIAL PHASE

Pavolotsky, A. V., Korolev, D. A.
MIEM HSE

IT specialists are very demandable at any modern business and science sphere. And there is only one reason for it: most problems and tasks are decided and automated with computers. In this article we want to talk about IT specialists teaching, especially about their first classes in Computer Sciences and discuss the uprising in this process problems. This article is based on over than 10 years authors experience at Moscow's High School and College Computer Science teaching.

Keywords: education, computer science, teaching, high school, colleges

Russia's Computer Science teaching history

High school Computer Science began in 80th, when professor Ershov declared his thesis: "Programming – the second literacy". At that time computers were not so common like now, so anyone who wanted to be an engineer in electronic machines and work with computers at all, had to study Discrete Math, Electronics, Binary Arithmetic, Programming and so on. Professor Ershov equaled literacy as cultural phenomenon and programming — technique, that makes human to think systematically. He wrote: "If the development and distribution of printing has led to universal literacy, the development and share of computers will lead to everyone's ability to program". Academician Ershov's ideas led to fact, that a new high school discipline was born. It was named "Computer Engineering Fundamentals". From that moment Programming and basics of Computer Science became a part of Russia's High School Program.

Let's take a look to the picture of that times high school student studying Computer Science Basics. At first, computers were very strange and difficult things. For involved people they compared as magic boxes. Those students were enthusiasts. The programming process was not only practice in technique, it was like a quest. Students experimented and invented new tasks, tried to solve difficult problems. Of course last remark relates to special math schools. The main reason of all this is that such students were not users, they became a real specialists in Computer Science, and many of them decided to continue their education in corresponding college or university.

Technical universities in late USSR were narrowly focused. That's why Computer Science and programming education were oriented on special machines and technologies. Of course students studied fundamental theories and algorithms – the basis, but the most view was concentrated into special things. The consequence of this is the style and methodic of educational process. For example, imagine that you're studying array arrange methods. To pass this theme you have to make a big report, containing the full description of method on your native language, description of algorithm in special language or in flowchart, your code and testing sequences. It was necessary, because student had to know every feature of the machine, he will work on in the future.

No doubt, at that time such method was very good, but it was time of "not users, but specialists", the time of "not common computers" and the time of enthusiasts. Now the time has changed, people changed, technology changed and students changed, especially in our country. So, the teaching style and technology has to change too.

Let us briefly describe the vision of such training process that, as we hope, can teach students for Computer Science basics quite well.

Modern student portrait

Let's make a look to modern student portrait. Now in Russia all students are divided in two classes:

- motivated, who really want to learn a profession
- haphazard, who may be made a mistake with his choice

But all modern students are not bad computer users. Notebooks, phones and other gadgets moved computers closer to regular user. This is their main kind making the difference between them and students of twenty century. So, computers for them are not strange and interesting things, there are quite casual.

Base on this fact, we have to change all ideology for this students teaching.

Elements of Computer Science Basis teaching

We suggest, that modern computer science basis teaching ideology should consist of the following elements:

1. Computer science theory;
2. Theory of algorithms;
3. Language practice;
4. Automatized control mechanism;
5. Computer technology, literacy, collaboration, documents making and presentation;

Let's talk about each of them.

Computer science theory or computer science essentials is theoretical course containing basis information of computer mathematics and logic, digital devices, circuit design essentials, information theory, natural information conversion, computer structure and so on. Unfortunately students have different levels of computer knowledge at their study beginning. That's why this course is not a deep learning. It's a common element, created for taking all students to the same level. It has to include a lot of theoretical blocks into itself and also it must have regular control procedures. We want to note, that this course is required for all students, studying in any IT ways.

The second element – Theory of algorithms – purpose is to teach students not just fundamental algorithmic theories such as Turing machine, Post machine, Markov's theory, different ways to define the algorithm itself, methods to calculate algorithm's efficient, but a very large array of known algorithms. Look at them:

- Numeric algorithms;
- Arrays algorithms;
- String algorithms;
- Lists algorithms;
- Recursive algorithms;
- so on

This element also includes various data structures, like arrays, vectors, lists, stacks, queues, trees. But note one most valuable thing: like the first one this element is also theoretical. That's why during various controls teacher has to ask students very detailed on each question. Student, studying this element, after it's completed, should know basic principles, usable algorithms and data structures.

The third element of Computer Science program is Language practice. One of this article authors (he teaches Computer Science theory only) once asked his students: "How many tasks did you program during this module?" And student answered: "Approximately, 10". Author was very surprised with this answer. He asked again: "Did you study programming early in high school?" The answer was: "No". No one can learn programming at any language, having done only 10 tasks, even 20, except genius. To make a little success in this art, student has to complete at least 100 tasks, but 200 are better. We used word "art" to

describe programming. That's quite correct definition, we think. Anyone who wants to be succeeded in any art should have practice, a lot of practice. Student has to understand this art on his fingertips. There is no another way.

But we have very difficult question: what language should college or high school choose for this start programming course? There are many reliable ways. But this article authors think that most of them is to start learning from language, that hides from student any specific machine and difficult things like memory working, but gives very simple syntax and forms. Also this language should be quite modern and powerful. This language is Python, or something like it. This language has free IDE's, simple and modern syntax and good facilities. It was created by mathematicians, so it has integrated all needed data structures, such as lists, dictionaries, tuples, etc. At the start it hides any memory functionality even variable definition. Some teacher can object, saying that variables definition is one of the primary programming things, but our opinion is that now we should move student's attention to technique and practice, not to detailed memory structure. We can return to this problem later.

We told above, that this element is a practice one. And reasonable question is: how can tutor or teacher control and administrate all students work, especially in a large students number way? There is only one answer – automatized knowledge control system. And this is our fourth element.

Automatized knowledge control systems has already applied in various teaching methodic, more in programmer's contests and preparing for such contests. One of this article authors successfully involved this methodic in his high school teaching process. Using this system he can give large number of different own tasks for each student. And students are practicing not only in class, but from any place, where Internet is available, because such systems are Internet based.

For theoretical elements the best way is to use Peer-to-peer review systems. Such systems involve students in common control process and there is no way to exclude from it, because each student has to not only make his own work, he must check his several colleagues work. And his total credit will consist of this to activities.

The fifth element is a common one. Our students have to learn modern collaboration technologies, such as Google Documents, have to defend their works in front of any audience with presentation support. Unfortunately, most of students know only PowerPoint and nothing else. We must teach students to combine information technologies knowledge and any other fields of science.

What next?

Let's imagine what student can learn next, after finishing this course of Computer Science Essentials. He can extend his knowledge studying Object Orientated Programming and learning languages like C++ or C# and Java. After this he can start to learn Web technologies and programming (PHP language). Another way is in microcontrollers developing and programming practice. The third way is System Programming with C language. So, we have a large field for any activity.

Conclusion

What conclusion can we make, analyzing described methodic. First, these courses are very intensive. Student, taking these classes has to spend much time to learn theoretical elements and to make practice. To make elements working, teacher has to do a lot of work.

He has to:

- Prepare presentations and synopsizes for every lecture;
- Invent large pool of different difficulty levels tasks for practice;
- Find and set up automatized control system for task checking;

- Find and set up peer-to-peer review system for theoretical elements control;
But, what we are aiming:
 1. We give good knowledge to student. We are sure, that such knowledge can help student to study advanced parts of Computer Science.
 2. We can “play” with element, changing their volumes for making them more flexible to each situation
 3. We can extend it to Internet-based learning, what is very popular now. Just remember Coursera.com and Udacity.com
 4. We can interest different students in Computer Science and Programming, even they had no idea about it before
 5. We can make particular tests and rating for each student, depending on his possibilitiesWe think, that if we solve even a small part of these tasks, we can rise up level of our students and improve their professional and cultural characteristics.

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PROJECT METHOD IN PROFESSIONALLY-ORIENTED TRAINING OF BACHELORS SERVICE PROFILE

Kozhevnikova, A.
Chelyabinsk, South Ural State University

The article described the method of the projects as the primary technology for educational practice in the course of practical studies for bachelors of the specialty service of home appliances and information technologies applied in practice and their relevance.

Keywords: method of the projects, practical studies for bachelors, information technologies.

A modern teacher must possess at least three languages - native, at least one foreign language and information technologies.

Information educational technologies arise when using the tools of Informatics and computer engineering.

Different approaches to the definition educational technology, you can summarize of the as a set of ways of realization of curriculum and training programs, representing system of forms, methods and means of training, provides for achievement of educational goals.

Under educational technologies in higher school is a system of scientific and engineering knowledge, methods and tools that are used for the generation, collection, transfer, storage and processing of information in the subject field of higher education. Between the effectiveness of the implementation of curricula and degree of integration of information and communication technologies formed a direct relationship [1].

The main educational technology for the successful development of competencies provided for educational practice bachelors of the specialty service of home appliances is selected project method.

History of the project

«The project method» arose in the beginning of XX century in the USA. The origins of emergence are connected with the ideas of humanistic trends in philosophy and education, with the developments of the American philosopher, educator J. Dewey. The main idea of the authors is training on an active basis, through the activity of a pupil, according to his own personal interest in this knowledge.

Method of the projects, proposed by J. Dewey, suggested training in accordance with the personal interest of a student in any objective knowledge. «From here it was extremely important to show the kids their personal interest in the acquired knowledge that can and should be useful to them in life. This requires an issue taken from real life, familiar and meaningful to the child, for whom he needs to apply the received knowledge, new knowledge, which is yet to receive».

«The idea of project-based learning has emerged in Russia practically in parallel with the developments of American teachers. Under the leadership of the Russian teacher S. Shatsky in 1905 was organized by a small group of people, who tried to actively use design methods in teaching practice. Under the Soviet government these ideas are quite widely implemented in the school. In 1931 the resolution of the Central Committee of the VKP/b/ project method was convicted. Until recently in Russia a serious attempt to use this method does not exist» [2, 244 - 246].

Educational resource of the project method

The range of educational goals of the project is «development of cognitive, creative, student's skills, skills to construct their knowledge, skills to Orient in the information space, the development of critical thinking» [3].

The essence of the method of the project is to «stimulate the interest of students to certain problems involving the possession of a certain amount of knowledge and through project activities, providing the solution to these problems, the ability to practically apply the knowledge, development of reflex or critical thinking» [3].

Project method always involves, first, the solution of a problem, and, secondly, aims to obtain the result.

The project method is the way to make didactic purposes through the development of detailed problems (technology), and it should be quite real, tangible decorated practical result. In a basis of the project is based on the idea of constituting the essence of the notion «project», his pragmatic orientation on the result, which can be obtained by solving some of practically or theoretically significant problem. This result can be seen, to interpret and apply in real practice. The decision of the problems involved, on the one hand, the use of aggregate, a variety of methods, means of training, and on the other, suggests the need to integrate knowledge and skills to use knowledge from various fields of science, technology, the creative industries [3].

Andreas Papandreou (Institute of Education, Cyprus) indicates that project-based learning is an indirect, and here is valuable not only results, but to a large extent the process.

Working with projects occupies a special place in the system of higher education, allowing the student to acquire knowledge, which is not reached by traditional methods of learning. Students will make their own choices and take the initiative. From this point of view a good project should [4, 121.]:

- have practical value;
- involve holding the students of independent investigations;
- to be unpredictable in the process and at the end;

- be flexible in the direction and speed of its implementation;
- involve the possibility of solution of actual problems;
- give the student the opportunity to learn according to their abilities;
- contribute to the manifestation of abilities of the student at the decision of tasks over a wide range;
- stimulate interaction between students.

Today, the method of projects is one of the most popular in the world, as it allows combining theoretical knowledge and practical applications, to address specific issues surrounding reality in the joint activities of the students. In the USA, the UK, Belgium, Israel, Finland, Germany, Italy, Brazil, the Netherlands and many other countries, project method is widely spread and gained a great popularity. «All I know, I know what it is I need and where and how I can apply this knowledge» is the main thesis of understanding of the method of projects, which attracts many education systems, trying to find a reasonable balance between academic knowledge and pragmatic skills» [3] .

Typology of projects

Classify projects based on the following characteristics:

- Dominant in the project activities;
- The subject field of the project;
- The nature of the coordination of the project;
- The nature of the contacts;
- Number of project participants;
- Duration of the project.

In accordance with the first sign marked the following types of projects.

Research projects subject to the logic of research, and have a structure similar or completely coinciding with a genuine scientific research.

Creative projects involve the design results in the form of a scenario, dramatization, and the program of the holiday, presentations, articles, reports, design and sections of the newspaper, the almanac of the album. Degree of creativity in role-playing and gaming projects is very high, but the dominant view is playing games. Acquaintance-indicative or information projects focused on collection of information about an object, phenomenon. Practice-oriented projects distinguishes clearly defined from the beginning, the result of the activities of the participants, this result is necessarily focused on the social interests of the participants themselves.

For bachelors of the specialty service during the academic practice is selected creative project. The end result is a presentation model shop of home appliances with a detailed description of its functioning:

- The choice of premises with its description (location, size, mode of work, thou, and etc);
- A description of a trading hall, warehouses and subsidiary premises;
- Presentation of the layout of the products sold in accordance with the rules of merchandising;
- A description of the marketing policy of the company (corporate style, advertising, implementation of laws of perception, pricing, promotions etc);
- Description of products sold;
- Personnel requirements (age, education, qualifications etc);
- Economy of company.

Project stages

V.V. Guzaev in the book «Planning for results of education and educational technology» [5, 194 to 197] argues that all student activity focuses on the following stages:

- Training;

- Planning;
- Study;
- Results and conclusion;
- Evaluation of the results and of the process.

Method of the projects implemented for bachelors of the specialty service as follows.

Preparation takes place during the lecture, in which the teacher provides introductory information, explains the goals and objectives of the educational practice and the nature of the work of the student. Lectures are accompanied by slides and videos about shops of home appliances.

Planning helps to identify the following aspects:

- Sources of information (lectures, textbooks, magazines);
- Methods of gathering and analysis of information (to work in the library, use of Internet resources, video resources, excursions);
- How the results (presentation made in Power Point);
- Procedures and criteria of evaluation of the results and of the process.

Research - independent work of a student involves the collection of information.

The program provides for group visits the shopping salon of home appliances and a meeting with the Director. He talks about the functioning of the salon. Students can ask all the questions.

Then all of the information is analyzed and systematized by the student. Students give the intermediate results and conclusions on the educational portal. The teacher controls and gives recommendations.

At the end of the student draws up the work done, makes the final findings and presents a model of the shop in accordance with the mission.

Presentation of the work for each student as follows:

- Presentation of the project of shop of home appliances (3 - 5 min);
- Answers to questions from the Commission.

According Assessment of student comes from the results of the work during the whole practice.

The nature of pedagogical activity in the method of projects

Implementation of the project in practice leads to a change in the position of teacher. From the carrier of ready-made knowledge he becomes the organizer of educational, and research activities of their students. Changes and psychological climate in the class, because the teacher has to reorient its educational work and the students in the various types of independent work of students, the priority activities of research, search, creative nature [2].

The project method is used in that case when in the learning process occurs research, creative task which requires integrated knowledge from various fields, as well as the application of research methods [2].

«The main problem that hinders the dissemination of project-based learning consists in the difficulty mates design specifications with the requirements of educational standards. Practically it is not possible to formulate the project tasks so that you can use standard knowledge and skills (or, more precisely to necessity occurs) when performing students of these jobs» [5, 206-207].

Conclusion

Success in the modern world is largely determined by the ability of man to organize his life as a project: to determine the long and the short term, find and attract the necessary resources, draw up an action plan and accomplished it, assess. Numerous studies have shown that most of the leaders in politics, business, arts, sports - people with the project type of thinking. Today there are all possibilities for the development of design thinking with the help of a special activity of the pupils of the project activities.

The project activity may teach the students the ability to:

- To see the problem and convert it in a purpose of his own activity;
- To set a strategic goal and split it into tactical steps;
- Evaluate the available resources, including their own strength and time, to divide them;
- To extract information, critically evaluate, share and restrict in volume, use a variety of sources;
- To plan their work;
- Evaluate the result of work and compare it with what has been stated as a purpose of the work;
- See the mistakes and avoid them in the future.

For implementations method of the projects during the practice are the following information and innovative technologies:- the personal computer;

- local area network, the device of input-output of the information, means of input and manipulation of text and graphic information, tools archival storage of large volumes of information, and other peripherals modern computers;
- Device for converting from graphic or audio representations of data in digital and back;
- Modern means of communication;
- System of computer graphics software packages (packages of applied programs);
- Internet.

Project activities can be considered as one of the few types of work, allowing converting academic knowledge in real life and even worldly experience of the students.

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THE PERSPECTIVES OF LINKED DATA IN EDUCATION

Sytnik, A.A., Vagarina, N.S., Melnikova, N.I.

Yuri Gagarin State Technical University of Saratov, Russia

The lack of clear semantic definitions prevents integration of the various educational systems. To solve this problem it should Semantic Web use technologies, and especially the linked data technologies. Practically this means that that any network information have accurate, unambiguous meaning and association with some context. This could be done through the establishment of educational systems on base on subject domain using united vocabulary, ontology and links to external data sources from RDF-graph.

Keywords: linked data, semantic web, linked open data, RDF-graph

The term «linked data» was coined by Tim Berners-Lee in 1996 [1]. Linked data technologies is part of the Semantic Web technologies. The goal of linked data is the exchange of structured data in the Web by simple way. Already has many projects devoted to linked data, such as DBpedia, Geonames, US Census, EuroStat, MusicBrainz, BBC Programmes, Flickr, DBLP, PubMed, UniProt, FOAF, SIOC, OpenCyc, UMBEL, Yago. Linked data is widely used in a number of sectors, such as libraries, medicine, public administration and education. Also it should be noted that linked data are often used as linked open data. Linked data can be open, and open data can be linked data. These sets overlap but do not coincide. This led to the emergence of another term "linked open data". Among the many projects on the use linked data in a foreign education should note a number of projects, such LinkedUp; Linked Education Cloud; Linked Education. LinkedUp project is designed to advance the accumulated data on the Web in education. One of the parts of this project is creating of data repository Linked Education Cloud. Open platform for linked data platform in education is LinkedEducation.org. Here are the software tools and applications that can be used to create the linked data, as well as educational resources in the form of data schemas, data sets and vocabularies.

Creating a set of linked data in the Russian education is also advisable to develop in the direction of open data. First of all it is necessary to use semantic approaches to open data. Open government data can serve as a starting point for the promotion of semantic technologies and linked data in different educational areas [3]. In particular, of great interest is the creation of linked data for submission of multimedia educational resources [4], [5].

Development of information technologies generates a large amount of network resources and educational products. Many universities in Russia and abroad developed Web-based educational resources, including comprehensive online courses. This fact has caused an incredible spread of new kinds distance education. For example, the newest educational idea is a massive open online course (MOOC). It is a free online course aggregator from top universities like Stanford, MIT, Harvard, etc. For example, Udacity, Coursera and Edx and others. MOOC has great international success. The incredible proliferation of MOOC creates a real alternative to the traditional system of higher education [6]. MOOC makes the comparison of different educational models from different universities clearer and clearer.

Modern online learning environment combines the full range of new technologies and resources to create a personalized online learning space. But there is a problem of description, search and access to different learning objects in these environments. For textual information this task is largely solved, but the access to multimedia assets is not fully used. This is due to insufficient semantic describing of multimedia assets. It's so-called semantic gap. This could be done through the establishment of educational systems on base on subject domain using united vocabulary and ontology. To solve the above problems, you should use technology Semantic Web, because Semantic Web supposes that any network information have accurate and unambiguous meaning.

At first, it's necessary to carry out an appropriate description and establish mechanisms of effective access to educational resources. This will allow the use of educational assets. The layout of information resource should be fulfilling in some space of name, such as Dublin Core. Integration of different metadata can be based on ontologies. Ontologies provide a comprehensive description of subject areas. To represent the subject domain data to be used web-ontology language OWL. OWL is the basis for the organization of high-level syntactic and semantic interoperability of your application. For example, the project Linked Education is a series of educational ontologies to be adapted to the educational activities. The Bowlogna ontology aims at providing a standard schema for European universities involved in the Bologna Reform of higher-education studies. Academic Institution Internal Structure

Ontology (AIISO). The Academic Institution Internal Structure Ontology (AIISO) provides classes and properties to describe the internal organizational structure of an academic institution. AIISO is designed to work in partnership with Participation (<http://purl.org/vocab/participation/schema>), FOAF (<http://xmlns.com/foaf/0.1/>) and aiiso-roles (<http://purl.org/vocab/aiiso-roles/schema>) to describe the roles that people play within an institution

Designed vocabularies allow to connect to Linked Open Data via, for example, the project Linked Open Vocabularies (LOV), which used in the Linked Data Cloud. LOV objective is to provide easy access methods to this ecosystem of vocabularies, and in particular by making explicit the ways they link to each other and providing metrics on how they are used in the linked data cloud, help to improve their understanding, visibility and usability, and overall quality.

RDF provides the opportunity to describe metadata about all network resources. RDF may also be used to provide information about the resources in the network which identified by URI. The structural unit of RDF is a set of triplets. Each triplet consists of 3 items: subject, predicate and object. RDF-graph is a set of triplets. The vertices of the RDF-graph are the subjects and objects, and arcs the RDF-graph are the predicates (properties).

There is a way to transform the excel tables to RDF and create links to external datasets. There are many external data sources, which we can use to resolve external links. For example, we may use DBpedia or Europeana. For this purpose we may use software Open Refine and RDF extension to Open Refine which called RDF Refine. At first, our task is to make basic information structure as set of excel tables. This set is some analog of the relational database. Then we may to find points of connections to external data sources, for example mentioned above DBpedia [2]. Also we can to build RDF-graph on the links to external data sources. This approach is very useful for using external resources in education. Instead of surfing on the Internet we may construct information structure and then to connect to needed resources.

Using semantic technologies in education is in the initial state. But their potential in education is very high. This technologies give opportunity to use of open data, integrate it into a coherent international knowledge space Linked Open Data and re-use in the education of all types of information assets.

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ELECTRONIC PORTFOLIO AS A MEANS OF MEMORY TRACES FORMATION

Semenova, N.

Orenburg, Orenburg State University

In this work the structure of electronic portfolio developed by the author and its use environment as a means of memory traces formation in the process of students training of power engineering specialities are considered.

Keywords: electronic portfolio, information and communication technologies, inter-subject project.

According to S .V. Panukova e-portfolio is “the whole set of documents organized by students on the base of information and communication technologies including the results of qualification works and their examples, certificates and diploma confirmation in academy education system, continuous evaluation results and personal achievements prognostics out of educational system.” [1]. The scientific literature analysis helped to highlight the following portfolio types:

1. **Document or “Active” portfolio.** It includes a collection of works for certain period of studies showing students progress in educational and research spheres.
2. **Demonstrative portfolio** gives possibility to evaluate student’s progress in some basic subjects and performs the best works reflecting study and research progress.
3. **Process portfolio.** This type reflects all stages of studies including reflection process of student’s own experience.

The author offers e-portfolio integrating above mentioned types. As a result of such integration in e-portfolio structure we distinguish 3 units:

- personal data and progress unit of a student;
- personal task unit;
- information interaction unit.

Personal data and progress unit performs information about student: educational institution, speciality, course. The given unit involves general achievements for all years of studies: lists of research works, conferences a student participated in, sphere of study, his hobby, scanned letters of commendation, certificates, additional education diploma. The information from this unit can be used for making CV for an employer.

Personal task unit is created by a student during all course of university studies and consists of personal completed tasks: research works, projects, graphics structured by disciplines studied according to academic curriculum.

Performing, presentation of electronic form and recording in portfolio of adjoining tasks of inter-subject projects by a student are of particular interest. By **inter-subject project** we understand the research orienting students to their own problem solution integrating elements of two or more disciplines from different blocks of academic curriculum studied in different semesters , with obligatory computer presentation of intermediate and final results.

In our research work an inter-subject project unites (integrates) research tasks of interconnected subjects of curriculum “Electroenergetics and electrical engineering” direction, “ Electrical drive and automatics” profile: natural-science discipline “Mathematics”, general professional discipline “ Theoretical principles of electrical engineering” and special subject “Nonlinear and impulse automatic control systems”, notably mathematical knowledge gained

by studying “Fourier series” is used in inter-subject tasks of “Theoretical principles of electrical engineering” discipline, chapter “Non-sinusoidal circuits”. In the next semester mathematical knowledge gained by studying “Fourier series” and the one of non-sinusoidal circuits are applied by students in the following inter-subject research task of “Nonlinear and impulse automatic control systems” discipline, chapter “Harmonic linearization of nonlinear elements”.

The experience in e-portfolio application during 5 years helped the author to define the following functional possibilities: accumulation of personal projects, dynamics detection in object competences formation in specific fields of knowledge according to curriculum, revealing of creative talents, “memory traces” formation in inter-subject disciplines project.

Let’s define by means of what “memory traces” formation via e-portfolio is realized.

As it is known from psychology, all that we learn puts a certain trace in our memory, which can be saved for a long time and under proper conditions can appear again and become an object of consciousness. By memory in psychology they understand imprinting, conservation, further recognition and reproduction of past experience traces. Thanks to the memory human is able to accumulate information without past knowledge and skills losses.

The efficiency of memorizing, as it was noted [3], depends on:

1. Didactic material representation.

In the works [4,5] it is reflected that one of the features of mathematics and technical disciplines is the high abstracting level from studying notions and definitions, which perception and projection become difficult due to creation student’s own wrong visual-figurative notion. To provide a high level of information visualization perception and correct visual-figurative notion formation of scientific abstract concepts in the learning process of technical specialties bachelors they use electronic educational recourses. The computer visualization of inner content, scientific abstractions sense is named as cognitive computer graphics [6].

It also known from psychology and didactics that “visual material is memorized better than verbal one..” and it’s not by accident they say “It’s better to see one time than to hear 10 times” (seeing is believing). In didactics the principle of visualization is called as a “golden rule”. Hence one may affirm that to improve representation level of didactic material on mathematics and technical disciplines it’s reasonable to perform scientific abstract notions via cognitive computer graphics.

2. Logical structure of material.

The logical material organization is a guarantee of memorization success. “The efficiency of memorization depends on material’s type. A logically connected text is presented fuller than separate sentences.” [3]. Pointing to a great importance of logical and systemic content construction of learning material, Ushinsky wrote: “Only a system, of course, reasonable, going out of objects essence, gives us the full power over our knowledge. The head filled with fragmentary, incoherent knowledge looks like a storeroom in disorder where the owner can find nothing”[7].

Therefore one of the main requirements for performing an inter-subject project in our research is strict, logical sequence in adjoining tasks calculation.

3. Memorization organization

It’s known that it’s impossible to provide grounded knowledge, without use of special learning students activity for their memorization. The best method to learn material and achieve high storage level is to repeat. Repetition is an important condition of getting knowledge and skills. Each process in cerebral cortex makes traces due to influence of an exogenous irritant. The traces left each time during object perception, firstly can be insufficient for recalling, but after several repetitions they have great influence [3].

It's very important to distribute repetition by time. In psychology there are two repetition methods : concentrated and distributed. In concentrated one the learning material is memorized in one step and in distributed method - in several steps, separated by time periods. The present researches show that distributed repetition is more rational than concentrated one as it provides more stable material memorization.

For providing a distributed repetition in the process of performing an inter-subject project we offer to make intermediate computer presentations after each adjoining task which students create in time period after a certain research stage.

4. Involvements in memorization process of general types of memory.

Depending on what sensory areas of student dominate, they distinguish 3 types of memory: picturesque , verbal- logical, locomotory. All of them are tightly related to each other and exist independently . Of course , the domination of the only type is too rare.

Picturesque (visual) memory - memory for visual, sound, tactile and other images. The presentation of adjoining research tasks results by a student in the form of cognitive computer graphics in intermediate presentations improves his picturesque memory.

Verbal- logical memory is for sense of statement , its logic, relation to the elements of given in lexical form information. In the inter-subject project verbal- logical memory of a student dominates in the stage of preparation for intermediate presentations and during their protection process.

Locomotory memory - for movements and actions. This type is realized in performing some calculations and presenting them as symbols in the process of carrying out intermediate research tasks.

It's evident that performing individual intermediate tasks in the form of inter-subject project organization offered by us, students activate interactively all types of memories.

Considering all above mentioned, we may affirm that students memory traces formation on higher level in inter-subject projects via filling of personal task unit in e-portfolio, with further protection of each research stage is effected by:

- presenting of inter-subject tasks results by a student in the form of cognitive computer graphics;
- showing inter-subject personal tasks calculations in strict logical sequence.
- organization of distributed repetition after each research stage.
- involving in repetition process of all memory types.

In interaction information unit there are lecturers reviews about work done by a student, comments on project (task), their marks. The main functional possibility of this unit is in final reflection of student's activity.

Nowadays the development and application of e-portfolio is of great importance because of network learning technologies adoption by universities. For example, Orenburg State University applied electric educational system Moodle. One of its possibilities is to accumulate students e-portfolio. It's successfully used within 5 years in electrical power engineering faculty. The author developed a shell program in compliance with the structure presented in this work. Filling of e-portfolio is made by students from the first day of their studies.

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STAFF TRAINING AND EDUCATION FOR NEW ECONOMICS: WHAT TO TEACH? HOW TO TEACH?

Shmid, A.V.
“*EC-leasing*” Co.

According to the strategic forecast in IT for the period 2005-2015, made by IBM, by the year 2015 the new generation of the teachable computers (Expert Systems – ES) will have exceeded humans in the quality of decisions made in some of the spheres of the human activity firstly, and later on in the majority of the activities.

In order to prove the consistency of this forecast, it would be enough to mention, that IBM Watson ES in the previous year (2013) has passed the final university examinations on a regular basis and got the Doctor’s Qualification (Graduation Paper), that formally grants the legal right to provide treatment to people. It showed bright results in oncology sector. Some industrial and banking ES applications are also available on the market. Taking into account the above mentioned, V. Rometty¹ (IBM CEO) claims, that “during forthcoming five years all the companies will split up into winners and losers, depending on the corporate decisions quality (making use of ES!!!)”.

In the nearest future the decisions quality will not be able and will not rely on experience or intuition: the competitive advantage will be achieved via decisions consequences forecasting (predictive analytics). Technologically IT “arms race” will be and already is in superiority (predominance) attainment by main ES characteristics applied: awareness and intelligence.²

According to McKinsey’s³ estimation, this new IT technologies area in the nearest future will turn to be new sphere of economics, leaving behind oil and gas sector in the meaning of significance, with the difference, that “raw material” to be handled in this new sector will no longer be oil and gas, but huge and extremely fast growing scope of world data.

Therefore, there is need to build new type of “factories” to handle these new “raw materials”, that is ES.

Obviously, there are TWO threats to any national economics:

- a. Enterprises competitiveness loss, due to the absence of new decision-making technologies availability for such enterprises.

The problem is that contemporary ES at the moment are of teachable systems class, and in the course of operation the staff constantly upgrades and up-dates integrated automation means (“upteaches” and “uptrains” ES). ES competitive properties are defined by the whole of staff and ES quality.

Therefore, there remains a pending issue: availability of the staff, able to “upteach” ES in the course of operation in order to achieve the competitive advantages.

At the same time, as V. Rometty ¹ thinks, they do not teach such specialists in predictive analytics so far in the USA, but they are going to start teaching.

STAFF TRAINING PROBLEM TO DESIGN, OPERATE AND UPTeach ES IN PREDICTIVE ANALITICS AREA IS AN INTERNATIONAL ONE.

b. Economics Competitiveness Deterioration IN WHOLE in the case of drop out from the world division of labour (market share) in the new innovation economics sector: “ES MANUFACTURING” (building of “Factories” for “Raw materials” (Big Data). processing).

Despite the novelty and strangeness of the INTANGIBLE ASSETS NEW CLASS sector creation (teachable ES and service sector, connected with their education), as fundamental economics laws remain valid. Production volumes in this sector, as before, will be defined both by the NUMBER of the personnel and their LABOUR EFFICIENCY. Labour efficiency in the case of ES creation (as it used to be in the software engineering) will be defined by the automation means availability, intended for final product development from existed blocks of programs (earlier in the software engineering – high level languages, DBMS (Data Base Management System), transaction monitors, etc.)

Creating ES on the basis of commercially available platform (for example, IBM BIG DATA), the platform main components (more than 600) are positioned by the manufacturer namely as ES Development ACCELARATORS (speed-up). In other words, they can be treated as means of radical labour efficiency increase in the new “Manufacturing” (ES Production).

To sum up, in order to fulfill the demands in economics innovative development (for example, in the RF), as the experts estimate, in the nearest future there will be a great need in thousands of experts in the sphere of ES creation and development – the new generation of teachable computers.

The necessary (but not sufficient!!!) condition of the possibility to launch the above mentioned training of such kind of experts is the availability of access to the contemporary ES design automation facilities in the process of training: BIG DATA Platform – the ABC of the New Computing Competence, a construction kit for ES initial assembly. The standard requirements to the BIG DATA Platform functions are shown in Figure 1 (the left column), and the basic Program Products, meeting the above said requirements from IBM BIG DATA Platform toolkit – in the right column, Figure 1.

However, in order to answer the question – What else should the experts be taught in the sphere of ES additionally to platform technology knowledge, we have to remember, that market value as IT product has COMPETITIE DECISION .

Therefore, the experts, working for these sectors should be able to work with ES on the WHOLE, to estimate quality of decisions, made by ES, and be able to improve the quality of the decisions made in the course of ES life cycle.

Otherwise, the experts should have good command of knowledge and skill on the ES FUNCTIONALITY impruvement and bring-up it up to the desired level - to be able to teach ES both in subject area of accountable arguments composition (ES Information Awareness Improvement) and decision-making models on the basis of the information, collected in the subject area (ES Intelligence Improvement).

Requirements to BigData Platform Functions

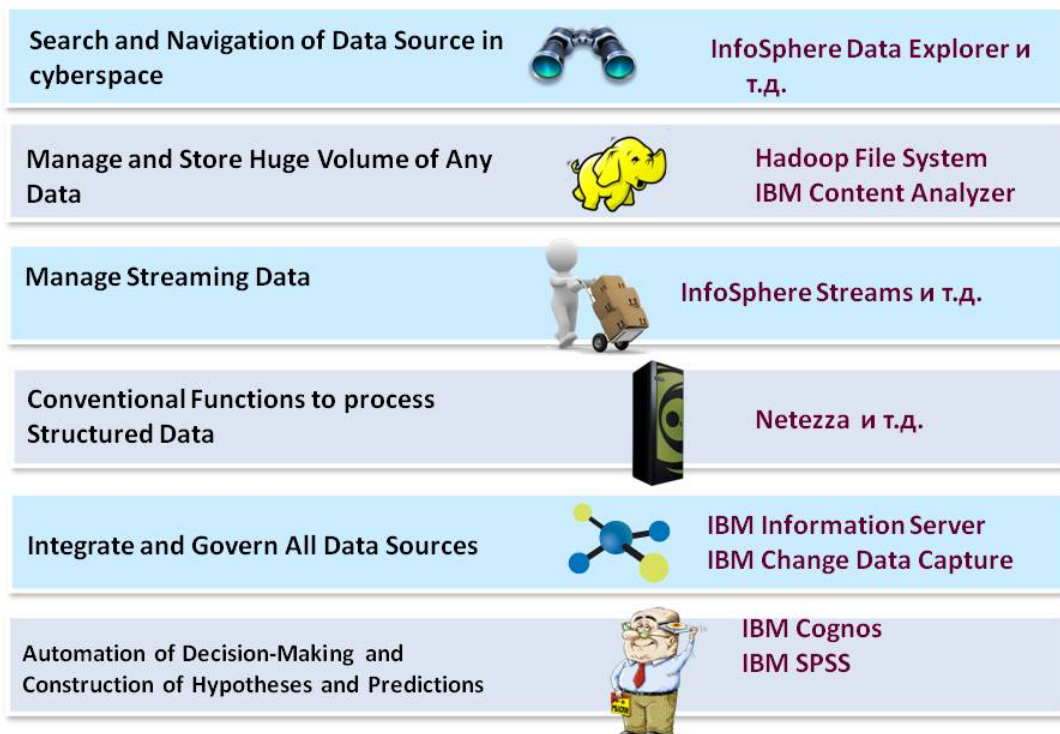


Figure 1. Requirements to BigData Platform Functions.

For better understanding of the ES teaching process details, let's refer to some simplest DECISION-MAKING SCHEME, from [2] shown in Figure 2.

Expert System Training Goals

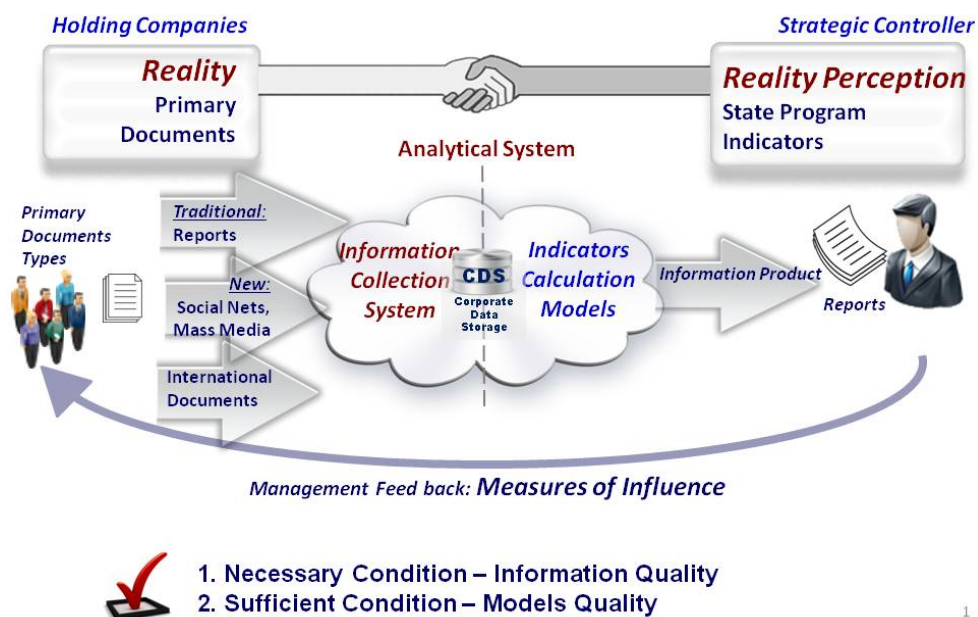


Figure 2. Decision-making Main Processes

Content of primary documents (Reality) is being collected and handled in a manner to suggest to decision maker (Holding CEO) information to make decision with no loose of important details of primary content (Reality Perception).

Appealing to common sense, it follows, that it is possible in principle to influence the decision quality in two ways: to expand number of sources of information of all the types in subject area, and to alter decision-making model on the basis of the information available.

Similar to adaptive control systems with feedbacks, it is possible to assume, that feedbacks usage both in information collection and in decision-making models could contribute to ES decision - making quality improvement.

Figure 3 shows one of the possible modern scheme of ES [2] that differ in multiple feedbacks at every ES operations. Obviously, that the personnel qualification requirements of the COMPUTER TEACHING creative team are defined by the specialists positions in the scheme Fig 3.

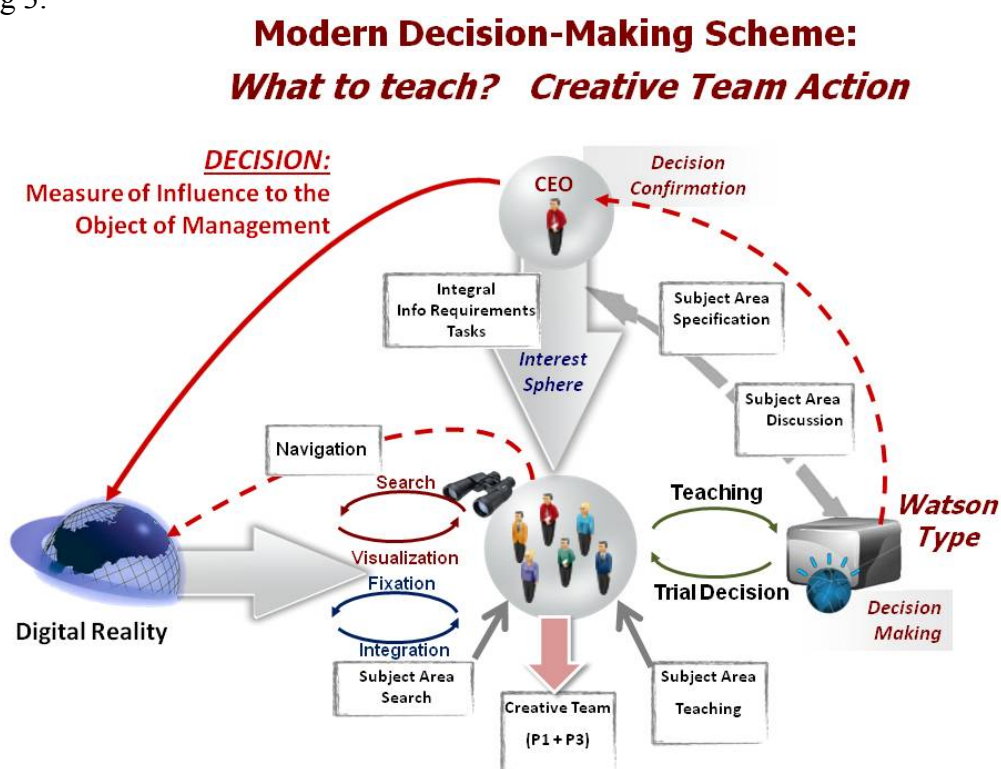


Figure 3. Modern Decision-making Scheme to be deployed in ES

Thus, the main requirements to the personnel knowledge and qualification of the computer teaching creative teams, drafted on the macro level, are the requirements to the ability to work with whole set of feedbacks, increasing the decisions quality of the TEACHABLE computer. In other words knowledge and skill of the TEACHER of the TEACHABLE computer.

Basically, it is going to be the old profession of TEACHER, but in the new reality, on the basis of new educational technologies and UNUSUAL STUDENTS (teachable computers). Dialectics.

Obviously, that to learn teacher, additionally to the theory of education, you need students to be taught: group of teachable computers.

To meet the demand of availability to such kinds of technologies, Competence Center (CC) of IBM BIG DATA Platform Technologies (ES Watson design base technologies) was launched by the EC-leasing company together with IBM in December 2012.

IBM BIG DATA Platform Products are represented in CC in the EC-leasing DPC (Data Processing Centre) in full scale, as well as main university IBM laboratory works on the primary training on the above mentioned products.

In order to get group of teachable computers, The Centralized Information Analytical System (CIAS) has also been launched, as shown in Figure 4.

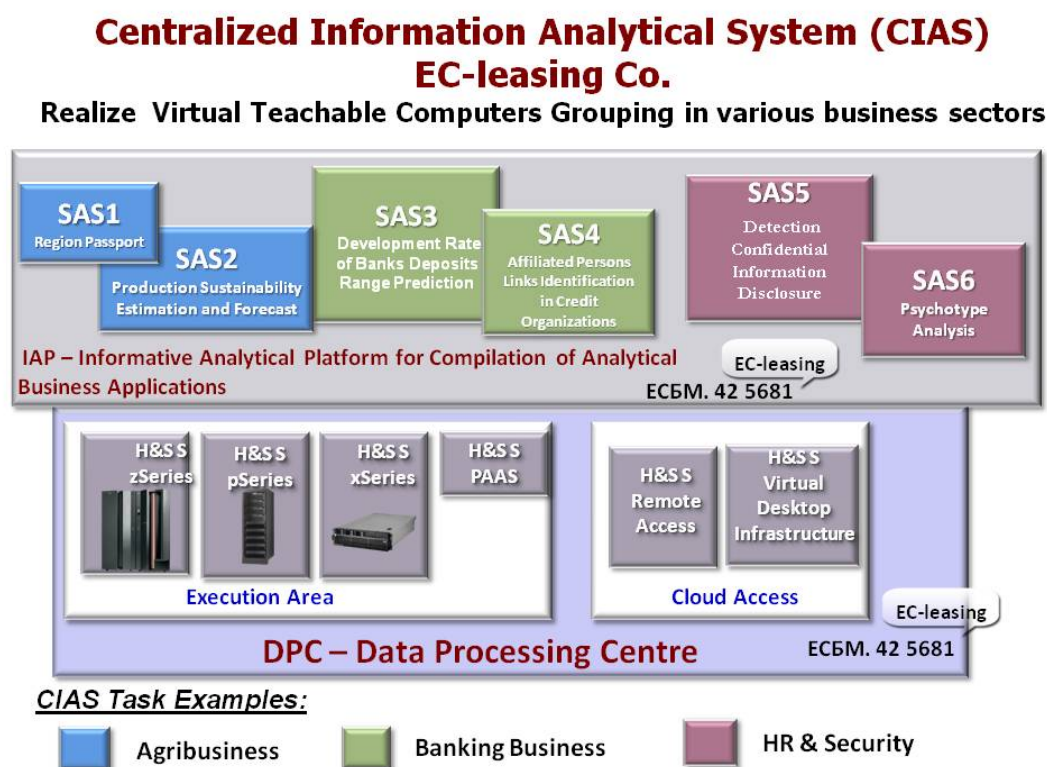


Figure 4. Virtual Teachable Computers Grouping for Educational Processes Drafting in various business sectors

Its basic components are:

- Virtual Teachable Computers (dark blue, green and red squares) for applications in different business areas;
- IAP (Informative Analytical Platform): runtime virtual environment of many teachable computers;
- DPC: Data Processing Center.

The teachable computers educational processes are being formalized in the laboratory works by the master's degree students and post-graduate students.

The Experts Training itself at the present moment is being arranged on the basis of the EC-leasing Base Chair "Informative Analytical Systems", founded in Highest School of Economics (HSE) National Research University in 2013.

Postgraduates, completed Master's course of study on the base of CC are granted with IBM Certificates, enabling them to work in IBM BIG DATA area.

Training on the EC-leasing Base Chair is characterized by the obligatory participation of the students under the guidance of the academicians as well as by the practical system engineering, implemented for the EC-leasing Customers.

The EC-leasing IBM BIG DATA CC is a base to carry out research, design and development works in the sphere of modern information analytical systems (IAS) engineering, including ES. The CC provides a wide range of services, aiding in BIG DATA

technologies conversion and in personnel training arrangement as well as IAS prove of concepts by customers.

From the point of view of the customers CC looks like it is shown in Figure 5: in the form of a powerful vacuum-cleaner of various data and their consequent processing in the interests of a great number of virtual teachable computers: customers applied problems, prototyping their execution and teaching their creative teams personnel.

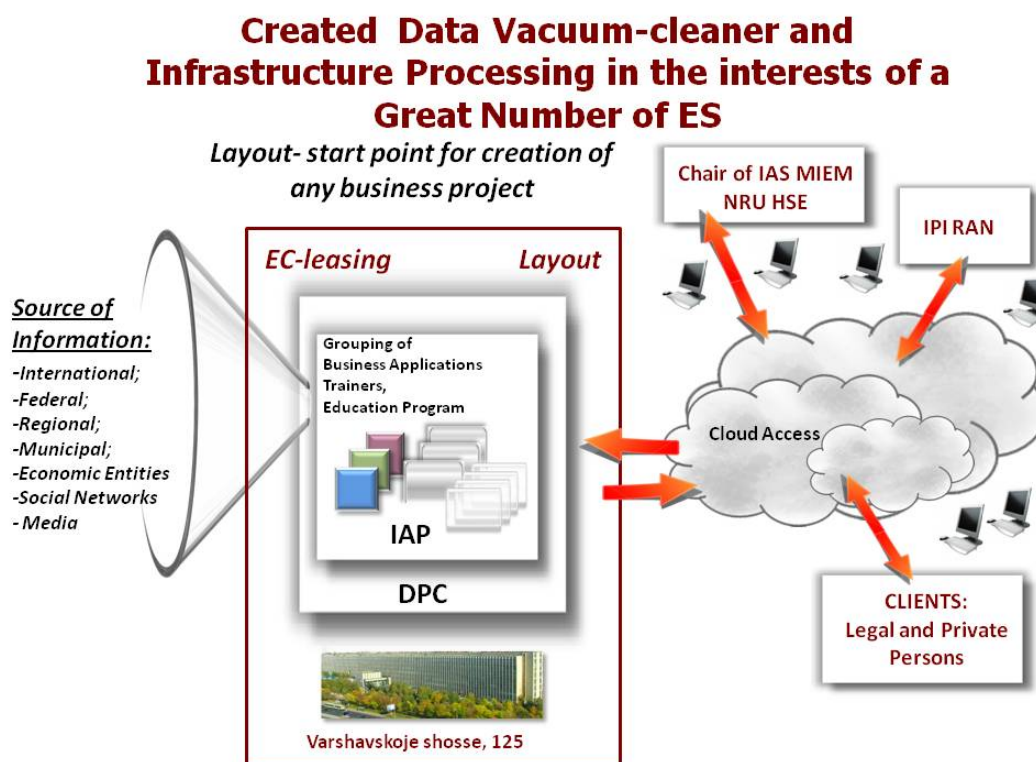


Figure 5. Full IAS cycle: from data sources to decision making was implemented for various types of businesses on the mutual IAP platform (CIAS). In use for teaching computers teachers.

Conclusions:

1. The ES Developers and Teachers labor efficiency plays the key role in the competition both for the corporative decisions quality and for the market share in the new economic environment. The Target labor efficiency can be reached only by the means of BIG DATA Platforms – large block construction kits for ES production.
2. BIG DATA technologies application brings into existence teachable ES, that differ from the current traditional ES by the decision- making shemes and upteaching possibility availability in the course of operation with the corresponding requirements changes of the personnel roles and qualification.
3. The experts training for the large block engineering and subsequent ES teaching requires that the staff under training get access to the ES as teachable computers, providing necessary skill and knowledge shaping.

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CREATION OF EFFECTIVE UNIVERSAL PROFESSIONAL DICTIONARY BASIS BY USING MULTIMEDIA COMPONENTS

Shuvaeva, E.I., Kazantsev, A.G., Popov, F.A.

Biysk Technological Institute branch of Altai State Technical University named after I.I. Polzunov, Biysk

Illustrative and graphical representation of knowledge fragments using sound, movement, color lets use such software as visual dictionaries for effective using it as a basis for dictionary of professional terminology subspecialties.

Development of whole framework of that kind software is very difficult, and in this regard, the problem of creating a simple, understandable and the most effective basis for the creation of specialized dictionaries is relevant. We need a system that allows us to change the specialization of the dictionary, by changing only its content.

Keywords: visual dictionary, terminography, multilingualism, visual memory.

Enhancing the role of communication in the modern world, with the active development of relations between people of different countries, speaking different languages and dialects, requires development of effective materials for the translations.

English as an international language has accumulated an impressive base of general and specialized terms, for which there are a large number of dictionaries. As for the Chinese, there is the problem of their absence. Due to the fact that currently many sciences are developing actively, often take place difficulties in translating highly technical terms, especially those of them that appeared in use lately.

Most of the Russian - Chinese dictionaries are collections of common terms and a small portion of specialized. At the same time for such difficult language there takes place a problem of remembering.

Development of many sciences is happening rather fast, so, paper dictionaries are quickly becoming obsolete. Besides, books take up much space and in the age of ubiquitous computerization they move sidelined. All this leads to the creation of their electronic substitutes. Electronic dictionaries are software products having in their composition a database defining the theme of a dictionary, and various media objects for easy understanding and memorizing of different terms.

Because specialized communities are multilingual, it pays much attention on terms translation and texts majoring in a foreign language. As terms there are used both specific words used only in a given subject area, and special values of well-known.

Terminography is one of the most important human activities in the field of terminology, its tasks are organizing, streamlining and standardization of scientific terminology. According Z.I. Komarova at the beginning of the 80s there were isolated and named 12 million of names of objects (mostly special). At the same time they are adding

more than 200,000 every year. Thus traditional science doubles and triples its logical-conceptual capacities, resources and new sciences are generated and formed.

Distinguish 3 types of qualitatively different terminological dictionaries:

- 1) general scientific and general technical
- 2) industry glossaries

One of the most important conditions for the formation of the vocabulary and terminology dictionary is preliminary modeling of logical-conceptual system for industry knowledge of that dictionary. Dictionaries as we are accustomed to see them are ineffective in training highly specialized foreign terms. In this regard, a good option is to use human visual memory - namely, the creation of visual or otherwise illustrative dictionaries.

In recent years, the framework of modern linguistics considerable interest grew in side of non-verbal means of communication, so-called "visual information ". The greatest attention of researchers in modern visualization attracts ratio verbal (verbal) and visual (non-verbal) components. There are many definitions of visualization and its species, and methods and areas of its application. Visualization (in the broadest sense) - is the process of presenting data in the form of images in order to maximize ease of understanding, making visible for every conceivable objects, subjects, processes, etc.; mechanical creation of the image , creating a clear, stable and vivid images of any complexity and specificity (as actually existing, or created in the mind of the author) using technical devices or mental images (thought forms) directly into your mind (mental visualization) [1].

Visual memory linked to the preservation and reproduction of visual images. It is extremely important for people of all professions, especially for engineers and artists. In particular, the process of remembering and reproducing material is based on it: that people can visually imagine it is usually easier to remember and reproduce. [2] Carefully selected visual images can accurately capture the meaning of (the correct translation) words that are memorized. [3]

Illustrative and graphical representation of knowledge fragments using sound, movement, color lets you use all reserves human mental activity.

With the visual dictionary memorization of words occurs not as an abstract object, but as an association with a certain image. Dictionaries of this species based on the principle of the alphabet: graphic support terms as well as the presence of voicing their pronunciation, form a wide range of mnemonic techniques for the introduction of a foreign language in the depths of memory.

Thus, the use of visual base in the development of visual dictionary of a narrow sector is not only justified, but also efficient in terms of memorizing new terminology and concepts.

According to the pithy multimedia aspect of modern electronic dictionaries should have videos, sound pieces, fixed or animated illustrations voiced pronunciation, which is a big advantage over paper dictionaries and paper textbooks, since the concept of an electronic dictionary itself, has unlimited possibilities in terms of multimedia technologies that should be used to the fullest. Their absence does not give sufficient effect in the perception of foreign language material, studying it, reproducing and translating, not only for professionals but also the general population, using online dictionaries. [4]

Among the currently used visual dictionaries worth noting the following:

- 1) LanguageGuide. Its distinctive feature is the presence of sound to all terms in all supported languages dictionary. The disadvantage of this dictionary is absence of a list of all the terms, as in the usual form of dictionaries. In situations where the user will need to see and remember the translating of existing words in front of him, it will be difficult to find, since it will be necessary to review all sections of the dictionary until you find an image with the sought-for term.

2) Visual Dictionary Online is a visual English Dictionary, containing over 6000 beautiful visual illustrations. The disadvantage is its monolingualism, thereby, it can't be used as a translator or as a basis for constructing bilingual dictionary.

3) The Visual Dictionary project. For each word builds his conceptual environment with support of moving through its semantic environment, using a visual interface. If you use this dictionary doesn't arise associative links with the object as there are no illustrations to display terms.

Based on the IS Borozdina's experimental visualization of spatial scenes by native English and Russian languages, we can conclude that the using of experimental techniques such as verbalization of spatial scenes and visualization lexical expressions, is very promising in the linguistic and cognitive modeling different kinds of concepts, identifying the basic mainstays of conceptualizing ambient peace and lexical selection method of expression of different formats of knowledge. [6]

It must be emphasized that the visual support in the dictionary of professional communication in a foreign language makes more efficient of using it, facilitating memorization and learning material. [2]

In developing the dictionaries it is also necessary not only to correctly represent textual material, but also solve the problem of technical maintenance of diverse information: different languages, fonts and encodings. Especially clearly the problem is traced in creating Russian-Chinese materials. In process of this translating problems with the encoding arise. This is due to the fact that the Chinese language has hieroglyphic writing. In this regard, it can be assumed that indicated problem is the main reason for the small number of Russian-Chinese dictionaries. At the same time specialized samples have a standard structure and more effective visual vocabulary limited to the common words.

According to a V.V. Morkovkina's ideographic analysis of various dictionaries, it may be noted structure of Duden's paintings dictionary. It consists of three parts:

- 1) a subject index;
- 2) an illustrated part;
- 3) an alphabet index

A subject index also serves up the classification of dictionary. The mechanism of the dictionary is very simple. If we do not know the name of the object, but guess as to which subject group it belongs to, a subject index will help us. It sends us to the table, and it will lead us to the desired name. If, on the contrary, we know how to spell the word, but have forgotten what it means an alphabetical index sends us to the table, which shows the item. Duden's dictionaries are particularly useful for those who wish to read the professional literature in a foreign language. [7].

In this regard, today is a very urgent problem of creating a unified, simple, understandable, and the most effective basis for the creation of specialized dictionaries. We need a system that allows us change the identity of all the dictionary to one sector or another by changing only its content, without the development of the whole framework. Thus, the system has to be projected from a plurality of the glossary, as an usual searching tool of available terms and visual dictionary for representation and memorization its translation, as well as of associations with other related concepts.

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DESIGNING EDUCATIONAL PORTALS IN THE MODERN INFORMATION AND COMMUNICATION SPACE

Shvetsov, A.I.

Ufa State Aviation Technical University

The article is dedicated to designing education portals, to using modern information and communication technologies by higher education institutions for solution daily tasks, to legal aspects of designing portals, to innovation methods of designing.

Keywords: innovations, education portal, taxonomy, folksonomy, faceted classification.

Contemporary Russian educational trends are characterized by a policy of the transition from a traditional dogmatic and over-regulated training to an innovation active educational process. The sharp increasing popularity of interactive communication in the Internet (f.e. chats, forums, conferences) is one of the indicators of that policy.

Vladimir Vladimirovich Putin has announced the number of Internet users at a meeting with deputies in the State Duma. This number has reached 50 million people. According to facts announced by the President, around 70 million people used the Internet in 2013. According to different sources, there are about 580 thousand Russian sites in the Internet. Including 79 thousand educational projects that is 13% of all Internet resources [1]. Thus there is increased interest to creation their own portals by educational institutions of different levels.

Now, it's impossible to imagine a higher education institution without its own official site. And if in 1990s a web resource performed a function of presentation an educational institution in a small network community, then nowadays it became an actual instrument of educational, scientific and economic activity in the high school.

During the informatization of a society and its institutions the need in active using of modern information and communication technologies for solution daily tasks by higher education institutions becomes evident [2]. The system of a university educational portal can't exist without:

1) support on federal laws (Federal Law of 29.12.2012 No. 273-FZ "On Russian Federation Education") and resolutions of the government (Resolution of The Government of The Russian Federation of 10.07.2013 No. 582 "On approval Rules of the placement and the update information about an educational

organization on the official site of an educational organization in the information and telecommunication network “the Internet”);

2) support on the lower-level portals (f.e. faculty portals, independent sites, information educational communities) which function in the framework of a single information space of one University.

Information back feed is the most important component of any educational portal for its successful functioning. During the filling of the educational and scientific content, a University portal should use potential of all educational community of the University subdivisions and chairs (picture 1) which take into account specific regional (picture 2) and professional components [3].

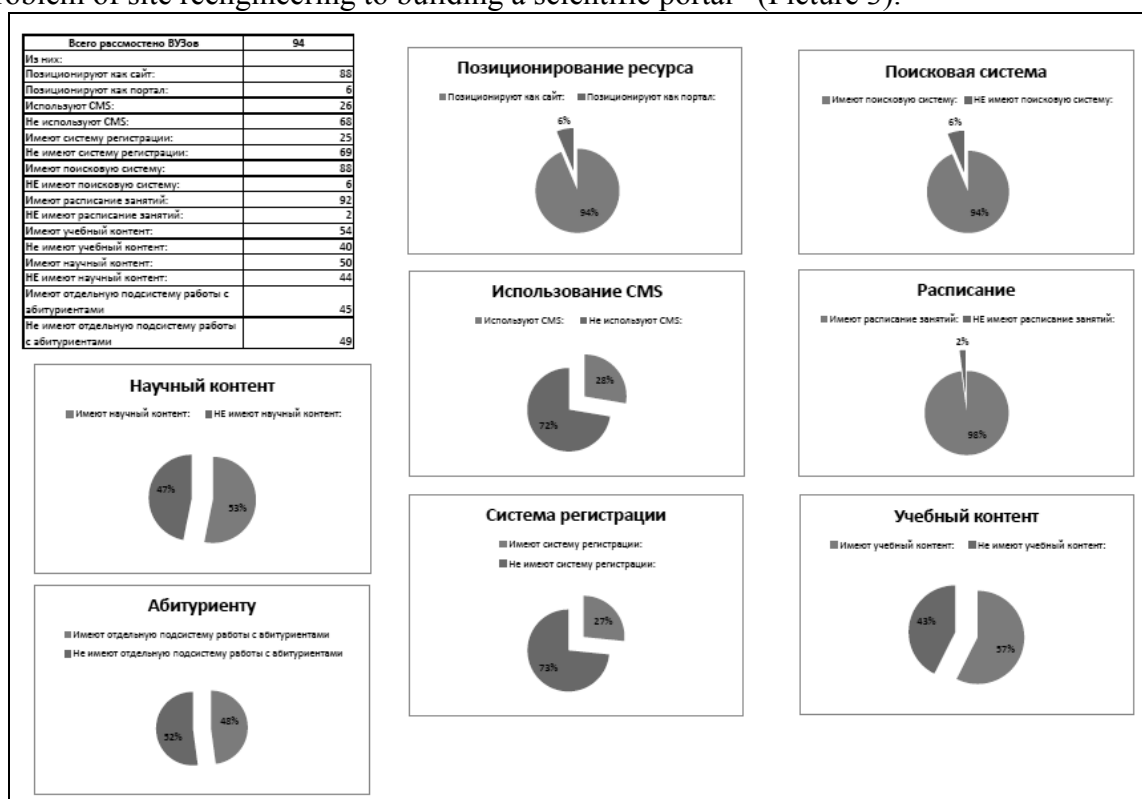


Picture 1 - The learning content of USATU



Picture 2 – The official site of BSU

A competition between higher education institutions because of students and investment actualizes the problem of modernization their official sites and, frequently, the problem of site reengineering to building a scientific portal (Picture 3).



Picture 3 – Comparative analysis of higher education institutions of the Russian Federation

Higher education institutions' annual rankings have a significant impact on the flow of students and financial investments to one or the other higher education institutions or even to one or the other country. Nowadays, there is a growth of popularity of higher education institutions' global rankings [4].

At the November of 2013 the Webometrics ranking was introduced on the third meeting of International Rankings Expert Group (IREG) (Picture 4).

This ranking is formed with according to the criteria of fullness, level of support and the popularity of the websites of universities. And it's possible to reach these indicators only with using new approaches in formation content of a portal and with attraction target audience to the portal. Most of the Russian higher education institutions sites needs to learn how to solve exactly these tasks.

Innovation methods of science portal content's organization and placement are associated with changes in the Internet for last 5 years. So, for example, if before during creation a web resource the method of taxonomy (a hierarchical or tree structure) was used for an information organization in this web resource, then now the method of faceted classification (several independent classifications that are performed at one time on different grounds) is increasingly used for the same purpose [6].

The traditional approach in content organizing on kinds of higher education institution activity (sections "Training", "Science" and so on) clearly demonstrates taxonomy. A disadvantage of this approach is that an object in such classifier may be linked only with one

node of a hierarchy and it's impossible to describe all required qualities of the object with aid of such structure.

ranking	World Rank	University	Def.	Presence Rank*	Impact Rank*	Openness Rank*	Excellence Rank*
60	3081	Moscow Aviation Institute University of Aerospace Technology / Московский авиационный институт (национальный исследовательский университет)	»	7586	3040	5175	3510
61	3098	Krasnovarsk State Pedagogical University / Красноярский государственный педагогический университет В.П. Астафьева	»	3122	1836	2215	5080
62	3122	Southwestern State University Kursk / Юго-Западный государственный университет Курск	»	4377	2274	4181	4440
63	3131	Murmansk State Technical University / Мурманский государственный технический университет	»	4539	1815	3736	5080
64	3146	(1) Russian State University for the Humanities / Российский государственный гуманитарный университет	»	1674	1918	2710	5080
65	3148	Modern University for the Humanities / Современная гуманитарная академия	»	6595	1805	3663	5080
66	3182	Ufa State Aviation Technical University	»	5530	4916	2516	2540
67	3197	(1) Tambov State Technical University / Тамбовский государственный технический университет	»	3498	2455	1680	4440
68	3220	(1) Saint Petersburg State Electrotechnical University / Санкт-Петербургский государственный электротехнический университет	»	268	4846	3583	2810
69	3236	Kazan (Volga Region) Federal University / Казанский (приволжский) Федеральный Университет	»	1089	6690	976	1952
70	3262	Kemerovo Institute of Food Science and Technology	»	1146	2023	4345	5080
71	3326	Moscow State Civil Engineering University	»	266	2201	2679	5080
72	3343	Samara State Aerospace University	»	2928	3297	3386	3863
73	3401	Russian State Medical University / Российский национальный исследовательский медицинский университет Н.И. Пирогова	»	7837	5303	3178	2540
74	3418	Russian New University / Российский новый университет	»	7489	2062	4541	5080

Picture 4 - Webometrics ranking [5]

According to faceted classification on the site, an additional navigation (for example, navigation on the kinds of target audience: sections “For Entrants”, “For Students”, “For Postgraduate Students”, “For Teachers”, “For Graduates”) is offered to the already existing one. Faceted classification improves usability of a resource, allows for different categories of users to find required information quickly.

The most innovational, for the Internet, method is called as folksonomy (the practice of joint categorization information through labels, also known as tags, that are choosed arbitrarily). However, already usual and familiar for Internet users “tag cloud” (also is a sign of folksonomy in the site) is not met on higher education institutions portals yet. It is connected with:

- 1) necessity of fundamental restructuring of a website content management system;
- 2) absence of any structure in the approach, i.e. there is not any elementary relationships (f.e. genus-kind) between objects.

Thus, the best way is a combination of folksonomy and taxonomy that is allowed organize more useful and semantic navigation. Folksonomy and taxonomy analysis is successfully used in the modern web projects (Picture 5). It hasn't found its implement in the higher education portals yet.



Picture 5 – The official site of winter Olympic games “Sochi 2014”

For a short period of time, the user of web resources from an information consumer became into a manufacturer of information. Technologies, that allow a user not only to read a content but even to create it, are appeared in modern sites. Intuitive interface, simplified system of publication are allowed to place required information in the Internet by just one click. Development of social networks allows to find required and interesting people easy and quickly, to establish and support a communication with them, to expand the circle of friends stimulating with that your own professional and creative development.

Nowadays it's necessary for University sites to very quickly react on changing of the information and communication space. This will allow them to find and to keep their own target audience, to involve the intellectual resources, to hold a strong position in the high competition market of science-intensive technologies and educational services.

Inculcation a blog, wiki, tags and gadgets to the higher education institution site is not enough to the successful solutions the above-mentioned tasks. University site should socialize itself in the Internet community: f.e. to prove itself in the largest domestic and foreign networks, to attract its own teachers and students to formation of an actual content [7].

Support service of the University site in addition to purely technical tasks should organize the process of perspective planning of the site development, should find and explore new forms, technologies and methods of work with the needs and interests of the target audience, should contribute to the development of ICT competences the site users.

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SOCIAL NETWORKING IN EDUCATION

Krukier, L., Muratova, G.

Southern Federal University, YUGINFO Computing Center at Southern Federal University

In the 21st century, the Internet has dramatically penetrated almost all spheres of human life. Various Internet services, such as e-learning resources, distance learning, online courses and contests, interdisciplinary research and laboratory projects, online teaching aids and materials for students, have become widely used in high schools and universities. This trend is most likely to be enhanced in the future due to development and implementation of digital education methods. However, teachers have no clear-cut guidelines as to what principles should underpin the creation of educational online resources. In particular, there is still a lot of ongoing controversy over which approach should be considered the most appropriate: to create and develop specialized educational resources (the most popular point of view), or to opt for existing popular platforms.

According to Klimenko's (2012) article "Social Network Sites as a Means of Learning and Interaction between Participants of the Educational Process" (<http://www.moluch.ru/conf/ped/archive/21/1799>), a social network has the following features:

- Identification, i.e. an opportunity to provide information about oneself (school, college, date of birth, hobbies, books, movies, skills, etc.);
- Presence on the site, i.e. an opportunity to see who is currently online and to interact with other participants;
- Relationships, i.e. an ability to describe a relationship between two users (friends, family members, friends of friends, etc.);
- Communication, i.e. an opportunity to communicate with other members of a network (like sending private messages, commenting on materials);
- Group formation, i.e. an opportunity to form communities of interest within social networks;
- Reputation, i.e. an opportunity to find out the status of other fellows and to track down their behavior on a social network;
- Exchange, i.e. an opportunity to share one's materials with other participants (photos, documents, links, presentations, etc.).

Although tens of millions of schoolchildren and students have been caught in these social "networks" in every sense, it would be highly unreasonable and pointless to drive them out. In this situation, it makes more sense to apply an ancient principle of "what one cannot prevent, one should head" meaning that we should utilize the potential of existing popular social networking websites as a tool to address educational goals.

The proponents of specialized educational resources (the authors of the article belong to them too) believe that when educationalists turn to social networking sites that cater to a general audience, they might find it hard to switch students' attention into the learning mode. It would be like inserting educational videos into a classic detective movie - educational snippets are bound to be ignored. But if one makes an educational film based on the laws of a detective story, there is some hope to get the effect one is aiming at. In our case, it means to take an advantage of general interest social networking websites and use them for educational purposes.

The current Russian Federal Education Standards have established a fundamentally different approach to teaching at a secondary level: aiming at an activity-based model rather than at a knowledge-based one with an emphasis on interdisciplinary collaboration; introducing more research components and hands-on activities; honing collaborative interpersonal skills in new conditions. This complex mode of learning fosters student's critical thinking and autonomy while they are analyzing experimental data and making logical inferences.

Inasmuch as the traditional format of school lessons remains unchanged, the experimental learning still appears to be a challenge. Educationalists are not trained in using new methods and technologies; resources are limited too. More often than not teachers find it hard to pick a specific experiment that can be integrated with the standard school curriculum.

Thus, there has arisen a need to develop new methods and materials. There is no denying it that the Internet allows for the most convenient location for them.

The authors of this article have conducted a study of major Russian digital educational resources according to the below-mentioned criteria. The focus of the study was the largest pedagogical networks whose main task is to enhance teaching and learning with IC technologies.

The following criteria were applied to estimate the resources:

- 1 - Target audience of the resource (teachers \ students \ parents);
- 2 - Full compliance with Russian educational standards;
- 3 - Social networks components;
- 4 - Opportunity to carry out one's own creative and research projects;
- 5 - Interschool, regional and international collaboration;
- 6 - School documentation management;
- 7 - Availability of software and teaching materials;
- 8 - Opportunity to create individual web pages;
- 9 - Distance learning;
- 10 - Availability of additional paid services.

The social networking website which has scored the highest is the GlobalLab global student laboratory.

One of the major innovations in the new federal educational standards is the requirement to demonstrate academic achievements not only at the subject matter level but also at a meta-disciplinary and personal development levels. Meta-disciplinary performance involves student accountability in setting goals and planning ways to achieve them, to consciously choose the most effective ways to address educational and cognitive tasks. It is also supposed to bring about a skill to organize cooperation, to work individually and in groups, to find a win-win solution and to resolve conflicts, to negotiate and defend one's

opinion. As the practice has shown, meta-disciplinary results cannot be achieved within the framework of the traditional educational process with its class lessons system. It is necessary that project work be applied to the curriculum as well as to extra-curricular activities of students. To implement such a transition, the school has to solve a big number of organizational, methodological and technological problems. The GlobalLab global student laboratory, a young ambitious project, has come up with their own solution to such problems.

The core mission of the GlobalLab project is to promote students' collaboration in joint (including international) research projects in all school subjects. Instead of the traditional passive way of getting knowledge from textbooks or teachers, students are motivated to actively construct knowledge by collecting experimental data, identifying patterns, and "discovering" the existing laws.

GlobalLab addresses teachers' needs, too. It has become a specialized source of ideas, a pool of project templates, and a library of teaching materials. All of these aspects allow for an optimal integration of the practice-oriented research into the fabric of school lessons.

All project participants share their data with each other and analyze their findings together. Students have an opportunity to work with different amounts of data in order to identify major trends, norms, and deviations of the phenomenon under study. They do research in teams of like-minded people which not only broadens their knowledge but also develops critical thinking and logic. Moreover, when they familiarize themselves with the work of other teams, both Russian and international, GlobalLab fellows think of themselves as a part of a global students' research community.

In September 2013, GlobalLab launched a new platform <http://globallab.org> that implements advanced IT- solutions. All in all, GlobalLab has created all possible conditions to provide a safe and comfortable work environment for researchers of all ages: all the published content is subject to thorough moderation; each project has an academic adviser (a teacher or a scientist) who, when necessary, can interfere and get the process back on track.

Due to its structure and high functionality, GlobalLab fully meets the requirements of the new federal educational standards and provides cutting-edge contents for the theoretical framework suggested by the Federal Educational Standards.

Article / Engineering - Computer Science, Computer Science and Automation

UDC 004

REVIEW OF SIMULATION METHODS

Lazareva, A.A.

Balakovo Institute of Technic, Technology and Management, SSTU

In this work we consider the notion of simulation, simulation methods, as well as the most common method of statistical simulation (Monte Carlo).

Keywords: simulation, simulation methods, the Monte Carlo method.

Currently in high school educational process used active forms of learning, including business games. At the heart of gaming domain model, which is training ground for future professionals. Modern business games are complex software and teaching tools that are being developed complex: meaningful content, mathematical, software and methodological support [1, 2, 3, 4, etc.]. We should pay special attention to the creation of a mathematical model, so analyze the modeling techniques.

Simulation modeling - a method of research, allowing the model to replace the system under study in order to obtain information about the system. This model is the most detailed and accurate description of the real system, with which experiments are conducted.

Simulation modeling is a definite alternative to mathematical modeling. This type of modeling is the best or only way to study complex systems.

The main methods of simulation include:

- analytical method
- method of statistical modeling
- the combined method (analytical-statistical) method.

For small, simple systems in which there is no element of chance, the analytical method used simulation. This method is called the conditional, as it combines the capabilities of process simulation model is obtained in the form of a closed analytical solutions, or solutions obtained by the methods of computational mathematics.

If you build an analytical model causes difficulty or impossible, the method of Monte Carlo. This method is one of the most widely used. Statistical method was originally developed as a method of statistical tests. This - a numerical method consisting in obtaining estimates of probability characteristics that coincide with the solution of analytical problems. Subsequently, this method was applied to simulate the processes occurring in the systems within which there is a source of randomness, or which are subject to random influences. It was called the Monte Carlo method. If the condition of the problem is an element of uncertainty, then solve this problem allows the Monte Carlo method.

By combining the advantages of analytical and statistical modeling techniques can distinguish combined simulation method. In developing the model, which consists of various modules, representing the totality of both analytical and statistical models that interact as a whole, applies analytical- statistical method. Moreover, in a set of modules may include not only the modules relevant dynamic models, but also modules corresponding static mathematical models.

The most widely used method of statistical simulation (Monte Carlo). In all cases where the functioning of the system simulation is carried out under conditions of random influences and interference experiment acquires statistical in nature, since the processing of the simulation results should be estimated using statistical methods.

Currently, this method plays a major role in computer statistical modeling of technical systems. To use this method, you must properly adjust the form (shape) of the model and prepare the simulation as an integral part of the study. Statistical Monte Carlo simulation allows you to manipulate a large set of data to determine the logical structure of the model and perform mathematical operations.

Monte Carlo method refers to the exact method because it does not use simplifications of the original problem, which reduces the accuracy of statistical modeling. Its accuracy is determined only by the number of calculations, but the method of their implementation. Instead of model parameters it normally uses the principal components whose values are obtained by using a random number generator with a normal distribution [5].

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STUDY OF ADAPTIVE INFORMATION AND COMMUNICATION TECHNOLOGIES IN THE SCOPE OF ADAPTED EDUCATIONAL PROGRAMMS OF INCLUSIVE EDUCATION FOR DISABLED STUDENTS

Martynova, E. A, Romanenkova, D. F.
Chelyabinsk State University

The article is devoted to adaptation issues of educational programmes of professional education for students with disabilities. Among special adaptation programmes we highlight the "Adaptive information and communication technologies". Problems of studying of given discipline, its content, terms and factors of implementation are covered.

Keywords: inclusive education, education accessibility, adapted educational programm, disabled and physically challenged people, adaptive information and communication technologies.

The Federal law on the "Education in the Russian Federation" defines inclusive education for disabled and physically challenged people as the right of equal access to education for every student considering special multiple needs and personal abilities. For this purpose, the federal state educational standards of higher and vocational secondary education contain special requirements which provide access to education for abovementioned people.

An essential requirement is the one that excludes any disparity or other out of the federal state educational standards of higher and vocational secondary education towards disabled and physically challenged students who study with other students. This refers to the qualification (specialty, profession) specific, graduates professional activity specifics, educational programm structure requirements and learning results [1].

The subject of education, educational facilities for disabled and physically challenged students are specified by the adapted educational programm. Adapted educational programm is an educational programm that was adjusted to the educational needs of disabled and physically challenged students considering their psychophysical development, individual abilities and providing improvement of impairments and social integration of above mentioned students.

Adaptation of educational programmes of professional education is implemented through integration of special adaptation disciplines (modules) into the variable part of the curriculum, extending of competence, special material and technical support of the education process, special methods and techniques, teachers training, including tutors, mentoring system.

Let us state some principles of adaptation of educational programmes for students with disabilities [2]:

– effective implementation of education programm is defined by the level of organization of special educational and rehabilitation environment in higher education institution;

– the adaptation process of educational programm is variable which provides individual approach by differentiating the forms and methods of education according to individual and physical characteristics of people with disabilities;

– adaptation of educational program is oriented to the development of positive characteristics of individual, his/her needs of self-organization, self-determination and self-development.

Material and technical facilities which encourage development of information processing abilities and competences play a very important role in inclusive education.

The processing of educational information and even the whole receive-transmit process should be organized through special technical and software tools which convert the information into such a format that is easy to understand by sensory and locomotor challenged people.

Let us define the restraints of living activity for students with disabilities which exclude them from standard process of information receive and transmit. For students with hearing disorders we refer to information receive challenges (acoustic analyzer disorders), information transmit disorders (speech disturbance), serious restraints in communication, low speed of information uptake, challenges in listening comprehension, eye-mindedness, etc. [3] Speaking about students with vision disorders we mark insufficient speed of information perception and attention switch, attentional capacity and sustainability which are the result of information volume reduction, challenges with memory image-build ability.

To compensate the vision disorders it is important to use information from all active and impaired analyzers. The restraints for students with locomotive disorders are connected with agenesis, disorder or loss of motor function which is accompanied with slow and improper eye-hand coordination. The students with cerebral palsy have motor, mental and speech disorders. The students with somatic disease have problems with social and psychological adaptation, social contacts, high emotional and stress pressure which demand personal approach to education.

To overcome above mentioned problems we need to include special adaptation disciplines into the curriculum, which means to include such disciplines that form educational skills, improve communication skills through special compensatory techniques of information receive and transmit, social and professional adaptation. Special adaptation disciplines are aimed to form the competences that are established in the federal state educational standards of professional education. Education for students with disabilities is impeded in standard educational process and has its own features.

Information and communication technologies for general and special purposes help to remove above mentioned restrictions and provide access to education. Information and communication technologies are used to solve the following issues [5]:

1. Compensatory issues: technologies help to compensate shortage of natural skills and optimize the process of information perception, provide studying facilities.

2. Correctional issues: give more opportunities for correctional and studying process in such directions as diagnostics and monitoring of students' knowledge, competence, experience improvement, restoring and replacing of lost or impaired abilities.

3. Didactic issues: achieve intellectual and creative potential of students; provide necessary facilities for implementation of modern educational strategies and performance rating, including distance education technologies.

4. Communication issues: technologies play intermediate role in communication process, or even become the only way of communication with the world.

To implement educational, communicative, developing, compensatory, socializing functions of information and telecommunication technologies we introduce the “Adaptive information and communication technologies” discipline into the special adaptation disciplines.

By adaptive information and telecommunication technologies for disabled and physically challenged people we mean the complex of general and specific technical and software facilities which are to provide accessibility of information receive-transmit methods, compensate physical restraints, support cooperation with other people using alternative means of communication as well.

The aim of such educational discipline as “Adaptive information and communication technologies” is to let students with disabilities learn the complex of theoretical and practical skills of using general and specific information and telecommunication technologies, special technical and software facilities for effective educational process and future professional activity not depending on physical restraints or location of educational institution.

The aims of the discipline are to:

- Let students know the advantages of using information and communication technologies in learning process;
- Form the ability to choose among general and special information and communication technologies and use them effectively depending on the type of physical disorder;
- Develop cognition interest, intellectual and creative abilities through the use of information and communication technologies in learning process;
- Help to gain the experience of interaction with special information and communication technologies in individual and team work in education process and at work;
- Form the ability to use alternative means of communication in educational activity and future professional career.

As the result, after studying “Adaptive information and communication technologies” the students should:

Know:

- Principles of contemporary information technologies of various data processing (text, tables, images, etc.);
- Actual level and directions of development of technical and software facilities, general and special;
- Methods of using surdotechnical facilities of rehabilitation (for students with hearing disorders);
- Methods of using blind treatment facilities (for students with visual disorders);
- Methods of using computers equipped with alternative input-output devices (for students with locomotor disorders).

Be able to:

- Work with general software facilities that meet all modern requirements;
- Use personal hearing aid and sound-amplifying aids (for students with hearing disorders);
- Use Braille technology, video magnifying devices, speech synthesizers, nonvisual access devices (for students with vision disorders);
- Use adapted computer devices, alternative information input-output devices, special software (for students with locomotor disorders);
- Choose the type of information representation according to educational issues;
- Illustrate the paper works using information technology devices.

Acquire skills of:

- Information search and conversion into the format that is appropriate concerning a particular physical impairment;
- Using acquired knowledge and competence in educational process and future professional activity for more effective arrangement of personal information space;
- Using special information and communication technologies in individual and team work during education and at work;
- Using alternative communication facilities for educational and future career purposes.

The discipline offers to study general information and communication technologies, assistive technologies which help to compensate functional limitations, alternative input-output devices, auxiliary devices, auxiliary and alternative software facilities.

Estimated workload of the discipline is three credits. It is arranged for 1-2 semesters. Given discipline is elective and suggest different content differentiated according to physical impairments.

Material and technical facilities include:

1. Loudspeaker equipment, multimedia devices and other technical facilities of information input and output which are appropriate for students with hearing disorders.
2. Braille computer devices, electronic magnifying glass, video magnifying devices, nonvisual access devices, speech synthesizers and other technical input and output facilities of information representation for vision impaired students.
3. Computer devices adapted for people with disabilities, with special software, alternative input-output facilities and other technical devices of information representation for locomotor impaired students. [4]

It is effective to use creative tasks, projects, role playing, case study, point rating system as the way and method of developing and scoring the competences which the discipline is aimed to form.

Studying of “Adaptive information and communication technologies” helps to form cultural and professional competences established by the federal state educational standards. The result is ability to use general and special information and communication technologies by students with disabilities for educational and future career purposes, the ability to use modern communication methods and technologies considering physical restraints.

Network form of adapted educational programmes of inclusive education for disabled and physically challenged people improves efficiency of implementation which can be provided by those educational institutions that are properly equipped with material and technical facilities and have experience of teaching physically students with disabilities.

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THE EFFECTIVENESS OF EDUCATIONAL RESOURCES

Remarenko, S.A.

Russia Balakovo, BITTU

Educational resources - are materials that are publicly available, have an open license and can be used for teaching, learning or research [1, 2, 3, etc.]. These resources are often used in remote or outdoor training. Their content may include: course materials, content modules, learning objects, collections and journals.

For educational resources include sites «Information Support exam." On these sites, get the resources with respect to the Unified State Examination (USE), which contain instructions for preparing the exam, as well as his conduct. These educational resources allow familiar with statistics that include test scores from different disciplines and state regional education systems. There are also sections that contain information about the type and content of jobs, recommendations pedagogical and psychological, information on universities that accept students on the results of the Unified State Exam. All these aspects allow graduates and teachers of the schools to be as knowledgeable as possible and be prepared to pass the exam.

The next type of educational resources related to the sections of distance learning. Distance learning is the interaction between teacher and students in the distance. With distance learning using all necessary training components using Internet resources and Internet technologies [4, 5, etc.]. Modern interactive and multimedia technologies enable superior distance learning [6]. With distance, learning teaching load is reduced, thereby increasing the efficiency of learning. Also reduced the cost of moving and less time away from their desks. Acquired knowledge in this way, let alone to measure student performance.

All this is made available, not only because of the development of technology, but also due to open educational resources, allowing not only receive information, but to use it in everyday life.

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UNIVERSITIES IN CLOUD

Jitka Koubalíková

Prague University of Economics

The future of education technology is all about the cloud and anywhere access. We have to be prepared for using and teaching cloud computing. A lot of universities are in cloud now.

Keywords: Cloud computing, education, Office 365

Introduction

Life of both students and teachers at the universities is getting faster with demands increasing. We are constantly forced to think how to make our job easier. We are overwhelmed by loads of documents that have changed from paper to electronic form, but on the other hand they have risen in volume. We could ask the question why it is so, but our task is not to search for the reasons of growth of documents, but how to easily keep and process these documents.

We need to read the documents, we want to modify them, send them to other people, but we also need to share them and to cooperate on processing the documents with our colleagues. If we focus on the work of university teachers, there among other things comes the necessity to share some of the documents with the students. We often assign team work to our students because we want them to learn how to work in groups as is common in practice. In this case, a shared document accessible via a certain platform called “cloud” can be very helpful. Students can modify the shared document together even when they are in various places, not even in the same time but whenever they are connected to the internet.

Cloud computing can be used not only by academic workers and teachers, but also by the students. If the students learn how to use these technologies, they will be able to use their knowledge in their future posts and therefore improve their prospects on labour market. We could ask whether it is enough just to offer these technologies and let the students master them themselves or whether to teach them in specialized courses.

If we want the students to use these innovations, it is essential that we learn them ourselves in the first place and then we can show the students what possibilities they have. From the beginning of work with cloud we have to keep in mind that students can be rather resourceful and they can make their work easier in a way we cannot consider proper.

Why do I mention these tricks in the very beginning? I myself have first met with cloud computing, namely a shared document, while sitting a multiple-choice test during

which the use of laptops was allowed. One of the students created document on Google Docs which he shared with his classmates who also sat the test. As the document can be shared with anyone, another people from outside the classroom could give advice as well. All the persons concerned (with the exception of the teacher) have therefore connected to the internet and checked their answers or clarified difficulties.

Cloud computing does not bring only advantages; there are also certain problems connected with it. We need to know about these situations and to be prepared for them. Introduction of cloud computing nowadays seems inevitable, so we have to face the question how to handle it so that the advantages would prevail over disadvantages. If we stop to be afraid of the cloud computing and take proactive approach to its use, we help not only ourselves but also our students.

Possibilities of cloud computing and its use at schools

To be able to fly in the clouds is like a dream. Every one of us would like to do it; for the time being we can at least let our documents enjoy this luxury. How to describe cloud computing? This term is used in various contexts; therefore its definition reflects the goal for which we want to use it. First of all, we expect the cloud to be remote storage for our documents, platform for subsequent sharing and also mean of communication through which we can communicate in real time, which can be likened to a popular chatting.

Cloud computing is rapidly developing technology which ensures sharing of hardware and software means via the network. It therefore depends in a large extent on the internet connection. It is depicted as a cloud, hence the name cloud computing.

Very shortly can we say that cloud computing refers to applications and services that run on a distributed network using virtualized resources and accessed by common internet protocols and networking standards. (SOSINSKY, 2011). Attempts to simplify the definition lead to such a simplification which equates the internet with cloud. Here it is important to mention that the internet is closely connected with using of cloud services but it “only” ensures function, not being part of cloud products.

Cloud computing refers to applications delivered as services over the Internet and the hardware and systems software in the data centers that provide those services. The services themselves have long been referred to as Software as a Service (SaaS). Under the term Software as a Service can we understand applications delivered on the Internet. (ARMBRUST, 2010) At this point we can note that some vendors such other acronyms such as IaaS (Infrastructure as a Service) and PaaS (Platform as a Service), but for our purposes will be sufficient SaaS.

Now we come to description of cloud computing as such. The basic idea is to share hardware and software means. The person interested in using cloud computing rents selected software for certain period of time. He gets licence to use the software without becoming its owner. If we deal with “pure” cloud, the user can connect everywhere to his documents via internet without the necessity to install anything in computer or mobile device. Our documents are stored in remote storages and we can access them even in a very simple way via mobile devices.

In this place I would like to give another example of how I use this technology. It is quite common to prepare various presentations for the lessons. I mostly use Microsoft Power Point to prepare these presentations. I start to create the presentation on notebook. Content and effects are easier to insert in desktop devices. I save the presentation in cloud storage. If it is a team work, I make my part and save it in the cloud. I share this presentation with my colleagues who are notified about this document by e-mail. We can see changes that the others have made even if we are not in the same place. The important thing is internet connection, although it is possible to make changes offline and then to synchronize the document. On my way to school I usually go through the presentation on my mobile phone,

where I can also make changes. These changes are of course immediately visible for my colleagues. Before I start with the lesson I can run the presentation on any computer directly without having to install any software or use flash disc as transportable memory disc.

Strengths and weaknesses of cloud computing

Cloud computing comprises digital means that are accessible via applications that enables entrance into the user interface. The biggest advantage is probably the fact that the user can access the applications from anywhere, provided that he has sufficient tools such as suitable device and internet connection. All cloud services like saving and modifications of document can also be used on mobile devices, like tablets and smartphones. Effective applications for simple and fast use and easy accessibility of data are developed for these devices.

In this case, users do not pay for the software itself, but for the use of it. The main advantage lies in the fact that during use of the service the user is provided with all updates and new versions of the software. Compared to the cloud, buying of software ensures installation for this product in the computer basically for ever, but owner of the software has no longer access for new versions, only to some updates. The user is therefore forced to buy new software with each new version.

Other advantage of the cloud is that the programs are saved on the internet while the users can access them via web browser or the client of the application and use them practically from anywhere. This advantage also hides a slight disadvantage, but the internet connection is considered a common thing in our conditions. Many places have wireless connections or it is possible to use mobile internet. If we use the mobile internet, it is useful to know approximate volume of data we want to load in advance.

By means of this technology it is also possible to save files and other documents in above mentioned remote storages and access them via cloud which means that no backup and use of large-capacity hard discs and portable memory discs is longer necessary. Cloud is nowadays basic product for both large and small companies dealing with development of software and for other companies associated with internet world such as Microsoft, Google or Amazon.

Privacy is an important issue for cloud computing, both in terms of legal compliance and user trust, and needs to be considered at every phase of design. (PEARSON, 2009). In the list of downsides it is also important to mention certain concern about potential loss of data. A question that often emerges is whether data storage are well secured and our document are really solely our own. We venture to state that these systems are generally better secured than our common computers. Data centres usually create two backups of data saved by the users. From this point of view, no there should be no reason for these worries.

When loading these technologies we come to other negatives in form of lowering of number of functions of some programmes and deterioration of system stability. We suppose that the situation will significantly improve in the future and that the cloud will be able to fully substitute buying of software in client version.

Selected types of cloud solution for schools and students

Google Apps for Business and other cloud products from the search giant are now used by more than half of Fortune 500 companies. (Panettieri, 2013)

Office 365

One of the biggest software companies, company Microsoft, offers service Office 365. This service includes tools for cooperation and office tools of Microsoft (Microsoft Word, Excel, PowerPoint) via cloud solution. Office 365 is provided in various plans that differ in range of accessible applications and in price. This product is used by students and employees of University of Economics in Prague. One of the following parts of this paper describes its functions and use in greater detail.

Google Apps

Alternative to Microsoft products is offered by company Google. It has divided its products lines for individuals (natural persons who are not entrepreneurs), for companies and for education. The line for education would be the most suitable version for universities. Some of U.S. and European universities (Northwestern University, University of Westminster or University Notre Dame) were basically forced by the students to implement Google Apps and to substitute previous system of school communication. In the Czech Republic, Faculty of Science of the Charles University in Prague have joined this project.

In 2013, Google Apps boasts 50 million users and more than 5 million businesses, including 74 of the top 100 universities in the U.S. (Robb, 2013).

Recently, Google Docs upgrade to Google Drive was quite well known. In the basic, free version, the service My Drive provides storage of 15 GB. For students and teachers is reserved storage space of 30 GB. Besides e-mail box Gmail, Google offers other products that can be used in communication between teacher and students – the documents.

Text documents can be created at any time after signing in one's account. No installation of software into computer or mobile device is required. We can create interesting documents containing pictures, charts, equations, references and other objects. With help of comments on social networks we can collect entries and administer comments. Google document contains some basic functions but it is primarily destined for data spreading, not for graphic arrangement of the text. Another tool is the charts. They are probably the most popular tool of the Google Drive connection. With the charts we can keep and share lists, follow the projects, analyse the data and to observe the results. With the tools such as advanced formulas, inserted diagrams filters and contingency charts we get new view of our data. For most of the work with the data, e. g. functions, conditional formatting etc., this tool can easily be used. As other programme tools we can use presentations and drawing. All these products are prominently similar, as to their functions and design, to correspondingly focused products from Microsoft.

Any private user has the possibility to create a Google account and to used, to a limited extent; these cloud solutions in form of mail, documents, saving photographs and other products. We can suppose that the students discover and use these tools themselves. Here we need to remark that method of attempts and fails can be in some occasions helpful, but it is not very effective. This is one of the reasons to make these technologies available to students and to help them with their exploration.

iCloud

Just like Google and Microsoft, another important player on the software market, Apple, relies on the cloud solution and since 2011 this service has been integrated into all devices produced by Apple. It is based on similar principles and offers its users access to photographs, music and documents from any place. In this case, however, the condition is to work on the device produced by Apple. The basic requisition for working with iCloud is to be loyal to Apple and use several devices by it.

Using of cloud solution on the University of Economics in Prague

Forget devices, the future of education technology is all about the cloud and anywhere access. In the future, teaching and learning is going to be social. (Britland, 2013).

University of Economics uses cloud solution of Microsoft, Office 365, to secure functioning of the organization. The best known product of this service is Microsoft Outlook. The knowledge of Outlook is so essential that it is virtually impossible to leave the school without having mastered it first. Most of the employers require the graduates to be familiar with Microsoft products and in particular Outlook. For even better prospects of the students we teach also other programmes in cloud solution that are usually used by the companies. From these we can mention Dynamics CRM that is also part of Microsoft product line.

Office 365 offers wide range of functions and is extensively used within the organization. The basis is imported address book of all persons within the organization. It is of course possible to use its services outside the organization as well, but in the inside the proceedings are simpler and offer more possibilities and functions. Above mentioned address book contains all persons who study or work at school or are otherwise connected with it.

Web App version of Outlook is really ace in hands of Microsoft. It offers arranged administration of e-mails that can be comfortably sorted into folders. It is therefore possible to unite all the addresses into one and use only this one, in our case the school e-mail. All e-mails are easy to find with the help of filters and search tools. We can also create folders with e-mails according to their particular goal. If we also use mobile device it is very easy to connect this address directly to applications destined for the mail. If we use for example Windows Phone as operational system, we have already pre-prepared application that is compatible with Microsoft account.

Another of communication medium in Office 365 package is Lync Online. It serves for communication between users via instant messages and audio-visual calls. This product is faintly similar to a better known medium, Skype. Calling and messaging is similar, just like is sending documents and photographs. This similarity ceases when we come to contacts. Big advantage of Lync is already mentioned address book. With address book we do not have to ask anyone for the possibility to add him into contacts. In Lync environment we immediately see all members of the organization and get the information about their status – if they are online and we can call them or if they are offline and we can send them message which will be saved by Outlook Web App. It is a great help mainly for the students who can see their teacher online any time, or send him message or call if they have some problem or unclarity. As a rule, in every organization are held meetings and conferences several times a month; universities are no exception. However, it can sometimes happen that one of the members is unable to attend the meeting. In this case, Lync makes possible conference calls during which can be shared desktop area or presentation. University of Economics uses Lync also in case that the teacher falls ill or he cannot attend the lesson; if such situation occurs, he is connected into classroom via Lync and can give distant lesson. Students can stay at home and connect to conference call, while they can send questions to the teacher via messages. Whole lesson can be recorded and replayed any time, including sound and image.

Tool for making team webs enables creation of intranets within the organization – share point. University of Economics has intranet for whole organization with each faculty having its own intranet as well. Access to individual sections is limited by licenses. Creation of these webs is very user friendly; we could compare it to work with text and objects in text editor.

Documents are looked after in skydrive Pro environment. I have already described how to simply modify a presentation shortly before giving it and how to deal with team work. It can further be used to create bachelor and diploma thesis. Instead of printing each chapter out and handing it over to the supervisor who would than write in remarks and cross out some parts we have the option to create shared document. In this document we have our unfinished document that can be checked or changed by the supervisor in the revisions. If he makes changes directly in the text without using revisions it is still possible to come back to earlier versions of the document. If we do not want our supervisor to have constant access to this document we can limit it or ban it for some time and make it accessible for example after finishing next chapter. Great advantage of the document saved in skydrive is that it is stored in remote storage with several backups in data centres. We have witnessed many cases when the computer stopped working just before writing the conclusion with whole work saved only on this computer disc or worse, on flash disc.

All our documents from skysdrive or e-mails from Outlook Web App and other data from sharepoint are stored and backed up in data centres. Data centres of Microsoft provide services for more than one billion of customers, 20 millions of companies in more than 70 countries of the world. These centres are called centres of 4th generation and they feature absolute energetic independence and high security. All energy used for running these centres should come from renewable sources. We can also look at location of the centres. Data centres for Office 365 are in North America, Europe (Dublin, Amsterdam) and Asia. Accessibility of 99,9% of operation 24 hours a day is guaranteed. Usually the accessibility 99,95% is reached (KUBÁLEK, 2012). Our documents do not overload school discs or mail. Everything is delegated on licence provider.

Cloud offers wide us for communication, sharing and saving of the documents also for the enterprises. It is gradually being introduced into management of customer relations where it helps all steps of this proceeding. The market nowadays offers wide scale of programmes for CRM support with use of cloud solution. University of Economics has decided to teach CRM in cloud solution on the example of Microsoft product – Dynamics CRM.

Dynamics CRM enables its users to improve planning and sales management by setting areas and teams of optimization of effectiveness within their organization and also to prepare price lists and discounts for acceleration of generation of offers. Dynamics CRM also offers possibility to monitor all potential customers in one centralized system and to connect e-mails with relevant interested parties and other functions connected with sales, marketing, social networking etc.

High-quality approach to customer relations management is one of the key factors to making business and also to success not only big corporations, but small and medium enterprises as well. These business bodies need to ensure flawless functioning of the company which comes with flawless administration and good marketing which helps to reach new rates of sale to existing and new customers. One of the basic targets of CRM is to locate and attract new customers and to keep existing customers with minimal costs.

Conclusion

Using of cloud computing offers both student and teachers new possibilities for work with document and other data and also for communication. We cannot resist the cloud any longer; we need to use it actively. If we want to serve as example for our colleagues and students, it is high time to get started.

It is not right to rely on our students to master cloud computing themselves. School should provide them with these technologies and to show them what functions they offer. From short list of positives and negatives we can see that cloud cannot be accepted just as it is; we should think about its using.

There is a vast number of various services offered in cloud which are suitable for our non-business, purely user's accounts. When teaching we should not concentrate on and present only one product but we should show the students other options. Great advantage for common users is usually quite low price of these services. Some of the systems are for individuals offered with limited functions for free.

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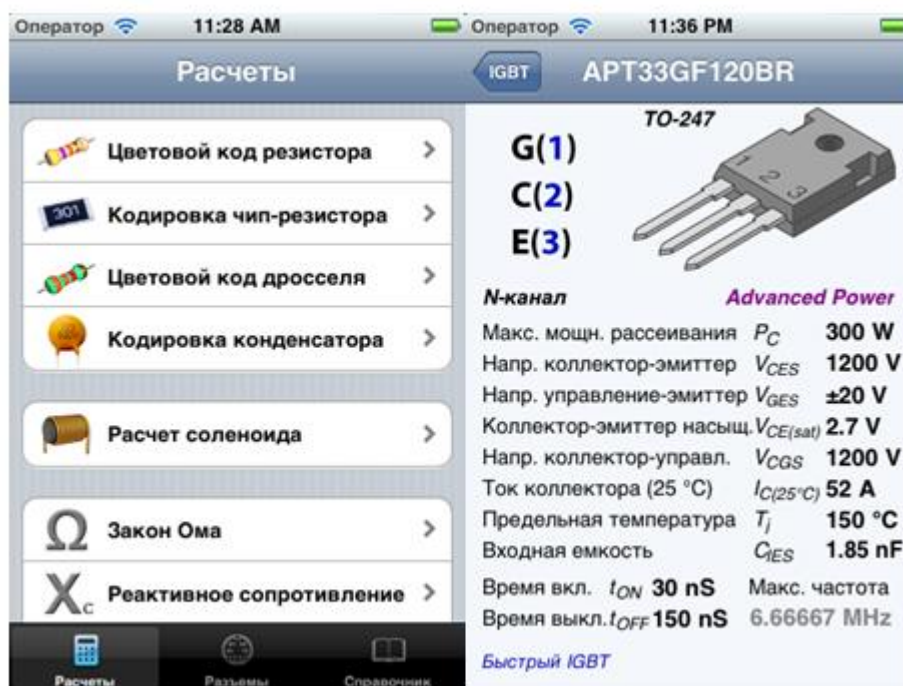
USE OF PORTABLE DEVICES WITH OPERATING SYSTEM IOS IN TRAINING

Belov, A.G., Kochegarov, I.I., Yurkov, N.K.

Penza

An analysis of existing software for mobile personal computer, and to divide it into different types. A table of distribution of the view.

Development of modern radio-electronic means takes place very fast. Few years ago, the concept of the mobile personal computer (the mobile PC)[1] was introduced, which was unaffordable for every user of the desktop computer, as the prices were very high. In the modern world, the mobile personal computer is available to everyone and is an integral part of our life. Why? Because it is capable to tackle and operate more and more difficult, and crucial processes[2]. They passed very long way of development from the personal computer taking some rooms of one building, working at electron tubes, which were very big and cost very much up to nowadays; before development of the mobile personal computer, which is a million times more productive and fits in your pocket[3]. They came to make our life easier. Mobile personal computers can be easily used in educational process of training on all disciplines: mathematics, physics, electronics, etc. In article the software, for training in electronics, carrying out laboratory works at stands is considered, to see course of electric processes, and to learn operation[4] of laws.

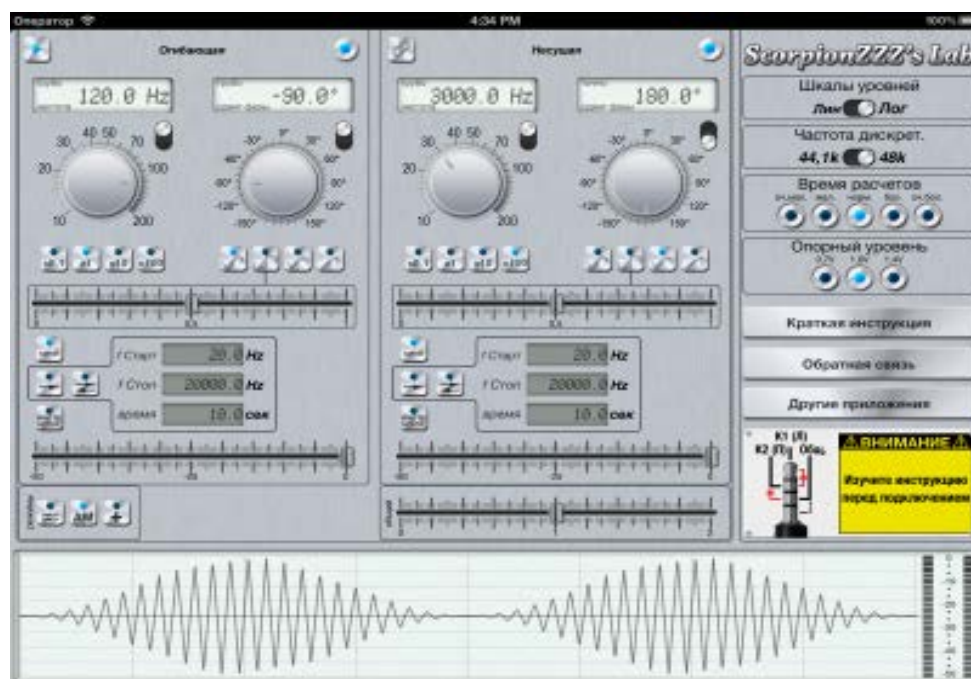


Pic.1

One of tools is the a program eTools PRO[5]. It is a powerful virtual toolbox(pic.1) which combines a lot of useful reference materials with electronics tools (calculations, conversations, coding/decoding, etc) in one app. Professional or amateur can easy finding most of necessary informations or calculation results at some simple finger touches. And also for example:

- Calculations
- Resistor Color Code.
- Chip-resistors (smd) decoding (3 digits, 4 digits, EIA-96).
- Axial inductors colors decoding.
- Capacitors decoding and voltage references for tantalum
- Solenoid Calculator
- Power calculator.
- Ohm's Law.
- Reactance (XC for capacitance and XL for inductance).
- Resistors voltage divider, ideal and with load. Variable resistor emulation. ("E24 rounded" integrated).
- Parallel resistors ("E24 rounded" integrated).
- Capacitor charging calc.
- LC-resonance.
- Resistor for LED(s) (with most popular presets).
- Operational amplifiers: non-inverted and inverted ("E24 rounded" integrated).
- Zener Voltage Regulator
- Compute LM317 voltage mode (with variable resistor emulator ("E24 rounded" integrated) & current mode.
- Compute 555-timer: astable mode with ratio 50%-100% and astable mode with ratio 0-100%, monostable mode

- Wire voltage drop calculator.
- USB 1.x/2.0 & USB 3.0 pinouts and specifications.
- FireWire 4, 6, 9-pins.
- RS232 (DB9 & DB25 & IDC10).
- Parallel (LPT port) / Centronics.
- Ethernet (RJ-45) direct & crossover connections.
- Parallel ATA (PATA/EIDE interface).
- Serial ATA (SATA/eSATA).
- AT-keyboard & PS-2 keyboard/mouse.
- AT-power.
- ATX-power (20/24-pins) & auxiliary connectors.
- Molex & fan connectors.
- SATA power.
- SCART.
- DVI.
- HDMI.
- DisplayPort & MiniDisplayPort.
- VGA (standart & VESA modes).



Pic.2

The following tool for training is SGenerator [6]. A high-quality 2 channels signal generator for the iPod Touch/iPhone/iPad with wide frequency range (1 Hz - 20000 Hz)(Pic.2). Create sine waves, square waves, triangle waves, saw waves, white noise and pink noise. Amplitude modulation and channels summary are available also.

You can:

- testing speaker systems
- balancing home theater speakers levels
- testing and tuning audio amplifiers, equalizers, crossovers and many other equipment
- use output in balanced mode

- You can enter frequency (phase) values enter manually or with help of knobs in two modes (coarse and fine). You can use sweep frequency mode.
- Phase shift for both channels for iPad and for second (R) channel only for iPhone/iPod
- Link frequency mode - link frequency of second channel to first channel.
- Internal oscilloscope and level meter for better clarity
- Generator is accurate, reliable, precise, and clean.
- Three calibrated master output level modes (0.7V, 1.0V, 1.4V)
- Note that non-sine waves have perceived transient processes that some distort ideal output from above about 1400Hz.

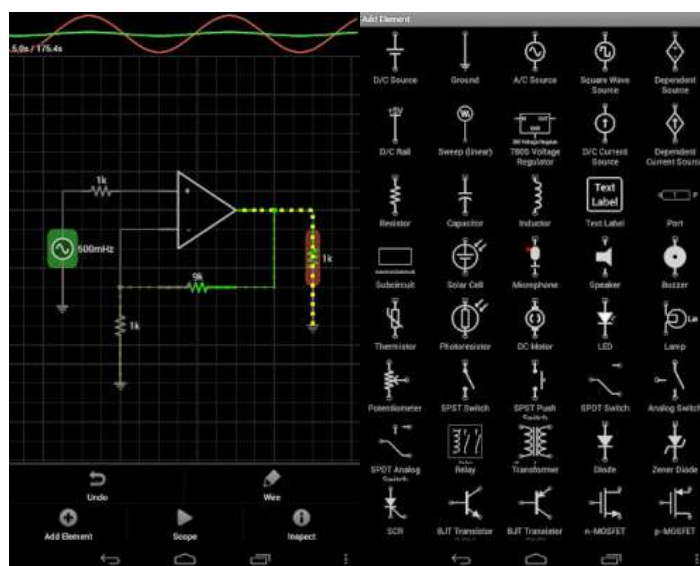


Pic.3

Electronic Toolbox Pro[7] combines electronic reference material with a huge collection of calculation(Pic.3), lookup and conversion tools in one handy app at your fingertips. The appendix also allows to look through:

- Type listings (with color coding) for Resistors and capacitors including SMT types
- Databases for Transistors, FETs, Triacs, Thyristors, Diodes, ICs, TTL, CMOS, Atmel and PIC controllers
- Calculating circuit values for Resistor, Capacitor[8], Inductor, NE555, Filter circuits and much more
- Unit conversion for numerous types of Measurements (pressure, energy, distance, speed, weight, etc.)
- A database for common electrical Symbols
- An Indices database of common electrical components
- Calculation of voltage regulators with 78xx, 79xx, LM317 or LM337[9]
- Op-amp circuit calculation
- Number base converter (Hex, decimal, binary etc.)
- Frequency, period wave-length calculation
- LED / resistor calculation

- Voltage divider calculation
- R/L calculations
- BJT calculations
- Schematic Diagrams
- Pinouts of Audio, Video, Computer or phone sockets
- ARDUINO Tool



Pic.4

iCircuit[10] is an educational program for development and experiments with electric chains! Its advanced simulation engine can handle both analog and digital circuits and features realtime always-on analysis(Pic.4). It is the perfect companion to students, hobbyists, and engineers. You use it as you would any CAD program: you add elements, connect them together, and set their properties. But iCircuit is unlike other CAD programs because it is always simulating. It's just like working with the real circuit. You do not stop to take a measurement or spend a lot of time configuring reports. Instead, you just play with the circuit as you normally would, with the power on! There are over 30 elements you can use to build your circuits. The app has everything from simple resistors, to switches, to MOSFETS, to digital gates. The app features a multimeter that you use to probe around the circuit to instantly read voltages and currents. If you want to see how a value changes over time, then you can add values to the built-in oscilloscope. The scope can simultaneously track many signals over time and features a touch interface to control the total time displayed and stacked and unstacked modes to easily compare signals.

The appendix includes the following elements :

- Signal generators, Voltage sources, Current sources, and Dependent sources
- Resistors, Capacitors, and Inductors
- Manual SPST/SPDT Switches, Push buttons, and Relays
- Diodes, BJ Transistors, and MOSFETs
- Speakers, Microphones, Buzzers, DC Motors, and LEDs
- ADCs, and DACs
- Logic gates: AND, OR, NAND, NOR, XOR
- JK and D Flip-flops
- 37 7400 series digital parts

– 7-segment display and driver

Conclusion

Now both in professional, and in private peoples' life there is an emphasis on mobility. Thanks to mobile personal computers various processes were accelerated: training, communication, record and storage of a large number of information[10-24]. And they more and more satisfy and raise the comfort of our life. All mobile personal computers came to help us. For example, in their use in electronics training. Work on portable devices will facilitate educational process. Thanks to such programs considered in the article it is possible to increase quality of students' education who will start to understand all laws occurring in all devices without any problems and to memorise more information about radioelements. All opportunities of this software can be divided on different types (table 1).

They will also be suitable for work with electronics which will help with carrying out laboratory works and practical training. Everyone can check the printed-circuit board without its installation, that will exclude: inoperability, unforeseen accidents, problems with incorrect installation on the printed-circuit board.

Table 1

	Directory	Calculator	Simulator
eTOOLS	+	+	-
SGenerator	+	-	+
Electronic Toolbox Pro	+	+	+
iCircuit	-	-	+

eTOOLS will approach more as the reference book on radioelements so that it will be the irreplaceable tool.

SGenerator will be useful to those who is engaged in sound equipment, as it contains control tools for different types of speaker systems.

Electronic Toolbox Pro is the universal application for training as it contains also reference books, calculators and also is a simulator that makes it irreplaceable.

iCircuit is a very strong tool for training in electronics as it allows to check the circuit which shouldn't be configured in real time and to visually observe all processes occurring in the printed-circuit board.

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IMPLEMENTATION OF EDUCATIONAL INNOVATION AND TOOLS FOR THE OBJECTIVE CONTROL OF CULTURAL AND PROFESSIONAL STUDENT'S SKILLS

Aydarkin, E., Pavlovskaya, M.
Southern Federal University, Rostov-on-Don

The project is aimed to develop electronic textbooks which provides the tools for the analysis of experimental results from representative databases and the actual knowledge base to help to discuss those results. Then student is to write a research article in accordance with the scientific journals requirements. New and verified methods to objectively control of cultural and professional student's skills (Federal State Educational Standard cultural skills 3, 6; professional skills 6, 8, 9, 13, 16) during their work with an electronic textbook are going to be developed.

Keywords - Electronic textbook, general cultural and professional skills, methods and tools to control skill development, student's self-training, tutoring

One of the major problems in psychology, physiology and educational ergonomics is the study of the mechanisms of the students' abilities, skills and competencies development by enrollment in educational programs for the development of sensory, sensorimotor and cognitive professional algorithms. Because of widespread penetration of computer and information technologies in the educational process upto the specific professional environment simulators creation (in particular, workstations, virtual simulators, electronic textbooks, etc.), it is necessary to establish approaches and methods to evaluate the efficiency of acquiring of professional skills with help of a variety of electronic educational resources that involve audio-visual perception of current information about modeled process, decision on the its adequacy and keyboard and/or mouse input during tasks solving and/or navigational commands to the graphical user interface. It is possible to estimate student activities speed and quality characteristics and also the functional state of the student as a characteristic of the "psychophysiological price" of her activities during developing and implementing professional algorithms (competencies). The set of electronic resources, the list of required professional competences, and the collection of objective methods and criteria to evaluate those competences levels, could form the technology basis of the new learning environment supporting individual student work, which is the priority of general education programs of the 3rd generation Federal State Educational Standard (3G FSES).

On the other hand, the 3G FSES require the competence-based approach to be deployed in the modern educational process. The competence-based approach aims to create

common cultural, professional, and special students' competencies, which are rather rigidly defined for various educational programs.

Competency requirements and their evaluation methods are set in competency passports and carry largely qualitative and subjective characteristics, based on expert tutor's estimates of student's theoretical knowledge and practical skills. The Section 8 of the FSES "Training quality assessment of basic Master degree educational programs" states that the student's training quality is guaranteed by the development of objective procedures for assessing the level of student's knowledge and skills, as well as graduate's competencies. Universities must create and approve assessment tools, which should include interdisciplinary issues, case studies, tasks with comparative assessment, rationale for the studies means choice, and other, allowing to control the quality of students' competencies and assess the graduates' readiness for the professional work.

The authors has developed an electronic learning environment that meets the basic 3G FSES requirements: interactivity, credit-modularity, individual learning path, tutoring, problem-based educational aimed to form common cultural (CS) and professional skills (PS).

At the first time the objective methods for assessing of required common cultural and professional competences level were developed. Among these competencies are: general computer skills and specific software environment knowledge (CS-6, PS-6, PS-13), ability to analyze experimental results (CS-6, PS-3, PS-11), extracted from the representative databases (PS-15), as well as discussing them within the modern knowledge base framework with access to full-text sources of relevant articles, writing a scientific report or article (PS-9, PS-16) in accordance with the requirements of Russian and international scientific magazines (CS-3, PS-9).

The work is based on the results of several fundamental research projects: 1) time budget allocation assessment system to estimate students' efforts during individual work at the computer [1], 2) method to control the structure and duration of mental operations during arithmetical tasks solution [2], 3) method of assessment of behavioral events by student's gaze direction during self-paced work [3], 4) integration of certificated electronic resources with open education system Moodle [4]. The projects resulted in 5 invention patents and more than 15 publications, and 18 electronic certificates in Russia.

A new approach based on the splitting of a normative competencies into subcompetencies, which can be described by quantitative efficiency and quality parameters and represent some of the professional activities, characterized by specific assessment algorithms. For a given stereotype implementation efficiency parameters characterize the degree of student's skills development, and the number of errors - the quality and reliability of its normative activities.

Proposed electronic educational resources are designed for individual work of students enrolled on the natural sciences faculties, developing a set of competencies required for a particular specialty. Electronic resources are used at addressing a number of important objectives: the development of theoretical knowledge (online tutorials, knowledge base), specific problems solution (taskbooks, experimental databases), training to work with modern equipment (virtual simulators) etc.

The environment where students can conduct their educational research works include: display class, local area network, digital learning environment that supports students' individual work with learning resources, 8 stands imitating elements of educational and professional activities with electrophysiological equipment.

The results were approved in a pilot Master Educational Program of the Department of Human and Animal Physiology of Southern federal university, as well as in the international interdisciplinary project 159313-TEMPUS-I-2009-1-FI-TEMPUS-JPCR «Post-graduate Training Network in Biotechnology of Neurosciences» (2009-2013).

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PROBLEMS OF ESTIMATION OF PROFESSIONAL COMPETENCE OF THE TEACHER

Klenina, N.V., Bushmeleva, K.I.
Surgut, SurGU

The article highlights concept and content of educational capacity. It is viewed the problems of professional teacher's capacities' assessment.

The requirements imposed on the quality of training of high school graduates make the statement of the problem of the faculty's quality legitimate. The existing formal requirements to a teacher fixed at the legislative and normative level provide the obligatory minimal requirements to teaching personnel without specification of professional and personal qualities of people engaged in this sphere of activity. But at the same time the key role of teachers consists in not only the provision of the main function of a high school – the educational one – the task of upbringing of socially responsible citizens, capable of living in a modern society is of not less importance.

The requirements to high school graduates formulated in the language of competencies make it logical to use the same approach to the development of the requirements to professional and personal qualities of teachers. In this case a model of competencies represents a full ranked set of competencies describing the key qualities, behaviour, knowledge, skills and other characteristics, necessary for the achievement of the quality and efficiency standards of a labour activity. Nowadays two polar approaches to the creation of competency models can be singled out.

- 1) An individualized approach focused on an individual's behaviour.
- 2) A collective (organizational) approach, aimed at the development of competencies for a definite organization taking into account the aims, mission, values, organizational culture, the programme of training and development of a personnel.

Pedagogical competence is a system phenomenon, the essence of which consists in the system unity of pedagogical knowledge, experience, properties and qualities of a teacher, making it possible to carry out a pedagogical activity effectively, to organize the process of pedagogical communication purposefully and presupposing personal development and improvement of a teacher [1 c.10].

The dominant block of a teacher's professional competence is his personality, in the structure of which people single out the motivation of a person (the orientation of a person and its types), the qualities (pedagogical capacities, character and traits, psychological processes and states of a person), integral characteristics of a person (pedagogical consciousness, individual style, creativity as a creative potential).

One of the most important qualities that characterize competence is initiative. It's some inner impulse to new forms of activity, the leading role in some activity. Initiative represents a kind of social activity, social creativity that is characterized by the fact that a person takes a greater responsibility upon himself than it is required by social norms [2, c.11].

Another important component of competence is cooperation. It's a humanistic idea of cooperative developing activity of children and adults bound by mutual understanding, penetration into spiritual world, and collective analysis of the course of this activity. [1, c.190]

Having studied a great number of competence terms we came to the conclusion that the most exact definition of the word "competence" is the one suggested by Professor Shadrikov: "Competence is a system manifestation of knowledge, skills, capacities and personal qualities. In every activity the importance of these components and their combinations may significantly differ". The term "competence" serves for the denotation of integral characteristics of the quality of a specialist's training.

The fashion on competencies without analysis of real needs of an organization leads to that that models are created for the sake of models themselves, without their further usage. Therefore it's very important to find out the aims of models' development from the very beginning of the work on models' creation. Thus we have singled out three such aims.

1) The creation of the tool "ideal image of a teacher" for improving the efficiency of the communication between the management of a high school and its departments with a pedagogical staff.

2) The creation of the tool for a more objective selection of the applicants for the position of a teacher. The determination of the level of claims on core competencies having a high rank, make it possible to heighten the quality of the selection of candidates for positions and reduce the probability of mistakes.

3) The increase of the validity of the formation of group and individual plans of teachers' development on the basis of the analysis of the difference between the desired and actual levels of competence.

The model that is being developed by us is aimed to automatize the process of management of the individual trajectory of a teacher's development in a high school, being adapted to the modern needs of a society.

In our opinion professional competencies are the principal ones, they contribute to promoting career. The assessment of a teacher's professional competence at different stages of his professional career is one of the most important and challenging directions of the psychological provision of a professional activity.

The main problem of competence assessment in general and its constituents in particular, i.e. professional competencies is the search for effective valuation techniques. For example, Moghilovkin considers that it is essential to find such valuation methods that

wouldn't be labour-intensive in processing on the one hand, and would give the greatest accuracy of the obtained results on the other hand [3, c.123].

The problem of the assessment of professional competence can be connected with two independent situations.

1) The situation of the assessment of a teacher's activity (the specificity of his behavior and individual effectiveness).

2) The situation of a project's valuation – the growth trajectory of a professional activity (the specificity of problems).

In this case the valuation of professional competence should be observed in the following contexts:

- competence in terms of search and selection of a personnel (the model of a demanded teacher);
- competence in terms of the development of human resources – the valuation of organizational development (the model of a future teacher);
- competence in terms of effectiveness – the valuation of efficiency (the model of an effective teacher);
- competence in terms of the stimulation of labour – the valuation of the link between pay and result (professional and qualifying models of a teacher) [4, c. 220 - 222].

So we can conclude that professional competence is directly connected with the quality of a teacher's performing activity, his individual efficiency.

The difference between a competent teacher and a qualified one is that a competent teacher possesses not only a certain level of knowledge, skills and attainments, but he also realizes them in his work, has some inner motivation to the quality implementation of his professional activity and the attitude to his profession as to some kind of value.

A competent teacher is able to exceed the limits of his subject, profession; he has certain potential for self-development.

Professional competence is a complex personal characteristic that includes knowledge, skills, capacities and experience, motivation, personal particular qualities and determines the success of a professional activity.

In the technology of professional competence assessment the main point is that one should determine a person's professional potential and work out a project of professional development. During the valuation work the following tasks are solved:

- detailed analysis and structuring of a teacher's professional experience;
- analysis and self estimation of inner resources and potential;
- correlation between professional potential, the requirements of the labour market and a certain work position;
- determination of optimal variants of professional development;
- elaboration of a professional project, including detailed steps and actions to achieve the goal;
- development of personal responsibility for a professional choice and the future.

The assessment of professional competence results in the optimization of a teacher's professional activity, satisfaction of the need for professional development, career planning.

Professional competence includes different techniques that are characterized by high reliability and validity. In practice for professional competence assessment people use:

- biographical profiles (sociobiographical profiles, analysis of documents, etc.);
- interviewing (structured and unstructured, formalized and unformalized, competence interview);
- work assignments (technical work assignments, situational tests, criteria tests, etc.);
- personality tests (typological questionnaires, tests of traits, self-esteem scales, etc.);
- motivation tests (tests of achievements, scales of motives, questionnaires of interests);
- cognitive tests (tests on perception and attention, on characteristics of memory, etc.);
- intellectual tests (tests of capacities, tests of creativity, tests of intellect structure, tests of mental development);
- project tests (the colour test of Lusher, association test, test of ink spots Rorschach);
- health coefficient (complex data of the state and functioning of different body systems, etc.);
- assessment-centres: performance assessment, group discussions, business games.

The technology of professional competence assessment is based on the observation of a teacher during the diagnostic conversation and the following psychological testing procedures:

- diagnostic methods of communication skills;
- diagnostic methods of mental capacities;
- diagnostic methods of personal qualities;
- diagnostic methods of individual professional qualities.

So the usage of these or those methods of diagnostics depends on the peculiarities of a professional activity. The assessment of a teacher's practical activity presupposes the selection of more rational, efficient data making it possible to measure the degree of accordance of its results to the imposed requirements, taking into account the effects of all determinants.

Professional competence is a kind of a measurer, indicator, quality and quantity characteristic of the level of professionalism. It is a very difficult category that characterizes a professional specialist in a fuller and more comprehensive way.

The essence of professional competence assessment consists in the determination of professional potential and elaboration of the project of a specialist's professional development.

The technology of professional competence assessment includes different methods characterized by high reliability and validity. Competence assessment may result, say, in determination of variants of a specialist's professional development and confirmation of correctness of a chosen professional strategy.

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INTEGRATED IT OF KANSEI / AFFECTIVE ENGINEERING AND SYSTEM OF SYSTEMS ENGINEERING IN SELF-ORGANIZED INTELLIGENT CONTROL: FROM R&D TO COMMERCIALIZATION THROUGH THE EDUCATION PROCESSING

Barkhatova, I.A., Tyatyushkina, O.Yu., Ulyanov, S.V., Cheremisina, E.N., *Albu, V.A., **Fukuda, T., ***G. Degli Antoni, ****Yamafuji, K., *****Hagiwara, T., Fujii, M. *International University “Dubna”, Russia; *Institute of Mathematics and Computer Science of Moldova; **Nagoya University, Japan; ***Università degli Studi di Milano, Italy, ****University of Electro-Communications, Japan; *****Yamaha Motor Co., Ltd. Japan*

Synergetic effect of integrated IT of Kansei / Affective and System of Systems Engineering is considered. New results in robust intelligent control are introduced based on unconventional computational intelligence as quantum soft computing technology.

Keyword: Kansei/Affective engineering, system of systems engineering, smart / wise robot, emotion, instinct, intuition, soft computing, quantum computing, quantum fuzzy inference

1. Introduction

Today a lot of scientific R&D of intelligent IT systems control, processing, storage, and data protection is conducted that is based on soft and quantum computing to improve the reliability and validity of the data obtained in complex ill-defined dynamic systems.

Selection of an appropriate and effective toolkit for a specific application problem-oriented field causes some difficulties (or intuitive contradiction) for students, engineers, research and development of new information technologies (IT). But scientific research, experience and development practice of control systems of physical experiment showed the following: design, development and implementation of effective intelligent IT (created in various fields of science and technology) are inextricably linked with the necessity to the developing and improving the intelligence of the models of processes and control systems, objectively taking into account the laws of evolution contextually-dependent effects of physical, thermodynamic constraints and information boundaries that actually exist in specific models of real objects.

The relationship between R&D, industrial companies and university, and its role in the commercialization processes of IT products are discussed. It must be said that the cooperation “R&D – Industry – University” is very important. This issue was discussed more early, as example, in 1995 at the International workshop [1]. This workshop was concerned with university - industry linkages and cooperation in the APEC countries and region, and was intended to make clear the existing conditions, polity, and problems in each country.

Nine countries (Australia, Canada, China, Japan, Malaysia, the Philippines, Singapore, Taiwan, USA) are participated in the workshop. The participants were mostly decision makers in the field of university-industry linkages for government organizations, men in charge of university-industry joint research centers, and private corporations serving as university-industry partnership advisors; in addition, participants were also presents from

UNESCO and OECF. Publications, which are issued today also shows how important it is to establish cooperation between the companies and R&D, and university [2 - 5].

The purpose of this cooperation is to create and usage the capabilities of the human capacity to develop intelligent products, to create and be able to protect its intellectual property (IP), to commercialize IP and conquer its market segment. The role of education processing in the successful realization of the commercialization of IT products is discussed.

This report presents an example of designing integrated fuzzy intelligent control systems (IFICS) in unpredicted situations. The background of applied unconventional computational intelligence is soft and quantum computing technologies. All researches are supported by relevant publications and patents (<http://www.qcoptimizer.com/>).

2. Quantum intelligent IT design of IFICS

For designing IFICS in unexpected situations were used two approaches:

- system of systems engineering technology describes the possibility of complex ill-defined (autonomous or hierarchically connected) dynamic control system's design that includes human decision making and risk factors in unpredicted (unforeseen) control situations;
- Kansei / Affective Engineering technology and its toolkit include qualitative description of human being emotion, instinct and intuition that are used effectively in design processes of smart / wise robotics and intelligent mechatronics.

We are considered the humanized technology of intelligent robotic systems design based on Kansei / Affective Engineering and System of Systems Engineering using Quantum / Soft Computing as unconventional computational intelligence toolkit. As well known the subject of humanized technology or human-related systems has been actively researched. With the increasing concern regarding human factors in system development Kansei Engineering and Soft Computing are the most representative research fields on this subject [5 - 7]. Soft computing toolkit is developed for emotion, instinct, and intuition recognition and expression generation [8, 9]. In particular with genetic algorithm – GA – (as effective random search of solution) an intuition process (optimization) is modeled.

Fuzzy neural network (FNN) is used for description of instinct process (adaptation and learning) that modeled approximation of optimal solution in unpredicted control situation. Fuzzy logic control is used for design of an emotion according to corresponding designed look-up table. Quantum control algorithm of self-organization is the background of wise robotic control system's design. Quantum computing toolkit is used for increasing of robustness in intelligent control systems (especially for unpredicted control situations) [10].

Figure 1 demonstrates the main idea of this approach and the creation of quantum intelligent design IT.

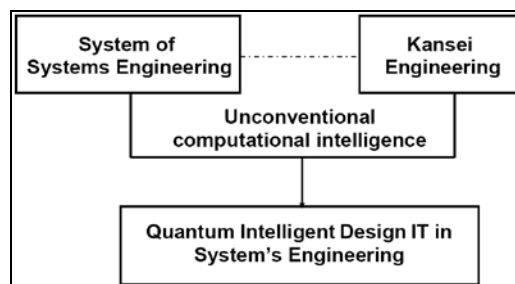


Fig. 1. Structure background of quantum intelligent design IT

The basis for the implementation of this idea is the research result that opened new principles: self-organization and minimization of generalized entropy production (as the new physical measure of control quality). Self-organization is a central coordination mechanism exhibited by both natural and artificial collective social-technical systems. Self-organized

mechanisms are characterized by nonlinear responses to stimulus intensity, incomplete information, and randomness. Self-organization coexists with guidance from environmental templates, networks of interactions among individuals, and various forms of leadership or preexisting individual specialization.

A general characteristic of self-organizing systems is as following: they are *robust* or *resilient*. This means that they are relatively insensitive to perturbations or errors, and have a strong capacity to restore themselves, unlike most human designed systems. *One reason* for this fault-tolerance is the *redundant, distributed* organization: the non-damaged regions can usually make up for the damaged ones. *Another reason* for this intrinsic robustness is that self-organization thrives on *randomness*, fluctuations or “noise”. A certain amount of random perturbations will facilitate rather than hinder self-organization. *A third reason* for resilience is the stabilizing effect of *feedback* loops.

Analysis of self-organization models gives us the following results [10]. Models of self-organization are included natural *quantum* effects and based on the following *information-thermodynamic* concepts: (i) macro- and micro-level interactions with information exchange (in agent based model (ABM) micro-level is the communication space where the inter-agent messages are exchange and is explained by increased entropy on a micro-level); (ii) communication and information transport on micro-level (“quantum mirage” in quantum corrals); (iii) different types of quantum spin correlation that design different structure in self-organization (quantum dot); (iv) coordination control (swam-bot and snake-bot). Natural evolution processes are based on the following steps: (i) templating; (iii) self-assembling; and (iii) self-organization.

According quantum computing theory in general form every quantum algorithm (QA) includes the following unitary quantum operators: (i) superposition; (ii) entanglement (quantum oracle); (iii) interference. Measurement is the fourth classical operator. [It is irreversible operator and is used for measurement of computation results].

Quantum control algorithm of self-organization is based on quantum fuzzy inference (QFI) model [11]. QFI includes these concepts of self-organization and has realized by corresponding quantum operators. Structure of QFI that realize the self-organization process is developed. QFI is one of possible realization of quantum control algorithm of self-organization that includes all of these features: (i) superposition; (ii) selection of quantum correlation types; (iii) information transport and quantum oracle; and (iv) interference.

With *superposition* is realized *templating* operation, and based on macro- and micro-level interactions with information exchange of active agents. *Selection* of quantum correlation type organize *self-assembling* using power source of communication and information transport on micro-level. In this case the type of correlation defines the level of *robustness* in designed KB of FC. *Quantum oracle* calculates “*intelligent quantum state*” that includes the most important (value) information transport for *coordination* control. *Interference* is used for extraction the results of coordination control and design in on-line robust knowledge base (KB). The developed QA of self-organization is applied to design of robust KB of fuzzy controller (FC) in unpredicted control situations.

Main operations of developed QA and concrete examples of QFI applications are described. Quantum control algorithm of self-organization design in intelligent control systems based on QFI-model is described in [10].

Figure 2 shows the structure of a new *quantum control algorithm of self-organization*.

Main goal of quantum control algorithm of self-organization is the support of optimal *thermodynamic trade-off* between *stability*, *controllability* and *robustness* of control object behavior using robust self-organized KB of intelligent control system.

Main problem in this technology is the design of robust knowledge bases (KB) of FC that can include the self-organization of knowledge in unpredicted control situations. The background of this design processes is KB optimizer based on quantum / soft computing.

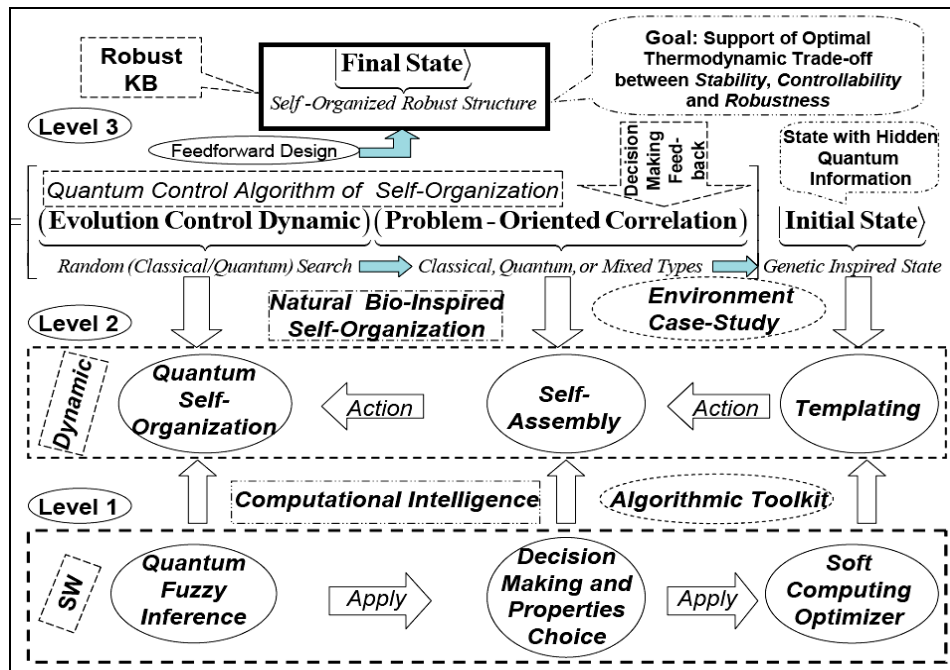


Fig. 2. General structure of quantum control algorithm of self-organization

The information design technology of robust IFICS is presented on Fig. 3.

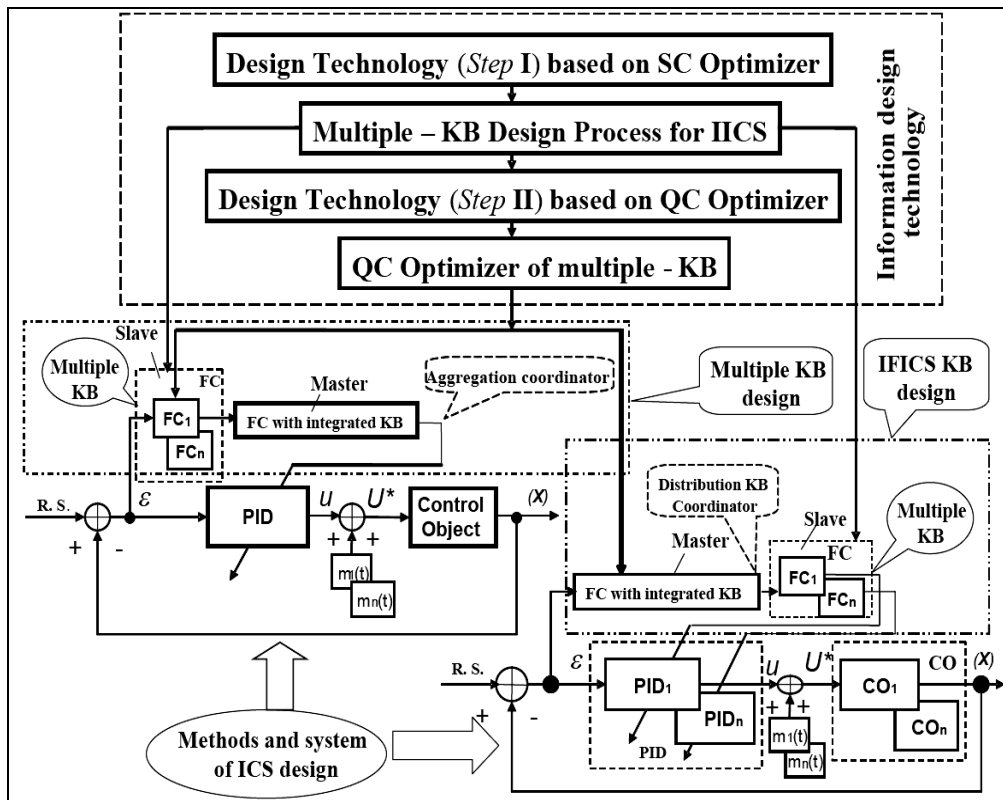


Fig. 3. Structure of information design technology of IFICS

Let us consider the application of the developed approach for reliable IFICS

3. Examples

3.1. Benchmark of QFI-application: “Cart – Pole system.”

Let us consider fuzzy control problem of “cart-pole” system as intelligent wise control Benchmark. This system is described by the following equation of motion:

$$\ddot{\theta} = \frac{g \sin \theta + \cos \theta \left(\frac{(u + \xi(t)) + \{a_1 \dot{z} + a_2 z\} - ml \dot{\theta}^2 \sin \theta}{M + m} \right) - k \dot{\theta}}{l \left(\frac{4}{3} - \frac{m \cos^2 \theta}{M + m} \right)} \quad (1a)$$

$$\ddot{z} = \frac{u + \xi(t) + -\{a_1 \dot{z} + a_2 z\} + ml (\dot{\theta}^2 \sin \theta - \ddot{\theta} \cos \theta)}{M + m} \quad (1b)$$

where θ and z are generalized coordinates (angle of pole and position of cart, correspondingly); $u(t)$ is control force; and $\xi(t)$ is random excitation.

Knowledge base of FC designed with Soft Computing Optimizer using Gaussian and Raleigh noises correspondingly.

Figure 4 show the dynamic behavior of the system (1) in unpredicted control situation. In this case a new time delay in the structure (see Fig. 4) in sensor is 0.002 sec; parametric Gaussian noise is with the amplitude 0.01; new initial state $[\theta_0, \dot{\theta}_0] = [13, 1]$ (deg), $[z_0, \dot{z}_0] = [0, 0]$. External noise is Raleigh noise as in the learning situation.

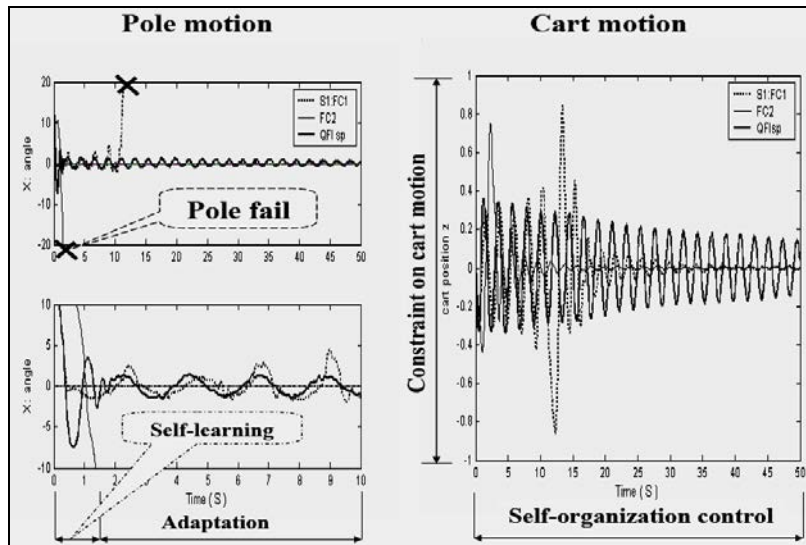


Fig. 4. Dynamic behavior of “cart - pole” system

Figure 5 show the thermodynamic behavior of the system (1) and of fuzzy controller.

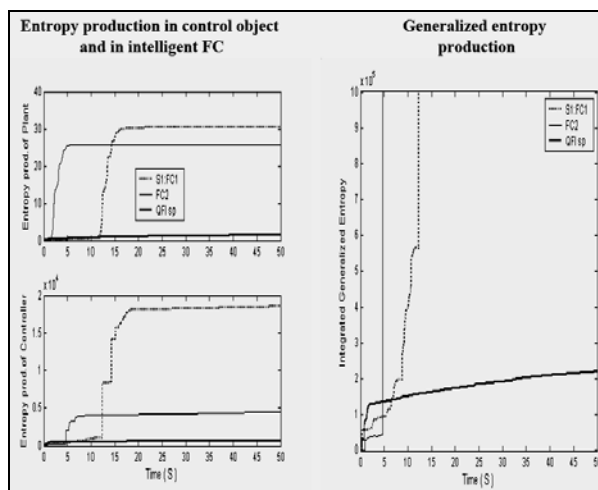


Fig. 5. Thermodynamic behavior of “cart - pole” system

Results of simulations on Fig. 4 are shown that from two unstable FCs it is possible to design in on-line a new robust FC (*Parrondo paradox*).

It is a pure *quantum effect* and do not have a classical analogy.

Figure 5 show that generalized entropy production of the system “control object + fuzzy PID-controller” is minimal and with quantum self-organization of KB required trade-off distribution between stability, controllability and robustness is achieved.

Thus results of simulation show that winner is quantum fuzzy controller (QFC) designed from two KB controllers with minimum of generalized entropy production. Therefore, QFI strongly supports optimal *thermodynamic trade-off* between stability, controllability and robustness in self-organization process (from viewpoint of physical background of global robustness in intelligent control systems).

Also important the new result for advanced control system that all other controllers (FC1, FC2) are failed but QFC is designed with increasing robustness.

This approach was applied to other complex commercial industrial robotic systems.

3.2. *Robotic unicycle.*

We attempted in the present work the emulation of human riding a unicycle by a robot. It is well known that the unicycle system is an inherently unstable system and both longitudinal and lateral stability control are simultaneously needed to maintain the unicycle's postural stability. It is an unstable problem in three dimensions (3D). However, a rider can achieve postural stability on a unicycle, keep the wheel speed constant and change the unicycle's posture in the yaw direction at will by using his flexible body, good sensory systems, skill and intelligent computational abilities.

In this report a thermodynamic approach is used for the investigation of an optimal control process and for the estimation of an artificial life of mobile robots [12, 13].

A new physical measure (the *minimum entropy production*) for the description of the intelligent dynamic behavior and thermodynamic stability condition of a biomechanical model with an AI control system for the robot unicycle is introduced. This measure is used as a fitness function in a GA for the computer simulation of the intuition mechanism as a global searching measure for the decision-making process to ensure optimal control of the global stability on the robot unicycle throughout the full space of possible solutions. The simulation of an instinct mechanism based on FNN is considered as a local active adaptation process with the minimum entropy production in the learning process of the vestibular system by teaching the control signal accordingly to the model representation results of [13].

Computer simulations in this study are carried out by the usage of *thermodynamic* equations for the motion of the robot unicycle. Entropy production and entropy measures for the robot unicycle motion and the control system are calculated directly from the proposed thermodynamic equations of motion.

Figures 6 and 7 are demonstrated the unicycle model and results of simulations.

In particular, Fig. 6 shows the main idea of robotic unicycle design using Kansei / Affective and System of System Engineering approaches. With genetic algorithm the intuition of solution search is developed based on bio-inspired model of unicycle rider behavior. Instinct and emotion are introduced based on FNN and corresponding look-up tables. Simulation and experimental results are demonstrated in Fig. 7.

From the results obtained in this study by the fuzzy simulation and soft computing, based on GA and FNN, it is obvious that the intelligent behavior controllability and postural stability of the robot are largely improved by two fuzzy gain schedule PD-controllers in comparison to those controlled only by a conventional PD and a fuzzy gain schedule PD-controller. As a result of this investigation the look-up tables for fuzzy robust controllers of the robotic unicycle are formed with minimum production entropy in intelligent controllers and the robotic unicycle model using this approach.

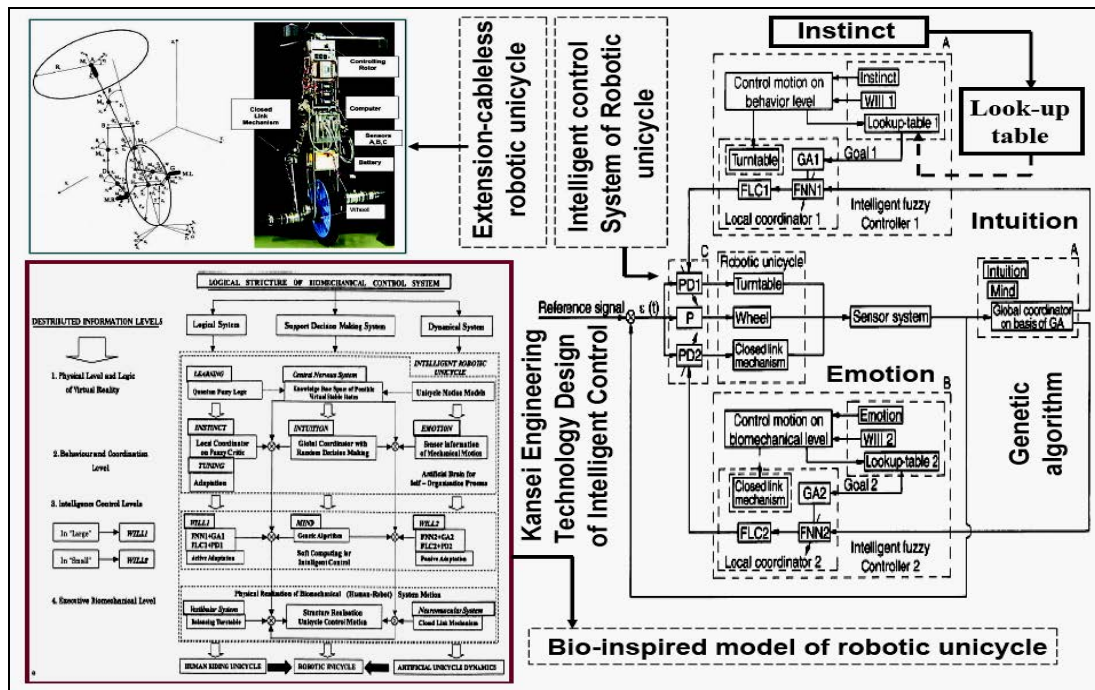


Fig. 6. Robotic unicycle model

Intuition and instinct mechanisms are considered as global and local search mechanisms of the optimal solution domains for an intelligent behavior and can be realized by GA and FNN accordingly. For the fitness function of the GA, a new physical measure as the minimum entropy production for a description of the intelligent behavior in a biological model is introduced. The calculation of robustness and controllability of the robot unicycle is presented. This report provides a general measure to estimate the mechanical controllability qualitatively and quantitatively, even if any control scheme is applied.

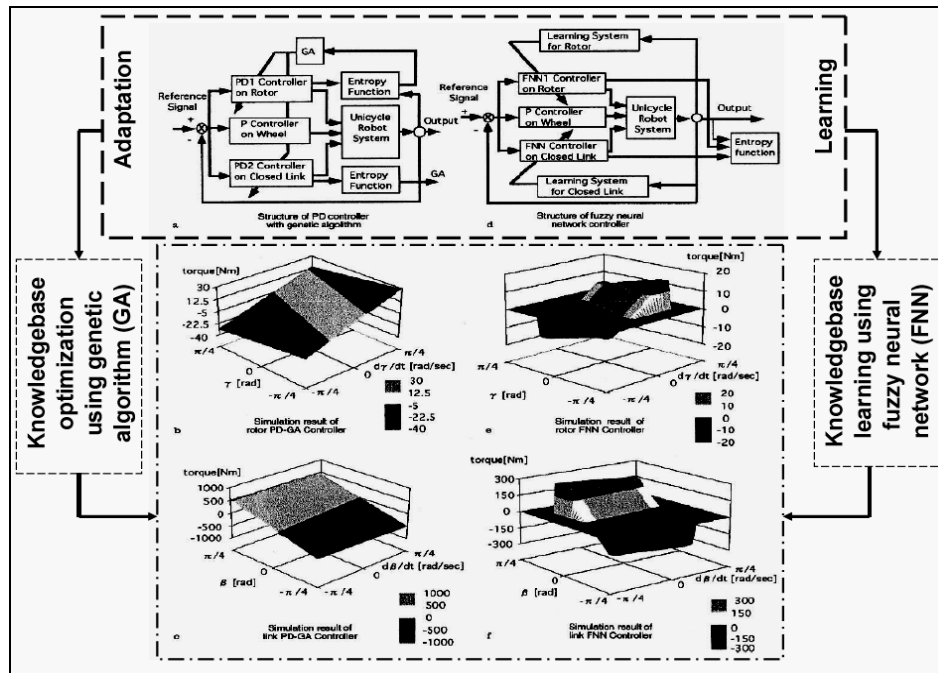


Fig. 7. Simulation of robotic unicycle model

3.3. Mobile robot for service use.

The mobile robot for service use works in buildings with different scenes of rooms and moves in unstructured environments in presence of many people and unexpected obstacles. We propose to construct a simulation system for mobile service robot behavior based on cognitive graphics. This system is used for possible world's simulation in the robot artificial life. This allows us to evaluate the control algorithms of real time robot behavior and to reduce difficulties connected with such troubles as robot collisions with obstacles and robot hardware damages. In this Item we describe a new approach to intelligent control system design using soft computing. A new form of direct human - robot communications (including emotion, instinct and intuition) and an autonomous locomotion control system were developed (see, Fig. 8).

Three sub-systems (as the locomotion system, the handling system for a mobile manipulator and the image processing system as human vision system) which organize the service robot system for its autonomous navigation (see Fig. 8) and the applications of this soft computing are described. The locomotion control system is composed of four functions, i.e. locomotion control, planning for works, learning and recognition.

These four functions are related to each other. By using the handling system for a mobile manipulator and the image processing system as human vision system, the robot can realize some technology operations, for example, opening a door and getting on an elevator.

These three sub-systems are based on fuzzy control, FNN and GA.

Experimental results on the developed robot show that the proposed methods are very useful for autonomous locomotion control of the robot.

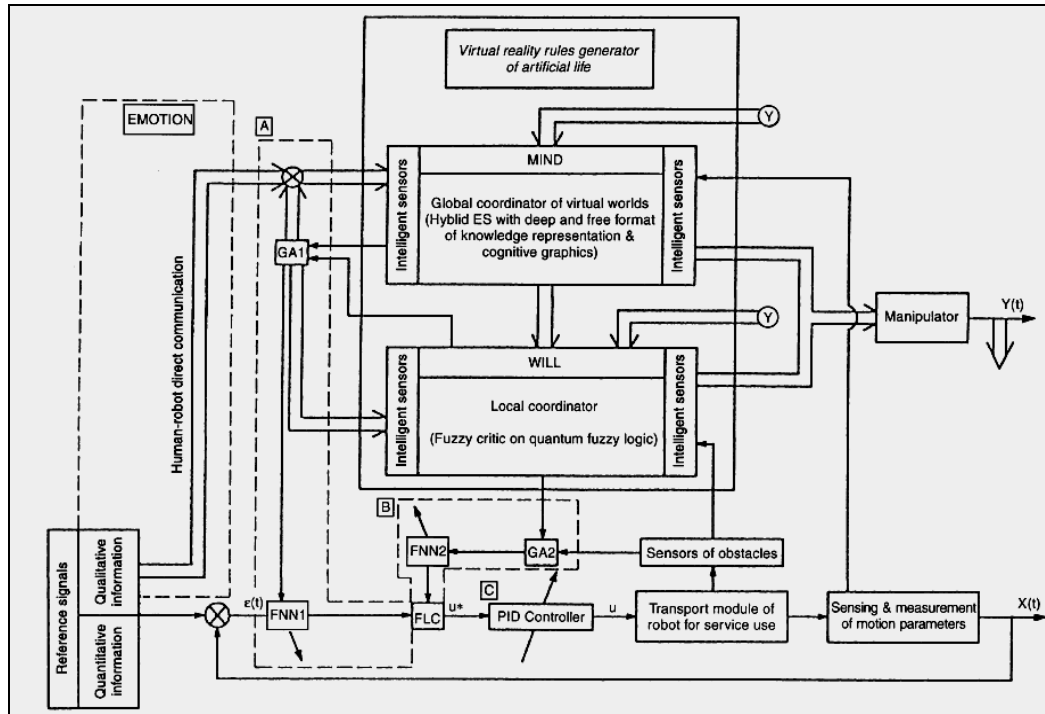


Fig. 8. Structure of AI control system with distributed knowledge representation (on control signal levels). a - Intelligent control “in large”; b - Intelligent control “in small”; c - Control on executive level

In this part we consider also the use of natural language computing and cognitive graphics for condition descriptions of robot artificial life and direct human-robot communications for a mobile service robot shown in Fig. 9.

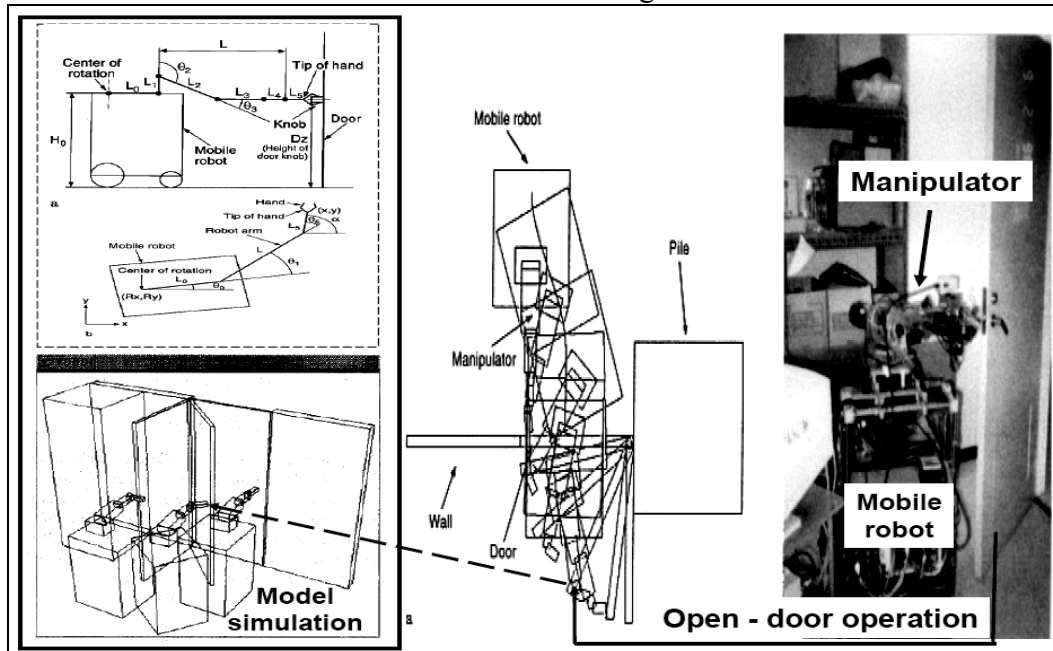


Fig. 9. Mobile robot for service use

Example: Intelligent control and soft computing for avoidance of obstacles and execution of technology operations. This robot is power-wheeled steering type which is achieved by two driving wheels and a caster with passive suspension for stable locomotion.

Thirteen ultrasonic (US) sensors, nine infrared (IR) sensors, a five degree-of-freedom (DOF) manipulator with a three finger hand and a CCD camera are equipped on the robot for conducting tasks and works in buildings including human being, opening door and getting on an elevator (see Fig. 10). In process of robot's locomotion in a building on Fig. 10 from point to point mobile robot must avoid obstacles in Room, and achieve starting position for successful opening room door (as technology operation from one point to another point) and go out the Room to Elevator in presence of obstacles in a corridor. The above command or process is planned by the managing system which was described in [14].

Technological operation's design of robot for service use is a new Benchmark [14] of human – machine interaction and of evolutionary intelligent computing in non-linear mechatronics and intelligent smart control.

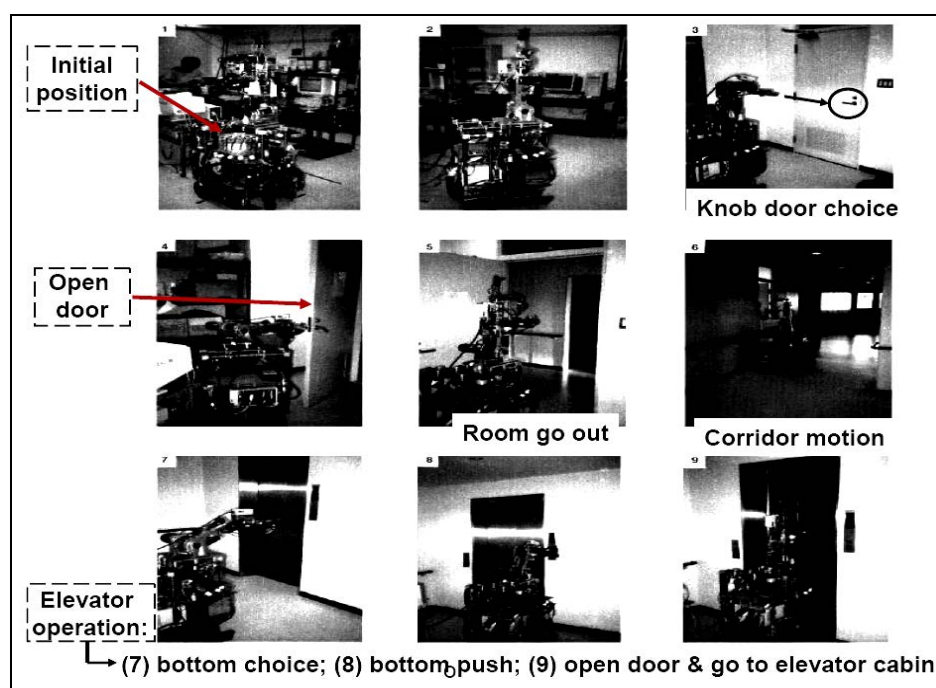


Fig. 10. Navigation of mobile robot for service use

Other examples as semi-active suspension system of car (Hagiwara T.) and robotic rider of motorcycle (Fujii Sh.) from Yamaha Motor Co., Ltd. in the report are also considered.

4. Conclusions

These examples show the possible using of new types of unconventional computational intelligence and quantum algorithm of KBs self-organization, which allows real-time (on line) control to achieve the goal in unpredicted situations by improving the robustness of the IFICS in problem-oriented fields. The background of applied unconventional computational intelligence is soft and quantum computing technologies. Creation and implementation of software products (using new types of intelligent computing and software and hardware support, knowledge extraction algorithms, processing and generation of knowledge in intelligent control of quantum nano-technology, etc.) is a special kind of knowledge, which can be considered as a separate item.

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BEHAVIORAL PATTERNS OF IT UNDERGRADUATE AND GRADUATE STUDENTS IN ROLE-PLAYING SIMULATIONS

Bakhtin, A., Lomovskaya, K.
Moscow, MIET

This paper considers benefits of creating a role-playing simulation environment for students of infocommunication technologies majors in terms of improved week-by-week studying behavioral patterns comparing to regular interactive learning environment. Common

behavioral profiles and combined roles in cooperative learning with role-playing simulations are described.

Keywords: cooperative learning, role-playing simulations, education in IT.

Role activities (or role-playing simulations – RPS) involve creation of a learning model of the interactions taking place in the future profession or in existing learning environment (including the professor-student interactions which can be sufficient for pedagogical practice of graduate students). Using RPS allows maintaining student motivation, expanding and strengthening the studying due to the variety of stimuli and methods of memorizing, adapting and applying the learned knowledge and skills. RPS also allows embedding social components which are subject to implementation in basic courses stated by a variety of common cultural competences according to Russian educational standards of 3rd and 4th generation both for undergraduate and graduate students. Steps of creation a role-playing environment include: (1) creation of an artificial social structure (or model of known social structure); (2) implementation and forcing of created social structure, familiarization and utilization of the chosen roles; (3) supplying of plausible scenarios for enactment of the roles, committing responses and performing independent actions. Due to its undeniable merits RPS is widely used as a method of learning in higher education [1–2].

Five key elements to ensure cooperative learning by RPS means and not a simple division of students into study groups: positive independence (each group and each individual in their actions with an understanding of the importance of their activities within the group and group project), individual answerability, full-time (motivational) interaction, interpersonal and small group communication skills, collective analysis of the results [3–5]. RPS (Figure 1) is recommended to be used for providing before mentioned elements of cooperative learning [6–7], especially learning independence, intergroup interaction and collective analysis of the results.

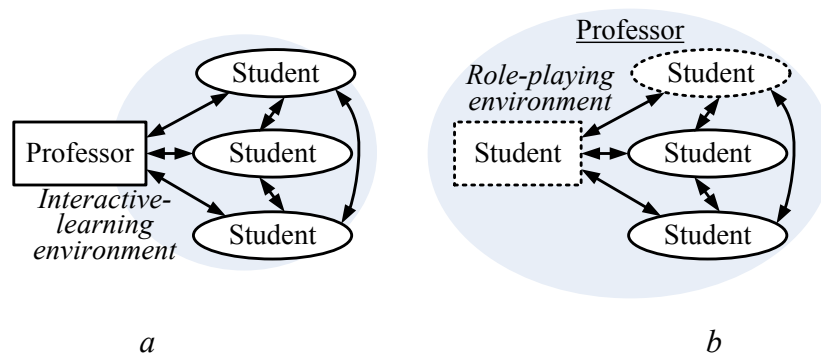


Figure 1 – Interactions between the professor and the students: a – while using interactive learning methods b - using role-playing simulations (RPS)

In the role-playing environment created by the professor (as shown on Figure 1) student usually performs one of three types of roles: *primary roles* – including first-hand project or report activities, implementing the basic function as a source and generator of information; *secondary roles* – validation of the provided information, criticism, questioning, reflection; *support roles* – especially important for the development of social skills: planning actions and time support of discussion within the schedule, etc.

In some cases it is more reasonable to choose some standard roles [6–7] and distribute them among the students; in the other – to give students a list of roles and allow the selection and change of roles according to the learning dynamics of a particular group of students. Degree of autonomy in choosing roles can be determined by the degree of students'

experience in educational activities [7], so for undergraduate students it is appropriate to fix the roles and closely monitor their rotation; for the master students – provide greater freedom in the choice of roles and in their implementation and rotation. It is necessary to provide some randomness in choosing roles and provide each student the opportunity to try the whole range of available roles, otherwise students tend to take the most familiar role, and avoid improving their weaker social skills and mastering additional competences [6]. The possible roles for discussions, projects, reports are well-known from literature [6–7], but it is encouraged to combine roles and adapt them for the employed RPS.

Used scenario of role activities for undergraduate students. For undergraduate students role-playing activities were used in teaching the course “Communication networks and systems” In each lecture had two speakers with reports on 20 minutes each, the remaining time was allocated for discussions, additions, remarks, intro and conclusions by professor. Professor carefully monitors what the student says and if an misunderstanding or an factual or technical mistake stops the student and explains where he was wrong and why, if it is not done by other students participating in the discussion. Thus, professor acts as creator and manager of role-playing environment, his/her presence is ambient but allows students fully employ all the different kinds of their skills.

The report, being the kind of scientific work, allows students to gain the necessary knowledge and the following speech and discussion are contributing to the development of social skills. The report is prepared during the independent work in the department’s computer classes with additional tutoring by teaching assistants and mentoring by lecturer. As a rule the graduate students act as teaching assistants while doing teaching training which is included in their curriculum as compulsory activity by Russian educational standards. The student must choose 3 days to work in the lab: 1st day – the formulation of the problem, studying of the materials; 2nd day – discussion of the structure of the report with mentor or tutor (usually during or after laboratory work); 3rd day - preparing slides and final check with mentor or tutor. Thus preparation of a report demands from a student a large degree of autonomy and a serious intellectual work, along with social skills and ability to be guided during engineering and/or scientific work. Preparation of the report includes the following steps:

- study of the most important scientific works on the subject by the list given by the professor;
- analysis of the studied material, the selection of the most significant facts, opinions of different scientists and basic scientific principles;
- generalization and logical construction of the material in the form of a detailed plan;
- preparing of PowerPoint presentations and writing the text of the report in compliance with the scientific style.

It is welcomed to use video lectures on the topic in the presentation of the report, as well as a demonstration of the connections between the previously studied materials of this course, as well as other courses studied at 1 and 2 years. *Example.* The physical layer of the OSI model works with analog and digital signals; in digital form the signal can be processed using the Fourier transform. Router is calculating the shortest path based on the mathematical apparatus of the theory of graphs.

Besides the first role, which is primary and is a combination of “Facilitator” and “Presenter”, students who will not be involved in preparing or presenting the report write an essay (abstract or summary) on the topic of lecture-to-be (secondary role). This allows professor to dynamically assign roles during the lecture and presentation of the report because all students are more or less familiar with the lecture materials. The role of students includes asking questions relating to the lecture, discussing among themselves and with the professor, the student must prepare besides the questions detailed response to them.

Results of weekly studying activities allowed to group all students in four rough types according their educational activity patterns (Table 1).

Table 1. Types of the students based on the degree of involvement in role activities

№ studying pattern	Definition of studying behavioral pattern	Range of course final grades	Average weekly grade	Average final grade
Type 1	Active role performer	4.34 – 4.86	0.2875	4.6
Type 2	Participant with recurrent activity cycles	2.69 – 4.26	0.2172	3.5
Type 3	Passive participant	1.43 – 3.27	0.1469	2.35
Type 4	Non-active participant	0 – 1.54	0	0.77
Max achieved grade		5	0.3125	5

More than 50% of the students could be defined within types 1 and 2 of behavioral studying patterns (all of them obtain “5” (excellent) or “4” (good) grades to the end of semester). About 28% of the students had sporadical activities (Type 3 and 4) during the semester thus having had to have additional assessment in form of combined written and oral exam and their grade was lower than threshold grade (3.0) but after exam about 80% of them received “excellent” and “good” grades. It should be noted that students who obtained threshold grade but less than necessary for grading them without exam had less motivation to study for an exam comparing to ones who haven’t had threshold grade.

The typical patterns for each type of studying pattern of a weekly dynamics of earning points of final grade within role playing environment are shown in Figure 2.

It is easily seen that each type of behavioral studying pattern has its own unique weekly dynamics. Sometimes the task of definition to which type of learner each individual belongs is not trivial. For further classification we defined subtypes of each learning pattern type:

Type 1a or “Consistent active role performer”: this pattern is typical for hardworking overachievers and usually this studying pattern is expected for successful learning in traditional education. This pattern is quite rare and should be less expected in senior years when students have less free time due to internships and practical trainings, usually 2–5% of all students.

Type 1b or “Realistic active role performer”: One of the most common patterns for well advanced learners, allows students allocate their free time, using every chance to intensify their

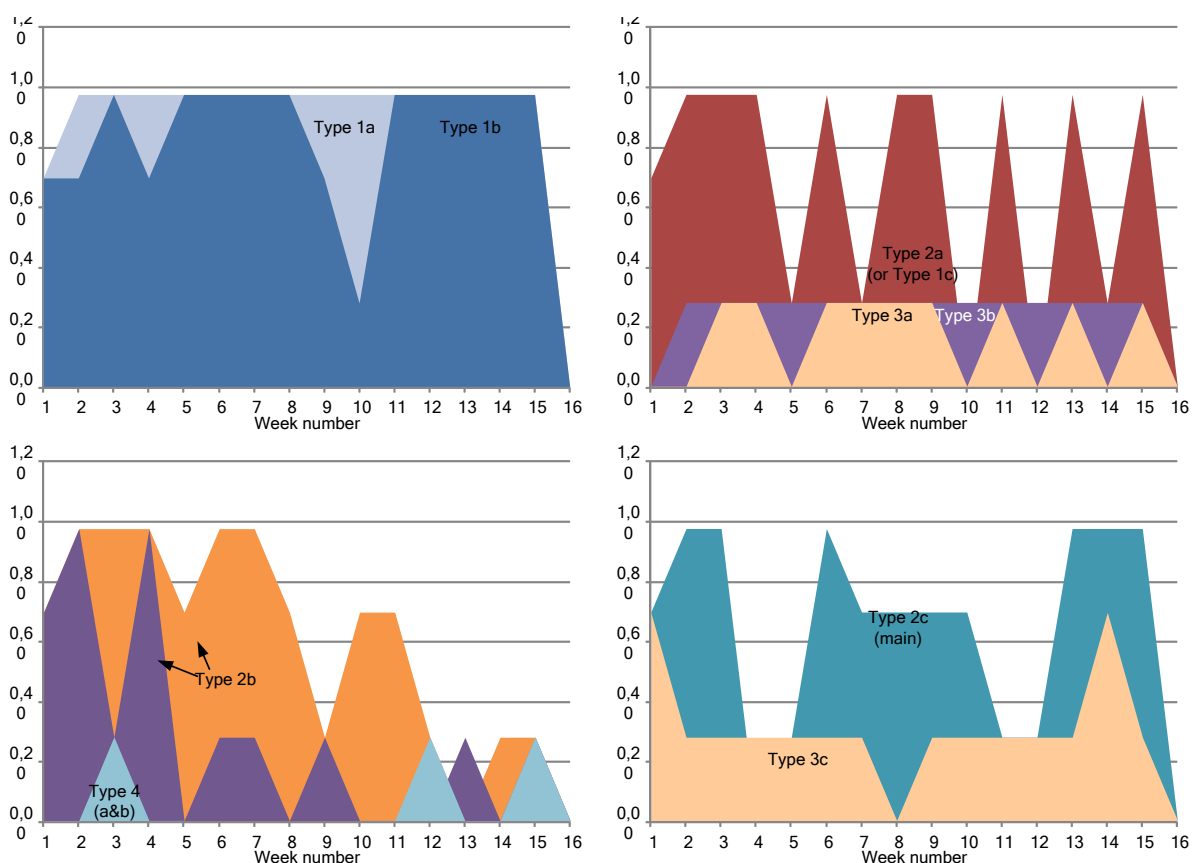


Figure 2 – Patterns of a weekly dynamics of student involvement in the learning process with RPS for undergraduate students (signature patterns for each type of learners are shown based on degree of involvement in RPS)

participation in group activities and RPS when they relate their abilities to current week task or topic and drop the intensity when then need it; usually 15–25% of all students.

Type 2a (can be defined as Type 1c) or “Meander/periodic activity cycles”: High level of activity cycles consistently combine with low or no activity cycles with almost equal gaps and lengths; usually such pattern is common for advanced learners or for students with good time management skills; 5–15% of all students.

Type 2b or “Ascending/descending activity cycles”: Ascending activity cycles are typical for traditional education with final assignment in form of oral or written exam – students work less in the beginning of semester and intensify their activities in the closeness of the end of semester. Interesting that in RPS environment ascending type of behavioral pattern is an exception rather than common event (less than 2% of students), probably, due to higher degree of student’s involvement in role activities, student who aim to obtain a certain grade cannot preliminary estimate the weekly amount of efforts needed to achieve it and work with higher intensity to when grade is secured; 10–15% of all students. Also this type balances Types 2c, 3c, and 4 thus evening teacher’s load.

Type 2c or “Non-periodic activity cycles”: Activity of those students have irregular structure with high level of peak activity and very low level of passive cycles, but if averaging the efforts they would have average or above average intensity; 15–25% of all students.

Type 3a or “Sporadically passive role performer”: Those students have very low motivation level and should be more thoroughly addressed and challenged by the professor; 5–10% of all students.

Type 3b or “Consistent passive role performer”: such type of activity as rare as Type 1a – students are not prone to show steady level of activity due to many reasons the major of which is a human factor; 2–5% of all students. Type 3c is practically the same as Type 3b but with more realistic performance with average low level of activity; 2–5% of all students. All passive role performers are not fully involved in role playing environment and hesitated to play primary roles.

Type 4a or “Episodic passive role performer”: Those students regularly pass on performing even minor secondary tasks; 5% of all students. If such performance is connected with overload during internship or else “good” reason, being usually competent in their major, such students pass the course successfully showing their skills and knowledge during oral and written exam.

Type 4b or “Not involved”: Those students are not involved in education process entirely (i.e. zero activity) and quite likely will quit the University, they probably cannot be successfully motivated and/or actively involved in studying process; 5% of all students.

It should be mentioned that before listed occurrence probabilities of each type of behavioral learning patterns were derived for average group of students (based on three sequential semesters of the same course) and can be different in each individual case of group of students and as well can be different for the same group of students learning different subjects.

Used scenario of role activities for graduate students. Graduate students were exposed to role playing environment during the workshops of the course “Fundamentals of Telecommunication Systems and Networks”. Students were allowed to choose the role for each specific workshop. Each role was consistent with the modifier of final assessment for the workshop (the factors of 1.25 to 2), and the required set of report materials and actions performed. Adequacy and quality of work in each role was valued and adjusted both by one of the chosen roles and by professor who played in this workshop scenario only an observer role in created role playing environment. Available roles included: *primary* – Leader, Spokespersons/Presenters; *secondary* – “Sceptic”/Critic, Reflection/Essay Writers; *support* – Workshop Secretary/Timekeeper/Evaluator [8–10].

Table 2 shows the weekly charts of students' activity within the RPS. About 70% of students took an main primary role (Leader) at least once and all students acted as Spokespersons/Presenters almost in all workshops; the most desirable role by the results of the workshops was the support role of the Secretary and the support roles of "Sceptic" and Reflection Writer were avoided by students whenever possible even considering that Secretary role got the least modifier factor for future grade and the avoided roles the most great modifier. Also in the table below is relatively easy to see pattern types, and final grade which was clearly depending on the quantitative and qualitative diversity role of activities.

It should be noted that the dynamics of the activity in the role playing environment, the final grade and weekly earned grade is strongly dependent on the specific socio-psychological profile of the group of the graduate students. Nevertheless, as shown in Table 2 and Figure 3 distinguish types of behavior can be derived within the RPS and they are correlating with the same for undergraduate students (Table 1 and Figure 2).

Table 2. Results and grades for graduate students' seminars in “Fundamental of TCS” (2013/2014 study year, autumn semester) using role activities (RPS)

№ of student/ № of week	1	3	5	7	Midterm exam	9	11	13	15	Role performing efficiency (immersiveness ratio) %	total received grade during the semester	Final grade for the course
1	X	X	7.5	10	13.86	5	0	0	11	56.25	59.86	59.86
2	3	9	X	5	9.46	5	10	7.5	15	98.75	60.46	60.46
3	3	0.5	5	5	13.86	5	10	15	14	100	11.36	24.86
4	3	5	6	5	15.00	5	0	0	15	60	75.00	91.10
5	3	9.5	5	11.3	13.21	5	0	10	26	100	23.71	38.81
6	X	X	5	X	13.04	X	0	5	0	25	33.04	33.04
7	X	X	X	X	6.03	5	0	5	32	25	58.03	75.03
8	3	5	5	5	13.04	12.5	2.5	5	11	95	97.04	17.04
9	3	3.5	X	X	X	X	X	X	19	16.25	29.00	49.50
10	3	3.5	6.25	10	10.11	5	10	7.5	16	100	13.61	29.61
Average/ max grade	5/5	5/10	10/15	10/15	9.8/20	10/15	10/15	10/15	Not limited	67.625/100	60	100

Figure 4 shows the comparative dynamic of studying behavioral pattern for learning environment with and without role-playing simulations. The average activity (Figure 4a) shows that role playing learning environment provides steadier pattern of learning though decreasing the average weekly scored grade. But comparing the studying patterns of most successful students we can see that for environment without RPS Type 1a of behavioral pattern is needed and encouraged and for RPS environment Type 1b (and even Type 1c and Type 2a) is acceptable for student with maximum grade from the group. This difference provided by RPS environment can be crucially important for graduate students allowing them to successfully combine learning of courses with scientific and pedagogical work and internships.

It is typical that students who performed the primary roles that are preparation of the lectures or leading a seminar know more than secondary and supporting role performers. To address this shortcoming for secondary roles is to include additional tasks, such as preparing an essay before or after a lecture or seminar. Also for the harmonization and simplification of

evaluation of reports and materials prepared by the students and evaluating the effectiveness of their submitted roles, it is recommended to introduce a more rigorous plan template for a lecture or workshop, or to provide a selection of standard templates, encourage the use of active and interactive methods in the discussion of report or during the workshop for involvement of other students.

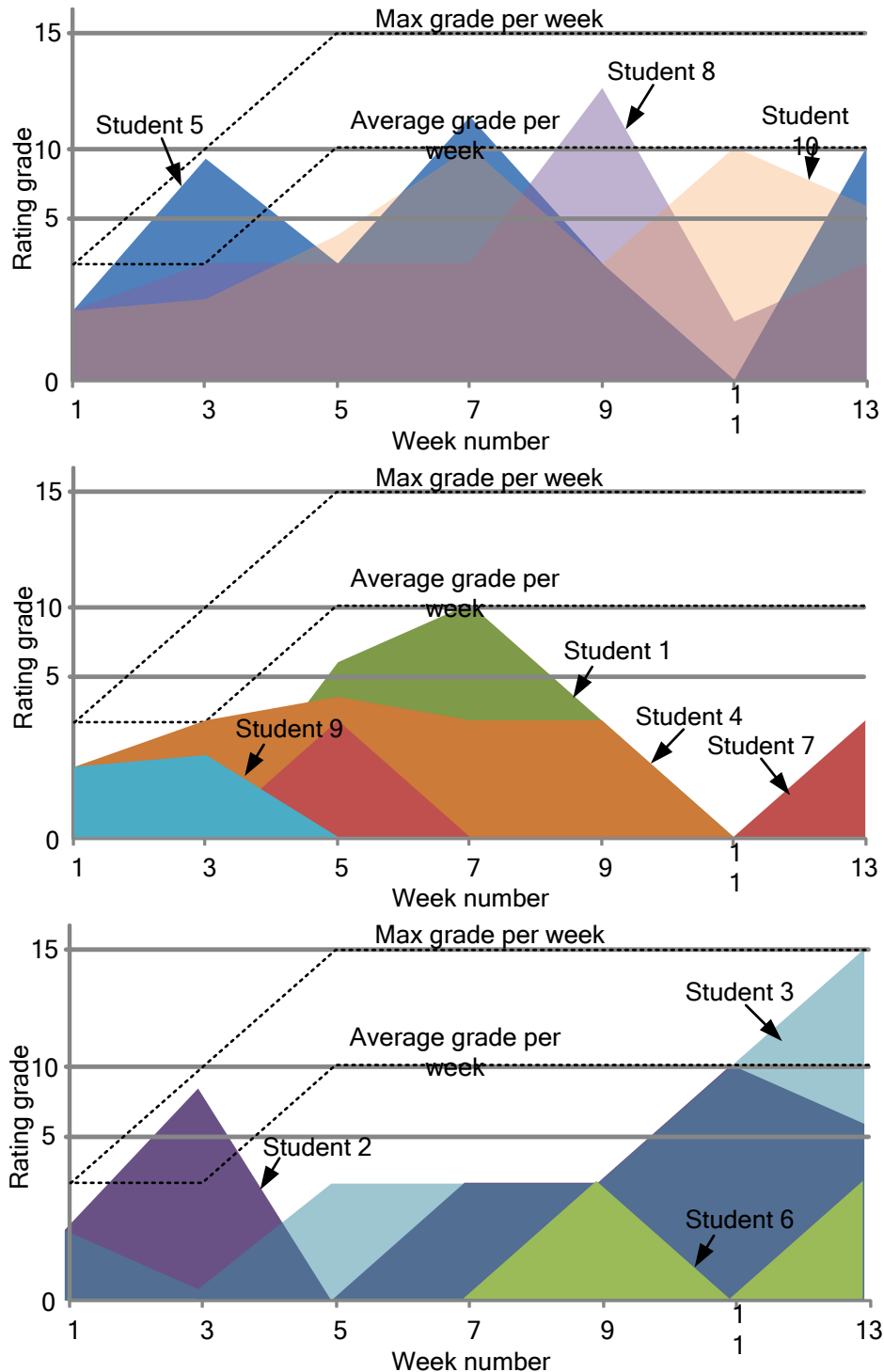


Figure 3 – Patterns of a weekly dynamics of student involvement in the learning process with RPS for graduate students

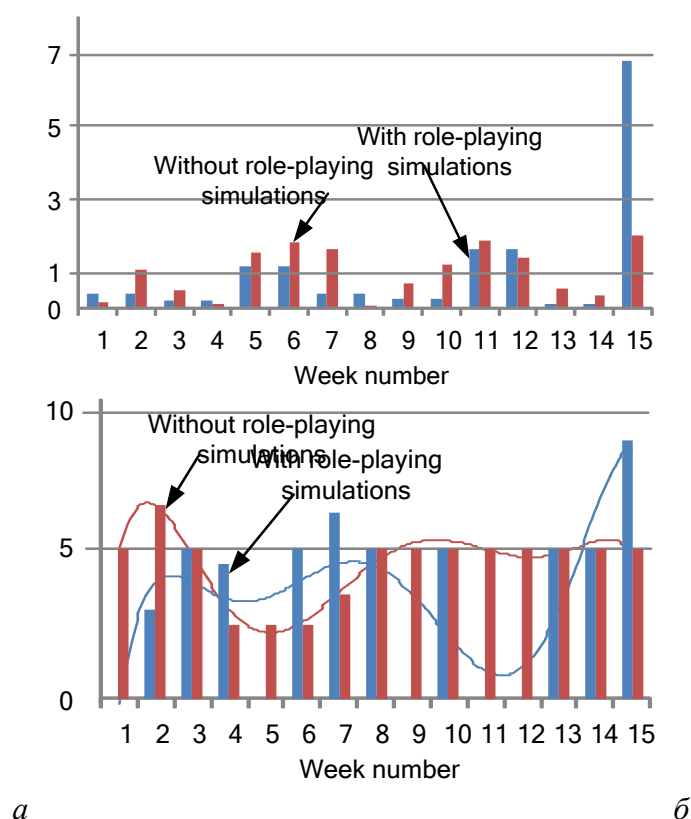


Figure 4 – Comparative dynamics of student involvement in the learning process of graduate students with and without the use of RPS: a – the average for the group (the deviation from the mean value), b – for the student in each of the samples, who received the maximum grade

For a guarantee of comprehensive learning of the course that is to implement all the competencies relating to the course being studied, 100% attendance is required for each of the students for lectures and workshops, which is possible with additional motivating of students. For further convenience of creating an environment for RPS professor can take advantage of electronic educational systems [11].

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THEORETICAL MODEL OF ELECTRONIC MEANS OF EDUCATIONAL ASSIGNMENT FOR COMPREHENSIVE SCHOOL

Bocharov, M. I., *Nurmukhamedov, G. M., **Zaika, A. Y.
*Moscow, IIE RAE; *Moscow, ICME RAE; **Lugansk, Ukraine, LTSNU*

In the article the issues connected to the creation and the usage of electronic educational courses for secondary school are discussed. The content of the publication consists of the following chapters: 1. Terminology, 2. Modern approaches to EEC creation, 3. The principals of EEC creation for secondary school, 4. Stages of EEC creation, 5. The requirements to educational electronic editions and resources. Complex review of EEC. 6. Problems and perspectives of design and usage of EEC.

Keywords: electronic editions and resources (EER), educational EER, school educational EER, electronic educational courses (EEC), versatile school actions (VSA), activity approach, ICT-competences, individualized system of study.

1. Terminology

Electronic means of educational setting (EMES) is an out-of-date term, not quite exact, because content products (content) and programmatic, and even apparatus means (computers, peripheral units and other) fall under it.

Electronic editions and recourses (EER) – are the most universal term, uniting electronic editions on physical (alienable) transmitters and informative resources in computer networks.

School educational EER are electronic editions and resources for support of educational process in institutions of general, special, and professional educations, and also for a self-education within the framework of on-line programmes, including programmes aiming on continuous education.

Modern comprehensive school is mostly interested in educational EER, providing the receipt of new information with the elements of self-testing and testing (attestations), and also accomplishment of practical tasks (putting of computer experiment, decision of tasks, construction of drafts et cetera).

It is more correct to name such EER as electronic educational courses (EEC). EEC allow to execute all basic methodical functions of electronic editions:

- Certificate-informative
- Supervisory
- Trainers
- Imitation
- Modeling
- Demonstration.

From point of ICT, EEC is the informative system (programmatic realization) of the complex setting, providing by means of the single computer programme realization of didactic possibilities of facilities of ICT in all links of didactic cycle of teaching process without an address to the paper transmitters of information:

- raising of cognitive task,
- producing of maintenance of educational material,
- organization of application of the initially got knowledge (organization of implementation of separate tasks, as the result of which scientific knowledge formation takes place),
- feed-back, control of activity of student,
- organization of preparation to further educational activity (task of checkpoints for a self-education, for reading of additional literature).

Thus EEC, providing continuity and plenitude of didactic cycle of teaching process, gives theoretical material, organizes training educational activity and control the level of knowledge, informational and searching - activity, mathematical and imitation modeling with computer visualization and service functions.

2. Modern approaches to EEC creation

Presently two basic approaches are seen for creation of EEC, which are not against , but mutually complement each other. From one side it is a professional development of EEC by the large group of specialists on the basis of division of tasks and, from other side, nonspecialized work above EEC, executable either by one person or at support of small group, often from a number of students. It is necessary to imagine the areas of work of professional developers and niches, occupied in general process of creation of electronic content by teachers- trainee. It is in fact difficult to imagine that the small team of amateurish developments will be able to create full functional EEC on the basis of modern pictures of architecture of software products,– virtual laboratory. It is too large amount of works, requiring bringing in of wide circle of specialists in the different areas of information technologies. At the same time, one competent teacher or small group of like-minded people is fully able to create the fragment of electronic course on the separate themes of the studied object, simple EEC in support of electronic course, to develop control questions for testing et cetera.

Modern technologies allow to use such revolutionary possibilities of the computer programmes in educational aims, as:

- interactiveness
- gipermedia
- design
- communicativeness
- productivity and other

The interactiveness is dominant and always present instrument. All other instruments, as a rule, are used jointly with the first, providing it the proper environment of application.

Active (interactive) co-operation of user with EEC is main advantage, allowing successfully to realize the strategic task of informatization of education – introduction in practice of inexhaustible digital educational resources.

Level of interactiveness, means the level of activity of user during work with EEC serves one of major indexes of quality of gipermedia course.

From the technical point of view the EEC is the aggregate of the programmes and information, but from point of user it is a content, means aggregate of content elements, presenting objects, processes, phenomena, abstractions which are the subject of study. Essentially content is that we can see and hear. Accordingly, content is subdivided into visual and sound content course.

Content, as a rule, is complemented elements managements which allow a user to move on a content array, means to pass from one of its fragments to other. Organization of moving (in general case – nonlinear) by these elements is accepted to name a navigation.

A navigation can be organized on the elements of content (a keyword is in a hypertext, clip art in visual composition et cetera), and also on the content-independent elements of navigation, more frequent than all disposed on periphery of screen (buttons «forward/backward», «following» «in beginning» and other). Generally speaking, the use of elements of navigation already is co-operation of user with EEC, means interactiveness. However this widely in-use form of interactiveness provides the comfort of management of electronic content only. Therefore further we will examine only co-operating of user directly with the elements of content and to analyse mainly interactive content.

Under interactive electronic content in which operations are possible with his elements is understood: manipulations with objects, interference with processes et cetera. As a rule, all operations are produced in the active field of content, which can occupy both all screen of monitor and its part.

We will consider the forms of co-operation of user with EEC, structured on four levels in order to increase the educational efficiency due to the increase of level of interactiveness, and, accordingly, more valuable expression of active forms of teaching [1]. We will mark that with the increase of level of efficiency of EEC creative and technological expenses grow on its creation.

1. *Conditional-passive forms*

They are characterized by absence of co-operation of user with content, content an unchanging form in the process of the use. These forms are named «conditional - passive», it is required managing influences for the call of one or another content fragment from the user.

To the conditional-passive forms we can include:

- reading of text;
- viewing of business graphics;
- listening of sound;
- viewing of images;
- perception of audiovisual composition and other.

2. *Active forms*

They are characterized by the simple co-operating of user with content at the level of elementary operations with its making elements.

To the active forms co-operations we can put:

- navigation on the elements of content (operations are in a hypertext, transitions on visual objects);
- printing-down of elements of content in a buffer (more frequent than all – for creation of own original compositions);

- plural choice from the elements of content (character lines or images);
- down-scaling of image for the detailed study;
- management interactive composition and other.

3. *Function forms*

They are characterized by the structural co-operating of user with the elements of content.

To the function forms we can put:

- delete/introduction of object in the active field of content;
- moving of objects for establishment of their correlations, hierarchies;
- combination of objects for the change of their properties or receipt of new objects;
- drafting of certain compositions of objects;
- association of objects connections with the purpose of organization of the certain system;
- change of parameters/descriptions of objects.

Function forms, as well as active, apply to the determined forms of co-operating with interactive content. They differ from active by the number of degrees of freedom, choice of sequence of executions, leading to the educational purpose, by the necessity of analysis on every step and making decision for the set space of parameters and certain great number of variants.

4. *Research forms*

Research are oriented not on the study of the offered events, but on the production of own events. The set great number of actions is not offered to the user, his manipulations with presented or generated in the process of co-operation with EEC objects and processes can be arbitrary. Educational aims are not inculcated in content, means a methodical sequence which will lead to given result. Aggregate of what have been said determines the research forms of co-operation of user with EEC as nondeterministic.

Accordingly, educational tasks can be formulated sufficiently various and the ways of their decision for achievement of certain from outside educational goal are chosen by a user. A variant is not eliminated thus, that at all effort of user solve task will not succeeded and educational purpose will not be attained.

For realization of research forms of co-operation content of EEC must be an interactive multifunctional audiovisual environment with multimodel support. Essentially such environment is close to virtual reality, maximally used new pedagogical instruments: interactiveness, multimedia, design.

Integration of the possibilities of electronic interactive content generates new quality in presentation and cognition of the world and determines the modern approaches to creation of electronic educational courses, oriented to support of educational activity in comprehensive establishments. It is thus necessary to take into account that it is not modernized classic, but span-new educational materials, consequently, and approaches must be adequate. Creation of modern electronic educational courses is a base problem of all process of informatization of education. In fact modernization of computer facilities and direction of retraining of teachers depends exactly from the decision of this problem.

EEC on the basis of gipermedia allow to automatize all basic stages of teaching - from exposition of educational material to control of knowledg and exposure of final estimations. Thus, all educational material is translated in bright, enthralling, with the reasonable stake of playing approach, multimedia form with the wide use of graphic arts, animations, including interactive, sound-effects and vocal accompaniment, including of video fragments , morfing and etc.

3. **The principals of EEC for secondary school creation**

There is a great number of views to the issues of development of EEC for comprehensive schools and their further use in an educational process. Nevertheless, in practical activity, related to approbation and introduction in the educational process of different software, supporting EEC, we often run into the problem of insufficient worked out of these products, absence of methodical support, by impossibility of the effective use of offered EEC within the framework of class-lesson system of modern Russian school.

EEC targets to support the educational process at secondary school. Therefore at development it is necessary to follow approaches and principles, formulated in works [2, 3].

Principle of necessary expedience: computerization must undergo only that part of educational object, within the framework of which possibility gipermedia is claimed and needed.

Principle of educational adequacy: At development EEC must be maximally taken into account operating on-line tutorials and level of requirements to the student. Unfortunately, the even leading producers of educational software violate this principle, using not the proper school requirements terminology, level of the offered tasks, theoretical maintenance often falls short of the standards of education.

Principle of organizational usability: developed for school EEC must have network support and administrative control block, allowing simultaneously to start it on all (or on chosen) workplaces, write down results in a database, to conduct and represent statistics of the use and effectiveness.

Principle of the module use: breaking up of material on sections, consisting of the modules, minimum on volume, but reserved on maintenance.

Principle of assemblability: EEC must be executed in formats, allowing to arrange them in single electronic complexes, to extend and complement their new sections and themes, and also to form electronic libraries on separate disciplines or personal electronic libraries of studying and teacher.

Principle of plenitude: every module must have followings components:

- theoretical kernel,
- control questions on a theory,
- examples,
- tasks and exercises for an independent decision,
- control questions on all module with answers,
- control work,
- context certificate (Help).

Principle of visualization: every module must consist of collection of shots with a minimum of text and visualization, facilitating understanding and memorizing of new concepts, assertions and methods.

Principle of branching: every module must be connected by hyperlinks with other modules so that an user had a choice of passing to any other module. The presence of the recommended transitions, realizing the successive study of object is assumed.

Principle of regulation: student manages changing of shots independently, he has a position to cause any amount of examples on a screen, decide an amount of tasks, set by him or determined by a teacher, and also to check up himself, answering control questions or executing control work.

Principle of adaptiveness: EEC must assume adaptation to the needs of concrete user in the process of studies, to allow to vary depth and complication of the studied material and his applied orientation depending on future speciality, as it applies to the needs of user to generate additional illustrative material, give graphic and geometrical interpretations of the studied concepts and decisions of tasks got studying.

Principle of computer support: at any moment of studying student can get computer support, releasing him from conservative work and allowing to be concentrated on essence of the material studied presently, consider the greater amount of examples and decide more tasks. Thus a computer not only executes bulky transformations, various calculations and graphic constructions but also accomplishes the mathematical operations of any level of complication, if they are already studied before, and also check got results at any level but not on the level of answer.

4. Stages of EEC creation

At development of EEC an important place is occupied by structuralization of this process, selection of the certain stages activity. The followings basic design of EEC are in-process formulated:

1. Goal setting.

Purpose of the use of textbook, and also those advantages which will be realized at his introduction in the process of teaching are determined and specified. It is recommended to use maintenance of those objects and to those, which have the obviously expressed semantic connections, allow to use audiovisual facilities of complex information processing.

2. Selection of educational material.

An author requires to take away such concepts, determinations, examples, illustrations, which would allow students to see, hear, feel deeply and understand basic semantic maintenance of new material. The selected educational material must provide opening of essence of the phenomena and processes, their intercommunications. It must be oriented on the individual capabilities of student, lean against the knowledge abilities and skills before got by them, stimulate further cognitive activity of students.

3. Structuralization and logical systematization of educational material.

The volume of educational information, produced on every employment is determined. It is important to define the volume of knowledge and abilities, actualise basic concepts, subject to the durable mastering. The studied material is divided into parts with such calculation, that it is possible it to provide logic, validity and expedience of producing educational information.

On the basis of analysis of the selected educational material the system of tasks is developed, questions, tasks which will provide active work studying in the conversational mode, stage-by-stage comparison of results of teaching and reach level knowledge with the produced requirements. It is expedient to foresee possibility of advancement of the studying to directionally "teaching", which can be disposed on the different levels of complication of educational information.

4. Development of scenarios of objects of study.

This stage is supposed by writing of educational phototypographs creation of scenarios or selection animation and video fragments, sketches of interface and animation, collection of illustrations for a scan-out.

5. Technical embodiment of project.

On this stage it is required to create the objects described before and plug them in a single software product.

6. Testing of textbook, removal of errors. As practice shows, there are errors in every created software product. On the stage of testing of electronic textbook it is important to expose majority from them. All transitions are necessarily checked up on hyperlinks, uses of interactive elements (tests, exercises), errors come to light in texts.

7. Approbation of textbook is in educational activity.

Only the use of textbook in the real work is able to show, how correctly the scenarios of employments are worked out, whether timings are faithful on implementation of tasks et

cetera As a rule, only after 4-5 lessons with the use of every theme and following after it correction of materials, a textbook becomes the truly working instrument of teacher.

5. The requirements to educational electronic editions and recourses. Complex review of EEC

A number of requirements is selected to educational SER, fully applicable and to EEC [4]. To basic it is possible to take requirements, not depending on the level of education:

1. Traditional didactic requirements:
 - Requirement of scientific character of the presented materials.
 - Requirement of availability.
 - Requirement of providing of teaching problem.
 - Requirement of providing of visualisation.
 - Requirement of providing of consciousness, independence and activation of activity of studying.
 - Requirement of providing of systematic character and sequence of exposition of materials.
 - Requirement of providing content and functional validity of control and measuring EEC and their components.
 - Requirement of providing of reliability.
2. Methodical requirements:
 - Support on intercommunication and co-operation of concept, vivid and effective components of thought of student
 - Providing of reflection of the system of scientific concepts
 - Possibility of the controlled trainings actions with the purpose of stage-by-stage increase of interdisciplinary level of abstractions of knowledge taught at the level of mastering, sufficient for realization of algorithmic and heuristic activity.
3. Technical and technological requirements.
4. Requirements of health saving character.
5. Aesthetic requirements.

The last three groups of requirements have the specialized character and change with development of both hardwares and medical - ergonometric norms and indexes.

Specific requirements are no less important, determined by a level of education and by the features of having a special purpose audience which application of EEC is counted on:

1. Specific didactic requirements:
 - Requirement of adaptiveness (to adaptability to individual possibilities of student).
 - Requirement of interactiveness (realization of feed-back, co-operations).
 - Requirement of development of intellectual potential taught during work with EEC.
 - Requirement of the system and structural-functional tie-up of presentation of educational material.
 - A requirement of formation of unique tasks is in control and measuring EEC (tasks, must not kind exist in the full up to beginning of measurings).
 - Requirement of providing of plenitude and continuity of didactic cycle of teaching.
2. Psychological requirements.

They include the account of such cognitive psychical processes, as perception (mainly visile, and also auditory, tactile), attention (stability, concentration, commuted, distributing and volume of attention), thought (theoretical concept, theoretical vivid, practical evident-vivid, practical evident-effective), memory (instantaneous, short, operative, of long duration, phenomenon of substitution information in short memory), imagination. In general, it is

possible to mark that development of psychological and pedagogical requirements to developed EEC becomes the article of more intent attention of researchers.

Most developers try in one or another measure to execute even part of the resulted requirements at development of the software products. But as far as it turned out, as far as the end-point corresponds to the educational standards and requirements, on all these questions complex examination must give answers. And here is a row of problems.

For software products to which belong EEC, the widely in-use mechanism of estimation of quality is a certification (verification of parameters, descriptions, functions et cetera on accordance criteria, to the standards and rules, set by sectoral, state and by international agreements). Certification of software product guarantees its capacity, implementation of all functions, compatibility with other programmes. But certification does not suit for the estimation of intellectual, content products. The point is that certification means prohibition of distribution of the not last a test products, that in regard to maintenance (content) of electronic edition it is possible to name censorship. But Constitution of Russian Federation forbids censorship. Therefore all verifications of maintenance of EEC can carry recommendation character only.

For the estimation of quality of EEC it is required to conduct examination, in the result of which EEC it is possible to assume or recommend to use it in the organized educational process.

In basis of technology of examination and criteria of estimation of electronic editions and resources experience of the Federal expert council is fixed of educational electronic editions of Ministry of education of Russia, experience of lead through of the Russian festivals and competitions of CD-ROM, long-term experience the Federal expert council of educational book publishing industry of Ministry of Education of Russia, and also the criteria of estimation accepted in the world on international measures («Milia», «Festival Audiovisual International» and other).

Complex examination of EEC, including, is as a result developed:

- technical examination;
- content examination;
- examination of design-ergonomics.

In detail the terms of lead through of examination and questions examined during its lead through are expounded in-process [1]. At the same time it should be remembered about some degree of subjectivity of any examination. Questions of expert estimation of created EEC still are in the stage of becoming and require the further working of criteria and requirements.

6. Problems and Perspectives of designing and usage of EEC

To the general issues of informatization of school education, to standings on the way of the use of new information technologies (to which belong and EEC), take traditionally [5]:

1. insufficient forming of material and technical base;
2. possibilities of connecting of Russian schools to the network the Internet;
3. questions of training of personnels;
4. quality of electronic products.

However the last years these problems are actively decided at state level. Among persons, who make decisio, opinion has been formed, that the technical rearmament of school must develop like mechanization and automation of production processes on enterprises [6]. In accordance with it, during the last decade schools were equipped with modern computers and computer classes, digital projectors and other peripheral equipment. The ICT-saturated educational environment began to be formed. Many schools were interconnect to the Internet. The digital was developed educational SER. New facilities of teaching appeared, arising up due to development of digital technologies (digital natural-scientific laboratories, interactive

boards etc.). The methods of internet-teaching of schoolboys have been developed. In schools computer networks which facilitated access to facilities of ICT, storage and use of digital, educational SER began to create.

Hundreds of thousands of teachers through this country passed additional preparation on the specialized courses, oriented to the increase of computer literacy and pedagogical ICT-competence. As a result all more teachers began to use facilities of ICT.

Nowadays most schools are already equipped with computers and the Internet is interconnected. Ten thousands of digital educational SER on most disciplines of school course are developed. However much noticeable changes did not happen in the educational results of schoolboys. A break was set between expectations of society which inlays the milliards of rubles in informatization of school, and insufficient effectiveness of investments. By the way, this situation is characteristic not only for Russia. Numerous foreign researches show also, that pedagogical effectiveness of informatization of school by introduction of ICT in teaching is not enough realised.

It is possible to assert on the basis of foregoing, that successful informatization of education depends not on the amount of computers, but from quality of facilities of teaching and methodical providing for their use.

Today digital educational SER rarely supported new methods and methods of educational work, and when it takes place, traditional organization of educational process at school (class-lesson system) hinders their valuable use.

In order to imagine perspective directions of development of EEC, claimed by school of the future, it is needed to analyse the new federal state of educational standard of basic universal education, accepted in December, 2010.

A standard is oriented not only to knowledge, but, above all things, on the function component of education, that allows to promote motivation of teaching, in a most degree to realize capabilities, possibilities, necessities and interests of studying.

A standard is directed on realization of the followings primary purposes:

- forming of integral picture of the world, based on the got knowledge, abilities, skills and methods of activity;
- gaining experience various activity (individual and collective), experience of cognition and self-knowledge;
- preparation to realization of the realized choice of individual educational or professional trajectory.

In this connection the key task of school education becomes the forming in students universal educational actions (regulative, cognitive, communicative), allowing them independently to plan and carry out educational activity and organization of educational collaboration with teachers and coevals, to carry out the construction of individual educational trajectory.

For realization of foregoing aims it is necessary to select the followings priorities which school must accept in the perspective development:

- transition of teaching from the class-lesson system (group learning) to the individualized system of educational work on the basis of school portal;
- systematic work of student in small groups with a mutual estimation by them works of each other;
- introduction of active project activity student in an educational process.

Passing to the individualized system of educational work, the updates of structure and organization of educational and methodological materials require transformation of traditional organizational forms and regulations and other, passing to the use of principles of the module-test system which helps to transform the traditional educational programmes in the test modules, to balance the educational loading of student. For every module the expected results

of educational work are fixed, variant educational and methodical materials are prepared. Breaking up of courses on the modules allows students to move in an own rate, going out on final tests on every module as they to it are ready.

Traditional textbooks and SER are not enough in an order to provide the necessary set of variant forms of educational work. The equipment of educational process such materials makes one of scale tasks of construction of new model of school.

Working out the totals all aforesaid, it is possible to suppose that already in the near future we are waited by the change of both architectural decisions of EEC and appearance is functional new products.

Module architecture supposes that all offered educational course is broken up on the educational modules, minimum on volume, but whole on maintenance (for example, one laboratory work, one lesson). All three components of educational process is included in every module: information, practice, attestation. The modules can be created in variant execution, counted on the study of different level of preparation users.

Modern works in this area allow to imagine, what lines the educational systems of new generation will possess. In particular, they will be characterized:

- by an openness (by module architecture);
- by an orientation on differentiation and individualization of teaching;
- by support of international educational standards;
- by support of algorithms of tasks and educational modules;
- by possibility of dynamic arrangement of electronic textbooks, control works, presentations, and also complete lessons (on templates or in an independent variant);
- by the active use of possibilities of the systems on the basis of functional dialog.

A change and enhancement, given ICT in the field of creation of educational EEC, takes place constantly, therefore perspective directions in area of computer technologies are capable already in the near future to change presentation about electronic educational manual.

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STRUCTURE OF AUTOMATED CONTROL SYSTEM PERSONAL CAREER PATH FACULTY

Bushmeleva, K., Pasyukova, N., *Uvaysov, S.
*Surgut, Surgut State University, *Moscow, MIEM HSE*

In this paper we studied the characteristics of professional competencies of the faculty at the university, developed infological domain model, and formulated a list of functional tasks and the basic functions of an automated control system of an individual career path.

Keywords: individual trajectory, professional competence, faculty, career development, automated control system

Modern understanding of specialist training is based on professional competence, integrated concept, which brings together the knowledge (general and special subject) and skills of professional activity, personality traits (based on the knowledge, skills and experience of the individual) and, finally, creative self-realization professionally.

Professional development of teachers is carried out in two directions: professional and personal. Professional growth - is a quantitative characteristic, implying high professional qualifications, skills development, including decision-making, planning, and algorithms resolving problem situations, that is, everything that leads to a high performance in professional activities. As a rule, professional growth meant training: education and training. Personal growth - a quality characteristic of the teacher as an agent of the professional activity, suggesting the development of professionally significant qualities such as motivation, creativity, values, etc. personal growth is identified with self-development [1].

Professional development of teachers - a process of continuous self-determination, self-awareness, goal-setting and tseleosuschestvleniya. It can be measured in accordance with the following criteria [2]:

- knowledge of the subject: on the basis of certificates of education, certificates of advanced training, internships, passed exams, etc.;
- methodical competence: based on the high performance exhibited by learners through open classes, designed training programs, written tutorials and instructional materials;
- research competence: based on the number and quality of publications, participation in conferences and seminars, dissertations, grant activities;
- communication skills: based on effective interaction in a professional environment.

Thus, a variety of solutions to problems, and consequent responsibility for the decision of the teacher emphasize the importance of methodical competence, which in turn implies, on the one hand, the ability of the teacher to teach students to its object, and, on the other hand - the need and ability of self-activities. Add to this that the decision of the modern teacher pedagogical tasks should be carried out in the context of optimization of training, i.e. mandatory accounting performance measures, the time and the quality of resources.

The aim of this work is to develop a generalized structure of the automated system (AS) path control individual career faculty (PPP) in higher education, taking into account the different competencies [3,4].

The automated system must:

- to collect and analyze information on the qualification requirements under PPP;
- analyze professional competence PPP;
- inform users about the results of the analysis and assessment of compliance with the qualification requirements of the PPP and professional competencies;
- create a model of individual career path PPP university based on an analysis of baseline data on PPP;
- to monitor the passage of a given trajectory of the PPP and the adjustment of the chosen model;
- carry out the assessment of candidates for the position held and provide an objective result (report) on their compliance with the requirements;
- organize the tender procedure for the position held and the draft form of the selection committee on the basis of evaluation of the relevant criteria.

The structure of the automated system consists of two functional modules: "Assessment PPS" and "Planning technology career". The module "Assessment PPP" includes the following sets: "The formation of databases on the PPP and the results of work" and "Evaluation, analysis of the level of professional skills". Blocks "Building, the choice of an individual trajectory PPP plan" and "Validation of an individual trajectory PPP plan" includes a module "Planning technology career".

Module "Assessment PPS" allows based on certain calculation methods to evaluate and generate analytical data on the level of competence of employees PPP, develop a database (DB) of PPP and submit documentation in the form of reporting the results of their work.

Module "Planning technology career" allows you to build individual career trajectories of some representatives of the PPP, as well as choose from them the most appropriate and effective to provide educational activities at the university. This module should also assess the implementation of the plan of an individual trajectory PPP.

Within individual AS control trajectory used classic client-server approach to solving applied problems. Software AS, in terms of interaction of its basic elements, implemented on different technologies and approaches, divided into server software and software client machines. In the server side includes database and its backup for the storage and management of information, implemented by a database management system (DBMS) MS SQL Server 2008, the main advantages are: providing multi-user access to data, scalability, support for this DBMS many software manufacturers software; orientation Current DBMS modern technology work, support XML, support Java, JavaScript tools for data access is considered easier to install, use and support.

The client application is intended to provide data to users, as well as to perform some operations with the data that are impractical to carry out on the server, implemented by standard means of Visual Studio 2012, this system provides: efficient application systems to create an interface with the user in visual programming style, full support architecture "client-server"; dock with a full-scale system of MS SQL Server 2008, including its object - oriented extension, connection and sharing if necessary relational databases of other species, both desktop and client-server, including servers located in different i.e. provides support for distributed databases that may be required for development of the system throughout its life cycle, and consists of forms that are accessed by the user to perform certain actions.

Until the moment of direct AS design must be obtained complex subject area - part of the real world of interest to the current use. For descriptions can be used as natural language, but its use has many drawbacks, the main ones being the awkwardness descriptions and ambiguity of interpretation and artificial formal language means not depending on the used software in the future, which in turn allow us to construct and infological domain model.

Central place in infological model is given to the description of objects (entities or represented real objects, which can be clearly identified and the information which should be kept and be available) domain and their attributes (certain properties of the object), and links (logical relations) between them.

Infological model provides storage of the qualifications (education, profession, position, degree, rank, etc., the number of points on the scale estimation) seniority, the results of scientific and methodological work (scale score estimation), competences (weight system estimation), etc. PPP.

Distinguish a number of subsystems created in AS:

- data input subsystem portfolio PPP performs the following functions: input and control data entry, transfer the data entered into the subsystem work with databases to store, loading data from the database, validating user input, management of new competencies, the introduction of recommendations to enhance career growth;

- subsystem data analysis to meet the qualification requirements and professional competencies, the following functions: analysis of the data entered, the calculation of the weights for the respective competencies;

- subsystem evaluating progress applicants, performs the following functions: analysis of scores on the assessment, decide on the adequacy of the proposed methods of evaluation and the results obtained, the data transmission subsystem statistics and charting the trajectories of individual development of PPP;

- subsystem objective assessment and agree on candidates for the post of show jumping, the following functions: analysis of the objective evaluation of the data obtained, a decision on the adequacy of the results obtained;

- subsystem build path of individual development of PPPs for the original data and make recommendations to users to achieve this goal, the following functions: builds its path of individual development PPP offers users recommendations to achieve this goal;

- subsystem statistics and analysis results of the PPP in the motion on the proposed path, output, and visualization of the data, performs the following functions: the formation and conclusion of the report on the results of PPP, the preservation of the results of the assessments for each user, save the report, print the report output in tabular form and in the form of graphs, the output history for all of the results for each user, the output of the recommendations output in graphical form the trajectory of individual development PPP, export data in tabular and graphical form;

- control subsystem of the database, perform the following functions: selection and viewing of database tables, edit records in tables, add and delete records, the correctness of the input data, deducing appropriate warnings when a user inputs;

- administration subsystem performs the following functions: adding and deleting users, assigning and changing user access level.

Thus, using the proposed automated system can implement PPP increase their professionalism through competently built individual developmental trajectories, and the administration of them to choose the most suitable and efficient staff to ensure a high level of educational activities at the university.

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SYSTEM THINKING FORMING OF FUTURE IT SPECIALISTS BY MULTI-AGENT SYSTEMS

Lavrinenko, N. V.

*Stakhanov Training and Scientific Institute of Mining and Educational Technologies,
Stakhanov, Ukraine*

The article describes the basic concepts of system thinking. The problem of system thinking formation of future information technologies specialists is formulated. Briefly discussed the main features of using multi-agent systems in the formation of system thinking.

Keywords: system, system thinking, information technologies, computer simulation, modelling, agent, agent-oriented approach, Multi-Agent system.

At the present the problem of system thinking formation is attracting increasing attention both foreign and domestic researchers. The need of systems thinking developing noted in works of M.N. Apletaev, I.G. Zakharova, A.C. Lobanov, N.I. Polivanova, I.G. Semakin, V.K. Tolkachev, L.I. Shragina, etc.

Interest of psychologists to problem of system thinking developing is defined by the general theory of thinking (B.G. Ananiev, L.S. Vygotsky, P. Y. Galperin, D. Dewey, A.N. Leontiev, L.S. Rubinstein, B.M. Teplov, O.K. Tikhomirov) and the theory of the development of thinking (D.B. Bogoyavlenskaya, A.Z. Zack, L.V. Zankov, T.V. Kudryavtsev, A.A. Lublinskaya, N.A. Menchinskaya, I.S. Yakimanskaya).

Such psychologists as L. Booth Sweeney, M. Goodman, J. O'Connor, S. Kuzhel, Y. McDermott, D. Meadows, I.B. Novik, Z.A. Reshotova and the others were engaged in system thinking developing.

According to a number of foreign researchers (F. Capra, J. O'Connor, J. McDermott, etc.) the systemic thinking caused, first of all, by understanding the role of information processes and interconnection in the functioning of systems.

We will consider the system thinking in the process of which the subject considers a subject of cognitive activity as a system, marking out in it an appropriate system properties and relations, identifying manifestations of the general system principles and regularities [1].

In the structure of mental activity of students, we can identify the following specific system skills [2]:

- to learn the system objects and distinguish them from non-system;
- to see the system as a hierarchical structure of interacting elements;
- to contribute the general principle of the system building to its integrative properties;
- to design new system on the basis of the set integrative properties or to develop and use the system model.

System thinking forming of information specialties students (engineers – teachers) is particular importance, because the rapid development of information technologies makes high demands to future specialists. The most important qualities of person as ability to analyze information and to make the correct decisions on its basis, to predict the possible consequences in the choice situation are the most significant. There is a need in forming personality with qualitatively new abilities, a new type of thinking, the person, who is able to operate complex systems of different nature and owns modern cognitive-information technologies.

The significant role in system thinking formation at the present stage is played by computer modeling which is not only helps to create abilities to think systemically, to foresee the results of work, to analyze and to operate the activity, but also allows to receive the result without detailed acquaintance to mathematical apparatus, and to concentrate attention on a solved problem.

In our opinion, formation of elements of system thinking is expedient, first of all, within discipline "Information science and information-communication technologies" as in a modern education system the information science is considered as a metasubject which provides universal tools and the most general approaches to the study of other subject domains and is designed to facilitate and simplify the perception of complex and voluminous training material.

The system thinking possibly needs to be formed within the other subject matters, but it is in the discipline "Information Science and information-communication technologies" there is a mandatory section "Modeling and Formalization", in which can be considered fundamental and cross-cutting for all other sections of the course, system concepts and patterns.

Activity of modeling systems offers the greatest potential for the formation of system thinking of the future information technologies specialists.

Creation of model of system is impossible without analysis of the system nature of initial object. During modeling, the subject has to, having analyzed initial system, design other system which serves as a model for the initial. In other words, in activity of modeling are realized and formed all basic skills of system thinking from recognition of system object to designing of complex systems. Creation and using of models of the real systems demands deep understanding of the nature of modeled systems, and, respectively, is carried out on a material of concrete subject domain in the process of the solution of tasks. It gives the ground to consider that this activity of modeling systems is the most appropriate task of systems thinking forming.

Using of multi-agent systems is offered for modeling complex systems, processes and phenomena.

Multi-agent systems – it is the direction of artificial intelligence, which uses the system, consisting of a great number of interacting agents for the solution of a complex task or problem. Multi-agent systems formed from interacting intelligent agents, which achieve own purposes can be used to solve such problems, which are difficult or impossible to solve with a single agent or monolithic system [3].

In the multi-agent systems the tasks are distributed between the agents, each of which is considered as a member of a group or organization. Distribution of tasks supposes assigning roles to each member of the group, the definition of measure of responsibility and requirements to the experience. Therefore agent-oriented environments can serve as an effective means of studying, researching and solving of complex problems in a wide spectrum of subject areas.

Today, the agent-oriented approach is widely used in areas such as distributed solutions to complex tasks (and the effective solution of the distributed tasks), combined

design of products, reengineering of business and creation of the virtual enterprises, imitating modeling of the integrated production systems and electronic trading, the organization of work of collectives of robots and the distributed (combined) development of computer programs. In the near future it, undoubtedly, will borrow the central place at development of control facilities by information and knowledge, and certainly, at creation and introduction of the latest systems of telecommunication, development of global computer networks, in particular, the Internet [4].

Multi-agent systems have a real opportunity to integrate in themselves the most advanced achievements in the field of information technologies, artificial intelligence, distributed information systems, computer networks and computer technology, demonstrating a essentially new qualities.

Using multi-agent systems in the education process give the following advantages:

- 1) possibility of understanding by the students of relationships in the modern world, modeling and studying the phenomena in their relationship, using of a multidisciplinary approach, communications between various fields of knowledge;
- 2) possibility of accounting of many factors and their interactions on the studied phenomenon;
- 3) the development of critical thinking of pupils and students, the ability of predicting, prevision [5].

The modern pedagogics can effectively use information technologies in educational process. It allows making educational process more informative, effective and qualitative. In turn the use of high-tech means assumes application of new pedagogical forms and methods.

Consequently, it is necessary to develop the technology that ensures the development of system thinking of the future information technology specialists. We need to create a model of forming of system thinking, which will be the basis for the development of appropriate technology.

To the creating of such model we learn to think in system approach - to consider that the process of education, as well as any system, has a certain set of the components which provides achieving the goals.

The directions of further research are connected with development of technology of system thinking formation of future information technologies specialists on the basis of the multi-agent systems using.

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DIDACTIC MATERIAL IN THE FORM OF NONVERBAL LOGICALLY STRUCTURED TEXTBOOK. THE DEVELOPMENT AND PERFORMANCE

Maslina, L.Y., Mel'chakov, V.N. Tanetova, N.P
MSTU MIREA Moscow, Russia

Questions of development of structures of subject matters, forms of their representation and practical use are considered that considerably lifts learning efficiency and preparation of creative experts.

Keywords: logically structured scheme of a subject (LSSS), its sections and subsections; nonverbal logically structured manuals (NLSM); education system self-organization (ESSO).

The main task of higher education is the development of creative personality traits, the ability to perceive and process new scientific ideas, analyze, and apply them to the conditions of professional activity. Today, however, the education system does not provide a solution to this problem.

We need a new educational environment, learning new technologies, providing effective audience participation in learning and teaching material allowing to realize the potential of an individual approach to training.

Specialist in any field of science should have the ability to think logically in any field of science, to identify between the concepts of well-defined logic - functional relationships based on understanding the fundamental concepts.

Through improved education in the first place is to optimize the content and form of the training process, which calls for the development (including collective) corresponding didactic material (DM) on subject specialty.

This work is carried out jointly by the teachers of academic disciplines in contact with specialists in specific areas of science and technology.

Targeted training in specialized programs allows to enhance the training of future specialists in the areas most in demand in the industry, the quality of education and graduates to adapt quickly to the demands of client enterprises frames.

DM development sequence can be represented as follows.

1. Analysis of the content of the discipline (CD) (definition of basic interrelated sections CD);
2. Analysis of intrasubject communications;
3. Drafting logically structured scheme CD (LSSCD);
4. Drafting logically structured sections LSSCD;
5. Development of nonverbal logically structured didactic material of each subsection sections CD;
6. All material is made in the form of nonverbal logically structured manuals (NLSM) on a subject.

As example NLSM developed the discipline "Radio-technical systems" [See Site www.rntores.ru (Society RNTORES them. Popov AS) section BOOKS]. Development NLSM originally implemented by each teacher discipline and further joint work of the team of teachers and representatives of the customer. Teamwork optimizes content NLSM and necessary adjustments. Didactic material as NLSM used in the learning process and the teacher trainees. Visual perception didactic material generates reflection audience being «motivational spring », causing the rise to the level of thinking, so it is possible to implement creative learning technology (CLT).

When CLT all kinds and forms of study with students include the main component of the thought process (TP). Formation and development of TP is realized in active teaching methods and effective organization of independent work of students. Perception of the material students motivates them to help the teacher in the form of active participation in the discussion and to finalize the preparation of didactic material and the corresponding text of the annex to NLSM. Invaluable support in preparation for the publication NLSM and text annex provides involve students to work in the form of coursework.

Designed didactic material perfectly help in training young teachers who will ensure continuity in the teaching discipline , as well as further improvements and the addition of didactic material in accordance with the latest scientific and technological achievements . In the process of the collective work of teachers on a specific discipline NLSM automatically solve the problem of teacher training (working with literature, to discuss the proposals and their structuring in general NLSM work with leading experts in the field (customer) , work with learners (testing levels and stages of perception)) .Develop training manual is intended for personal use by students in the learning process, both during classroom and independent work. Student in the classroom is exempt from chore of redrawing illustrations and note-taking, and the necessary remarks in its sole discretion in making teaching materials. No text to figures allows the student to focus on the visual image and a first approximation to cover the material studied.

When used in the educational process NLSM implemented the principle of individual approach in the form of group learning. Teacher instructional techniques relying on student NLSM provide entry into the space of ideas and concepts to be studied. NLSM use in the learning process to fully ensure the implementation of innovation in building the educational process , the introduction of Creative Technology training and allows you to organize training of highly motivated by emancipation creativity. While simultaneously providing not only increase the quality of learning of the students themselves, but also their own skills teacher.

Pedagogical process is implemented in a dialogue mode "teacher - student" and "student - student" that activates cognitive activity. This ensures the quality of self-esteem perception of educational material by students and teacher supply, which also forms the ratio of teacher to student as an equal partner. This allows you to expand the potential ability of students and promote their growth.

The student formed tendency to reasoned discourse, which in turn raises questions, problems, which activate their own code of thought, the discovery of its own relationship to the proclaimed problems. Allows you to turn in a lively lecture direct way of communication and interaction between teacher and student. Ultimately, to raise the profile of the teacher-scholar in the unity of its scientific and professional-pedagogical characteristics.

All components are in the learning process and ensure effective cooperation:

1. Openness of the educational process.
2. Interaction between teachers and specialists of the discipline in the formation of educational material
3. Analysis and identification of intersubject communications disciplines specialty.
4. Solution of continuity "school-university."

5. Approach to self-organization of the education system (SES)

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ON THE MULTILEVEL INFORMATION MODEL OF BEHAVIOR OF GROUPS OF AUTONOMOUS INTELLIGENT AGENTS FOR BIOMEDICAL SYSTEMS

Istomin, V.V., Istomina, T.V., Mikheev, M.U.
Penza, PenzSTU

Work is devoted to the development of multilevel information model of behavior of groups of autonomous intelligent agents for biomedical systems as a complex of UML-diagrams. The problem and its justification is presented and the mathematical apparatus and behavior algorithm that describes the sequence of purposeful actions of autonomous intelligent agents during the execution of their task is developed. An experimental research of the algorithm and evaluation of the adequacy of prediction of the agents' behavior is conducted.

Keywords: information model, multiagent systems; intelligent agents; modeling of behavior; swarm intelligence; swarm robotics.

The concept of artificial intelligence swarm behavior is the notion that in order to solve a number of problems it's impossible to build a centralized system, as information is distributed between the individual elements. Since each element, called an autonomous intelligent agent, has only a part of the available information, the solution of the problem can only be achieved by using a large number of autonomous intelligent agents acting independently.

There are many examples of natural swarm artificial intelligence systems, as well as systems of technological origin. Especially noteworthy are the biological systems, in particular, biomedical systems, that are potentially able to cure cancer diseases in general.

The object of simulation is information model based on groups of autonomous agents, and the result of simulation is biomedical system based on micro-and nanorobots. In this work 'microrobot' means a wide range of concepts from the modified microorganisms to the synthesized molecular objects, such as tecto-dendrimers, which can be composed of modules performing diagnostics, staining cells, therapeutic effects, etc. To solve these problems there's required a transition from centralized control to a distributed, collective, given the number of members of such biomedical systems that can reach hundreds of thousands.

As part of a comprehensive approach used analytical modeling results are specified using the simulation model. Thus, this paper studies the behavior of biomedical systems constructed on the basis of micro-and nano-robots. The approach is based on the information-

structural model based on the group of autonomous intelligent agents. Information model on the basis of groups of autonomous intelligent agents beneficially describes the behavior of both natural and man-made systems.

As the objective of modeling delivered study is their behavior and their capability of self-organization - namely, the ability to act within the group and to carry out the objective function. As a standard of objective functions for biomedical systems can be moving at a given point of biomedical environment given its current structure, physical and chemical composition, etc., the definition of targets effects, such as cancer cells, the implementation of these actions, in accordance with a prescribed Programme of Action.

Thus, the urgent problem of building information models is based on groups of autonomous intelligent agents for the description of biological and technological systems for various applications, in particular, biomedical systems.

To justify the choice of methodology and tools of research an analytical review of the prior art was carried out, as well as systematization of methods and algorithms for self-organization of autonomous intelligent agents for biomedical systems was developed.

In the foreign literature an approach to the development of artificial intelligence systems swarm using computer simulation has been debated a lot. Using the adequate mathematical and simulation models it's possible to make microrobots functioning forecast, to reduce the time and cost of designing robotic systems, to clarify technical requirements for their parameters. The use of modern computational tools allows us to optimize the system for the set of parameters.

For predicting the behavior of groups successfully can be used mathematical apparatus of swarm of artificial intelligence, based on which you can create appropriate models, computational methods and algorithms. Comparative analysis of existing algorithms gives us a reason to select a model approach to the description of formal relations between the autonomous intelligent agents at the level of agent and group level in the system with an accurate map of space. Systems, consisting of groups of micro-robots, are nonlinear and can exhibit complex behaviors. Another feature of such systems is the complexity of processes of interaction between robots, the consequences of which, in general, it is difficult to estimate and predict.

The essence of the principle of self-organization of such groups is the formation of disordered structures of the elements within the system without any regulatory impact outside. Consequently, many systems swarm artificial intelligence show the effect of signs of purposeful behavior, where it is difficult to expect such a thing because of primitiveness of elements that constitute the system swarm of artificial intelligence.

To study the behavior of the system groups in biomedical microrobots systems we need models and algorithms that describe the behavior of a group with an accuracy sufficient for a qualitative prediction of the activity result microrobots. This should only be set by the properties of individual members of the group as autonomous intelligent agents capable of planning and executing in a certain order the sequence of actions leading autonomous intelligent agents in the process of moving them to the target area bioobject.

Agent based modeling is realized on the basis of multi-agent system consisting of autonomous intelligent agents, which can act as a model and micro-robots. This simulation method allows us to investigate the behavior of the decentralized autonomous intelligent agents, as well as how their operation affects the behavior of the whole system. If the behavior of the autonomous intelligent agents is determined on an individual level, the global behavior of the aggregate is shown as a result of the activities of the full set of autonomous intelligent agents.

Thus, for agent-based modeling of the behavior of self-organizing groups of biomedical microrobots we need to develop multi-agent system, with defined structure and

detailed functions and structure components of multi-agent system of autonomous intelligent agents.

The authors have developed a multi-level information behavior model of self-organizing groups of autonomous intelligent agents for solving collective containment and decontamination of affected cells of biological objects and predicting the behavior of groups of autonomous intelligent agents in biomedical systems. It is presented in the form of collaboration diagrams UML, reflecting the relationship between different levels of the developed multi-level information behaviors of self-organizing groups of autonomous intelligent agents, and shown in Figure 1. In this figure, there are actors, reflecting the role of the developer and the developer of the algorithm in the application of micro-robots multilevel information behaviors of self-organizing groups of AA.

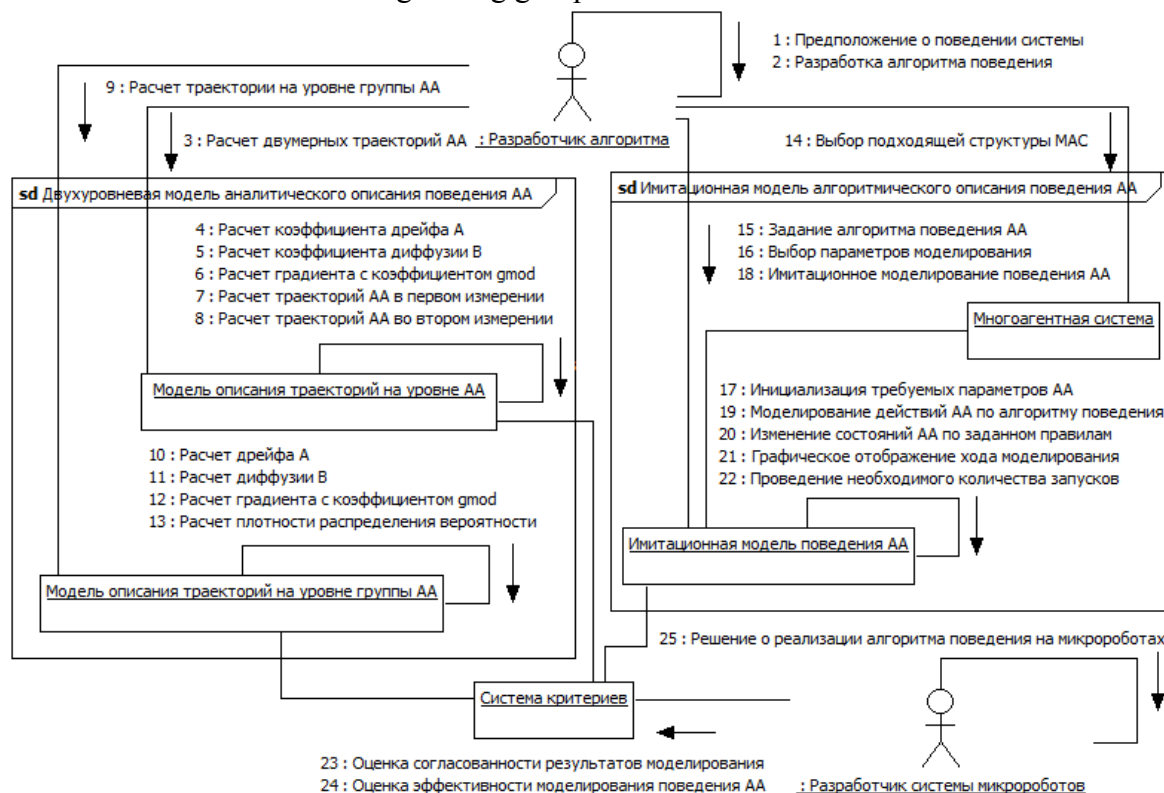


Figure 1 - Diagram of cooperation, describing the relationship between different levels of multilevel information behaviors of self-organizing groups of autonomous agents

Multi-level information model includes: a two-level model of the analytical description of the behavior of autonomous intelligent agents ; simulation behavior model of autonomous intelligent agents, multi-agent system and the system of criteria, that checks the consistency of the results obtained at different levels of the model to assess the effectiveness of the algorithm and its application in the implementation of microrobots system.

The basic requirements for mathematical apparatus, which should form the basis for a multi-level information behavior model of self-organizing groups of autonomous intelligent agents can be reduced to an adequate representation of collective processes of localization and removal of affected cells of biological objects.

Based on the theory of Brownian agents, that is self-propelled active particles, there was developed the two-level model of an analytical description of the behavior of the autonomous intelligent agents consisting of : a model describing the specific trajectory of the autonomous intelligent agents and presented in the form of stochastic differential equations, and models that describe the behavior of a group of autonomous intelligent agents, taking into

account the emergence of probability density functions of autonomous intelligent agents at a particular point and presented in the form of partial differential equations.

The mathematical model is determined by the drift and diffusion coefficients B . A With these coefficients calculated taking into account the specificity of biomedical systems, generalized equations of the mathematical apparatus can be used to describe the behavior of self-organized groups of autonomous intelligent agents.

This physical model has been extended to a generalized model of communicating groups microrobots based on heuristic arguments. Therefore, to produce an algorithm describing the behavior of groups of intelligent agents in biomedical systems, the adaptation of the model is required - in particular, the choice of the coefficients A and B in the Langevin and Fokker -Planck equations that take into account the specifics of use in biomedical systems

Based on the trofollaxis strategy and collective perception of the generalized algorithm, the algorithm behavior of self-organizing groups of autonomous intelligent agents with the ability to integrate procedures collective localization of the affected cells in biological objects and their treatment in the form of complex UML- diagrams detailing the behavior of autonomous intelligent agents during the execution of the target function.

Figure 2 in the form of UML collaboration diagrams shows the relationship between the objects of the algorithm behavior of self-organizing groups of autonomous agents to perform collective localization and neutralization of the affected cells.

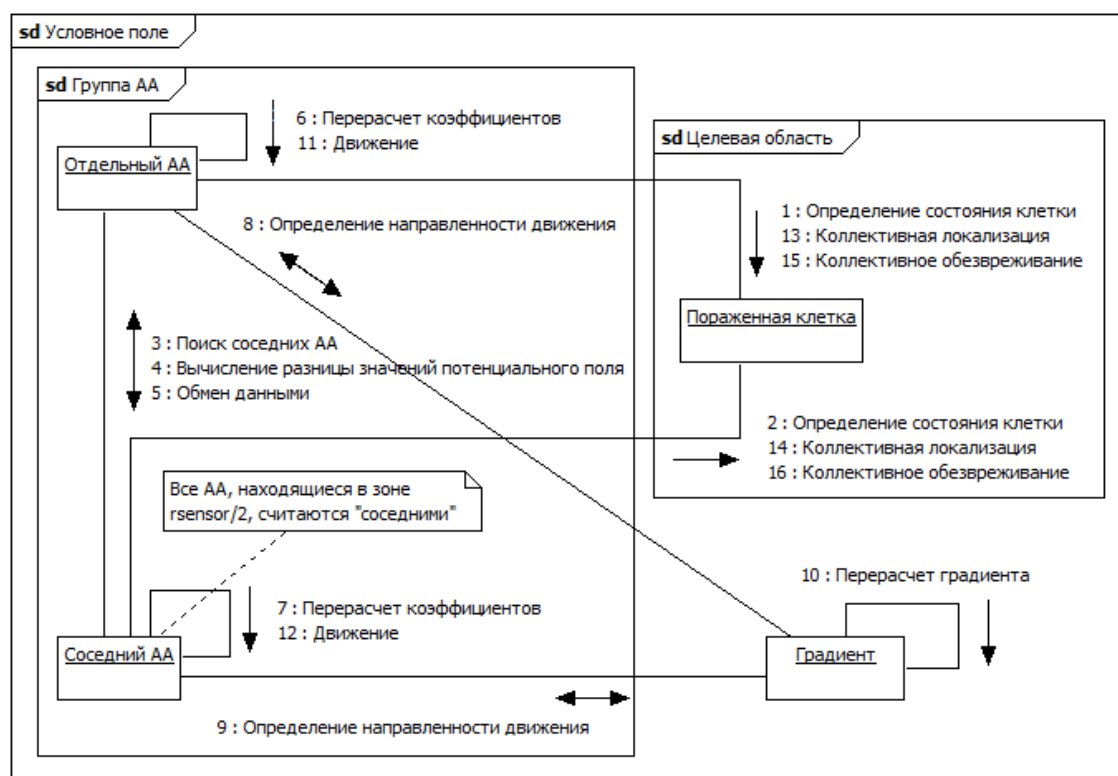


Figure 2 - The relationship between objects algorithm behavior of self-organizing groups of autonomous agents

Figure 3 in the form of UML activity diagrams presented algorithm for moving autonomous agents under uncertainty in the performance of collective processes of localization and removal of the damaged cells.

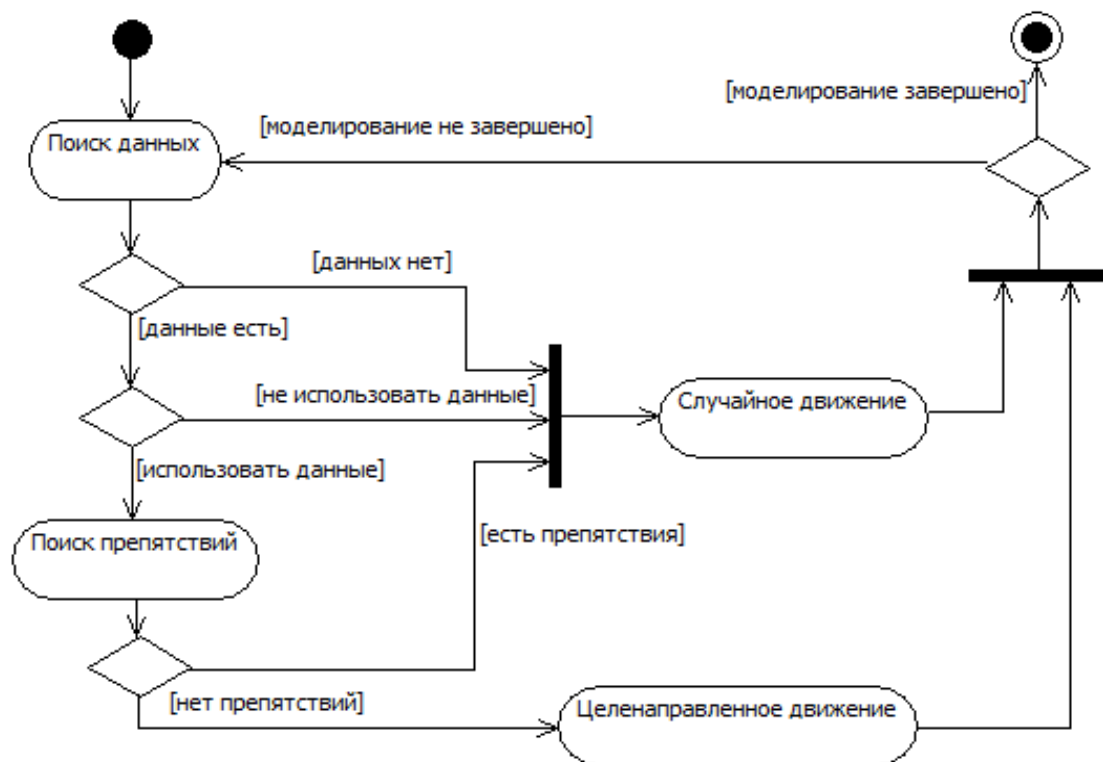


Figure 3 - Diagram of activity on the movement of autonomous agents in the face of uncertainty

Figure 4 in the form of UML activity diagram represents the algorithm behavior of autonomous agents in the process of collective localization and neutralization of the affected cells.

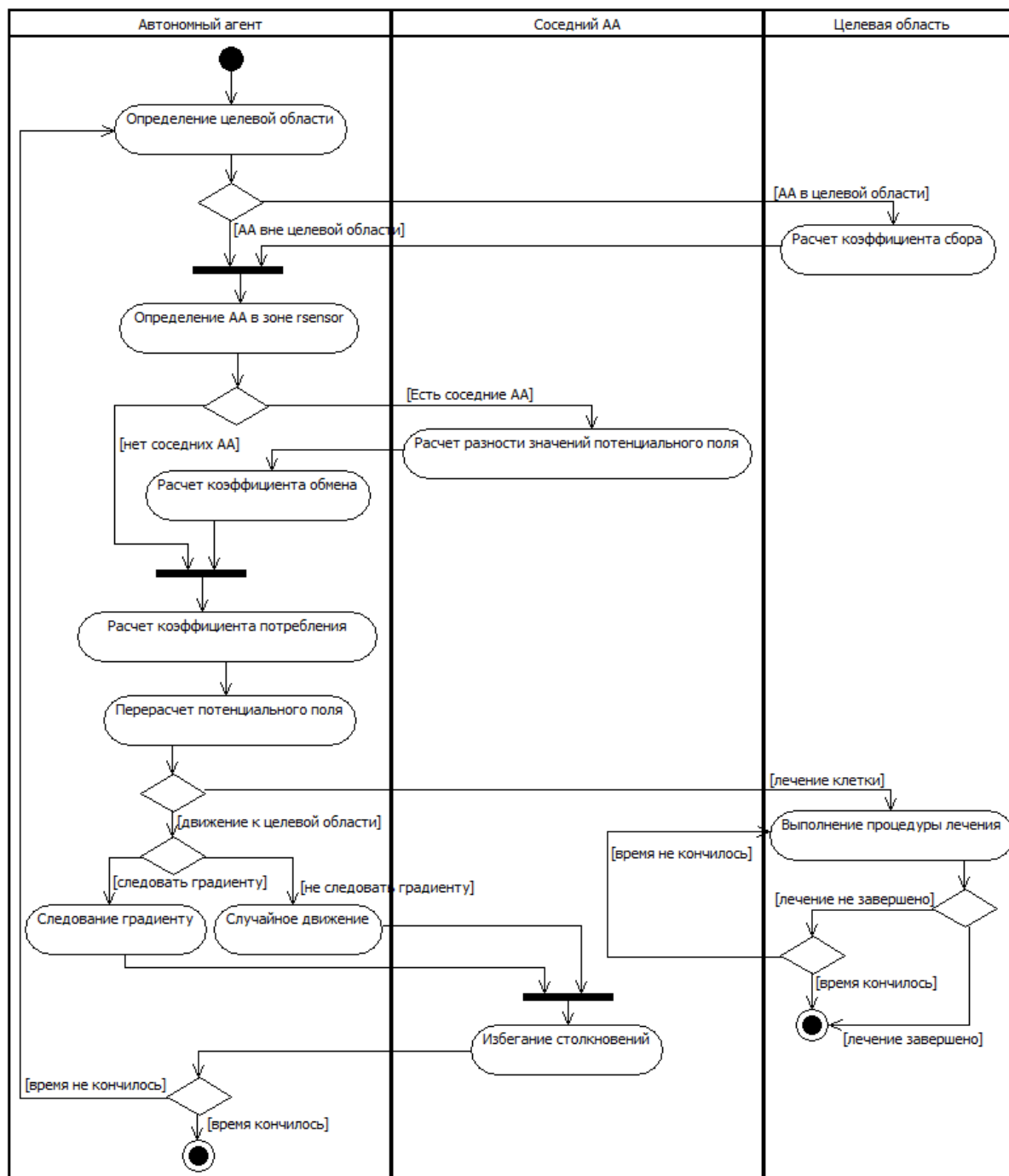


Figure 4 - activity diagram describing the behavior of self-organizing autonomous agents

Figure 5 shows the state diagram of an autonomous agent in the process of collective localization and neutralization of the affected cells, described using the language of UML.

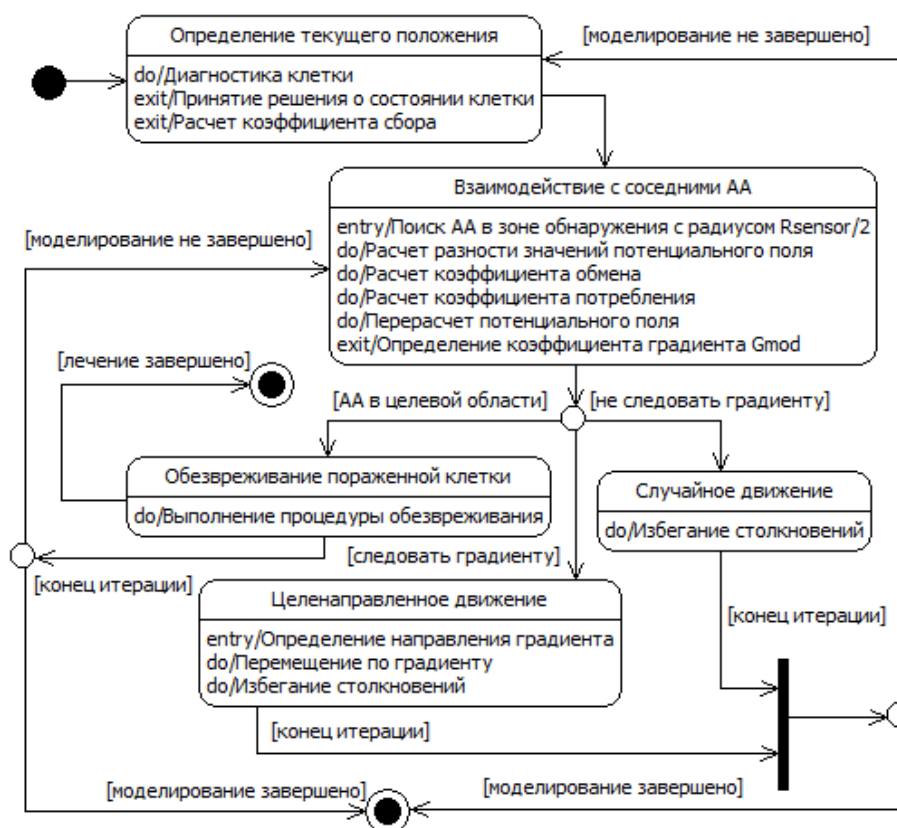


Figure 5 - diagram of the autonomous agent states during the execution of the target function

Designed complex of the UML- diagrams provides the basis for simulation of behavior of self-organizing groups of autonomous intelligent agents performing the collective localization and neutralization of the affected cells.

To create a multi-agent simulation system implementing the algorithm behavior microrobots, and to develop methodologies for the analysis of simulation planned (expected) results. During the simulation the objective was to determine whether micro-robots act in a planned way and to evaluate the reliability of the forecast of their actions. In addition, it was necessary to find how differs the level of confidence when modeling using computational algorithm improved compared to the baseline algorithm. This takes into account some of the limitations of the models reflect the specific conditions of use in biomedical systems. These limitations are as follows.

Since using the developed algorithm describes the behavior of groups of micro-robots in the search for lesions of tissues and removal of the damaged cells, it is believed that micro-robots are already in the desired area inside the human body and function at the microscopic level. Since we study the behavior of large generalized algorithm of self-organizing groups of micro-robots in biomedical systems, rather than a specific technical implementation of micro-robots, the target areas for their localization accepted abstract cell malignancy.

During the work structural and software implementation of multi-agent system that uses a specialized algorithm functioning of autonomous agents for solving biomedical diagnostics was carried out.

The development of the structure of multi-agent system based on the algorithm behavior of self-organizing groups of autonomous agents in the collective localization and neutralization of the affected cells of biological objects, as well as relationships and

characteristics of its constituent autonomous intelligent agents, produced as a class diagram UML, is shown on Figure 6.

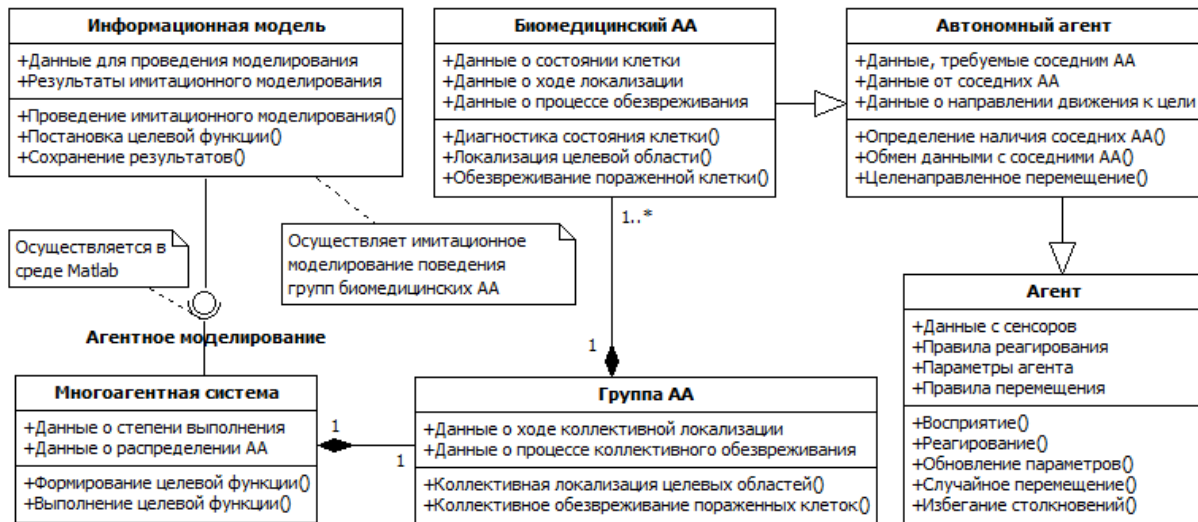


Figure 6 - Structure of multi-agent system for solving biomedical diagnostics based on the algorithm behavior of self-organizing groups of autonomous agents

For the implementation of simulation and analytical description of the behavior of self-organized groups of autonomous intelligent agents using computational methods is proposed software implementation of multi-agent systems in the environment Matlab, described by a diagram components UML, and presented in Figure 7.

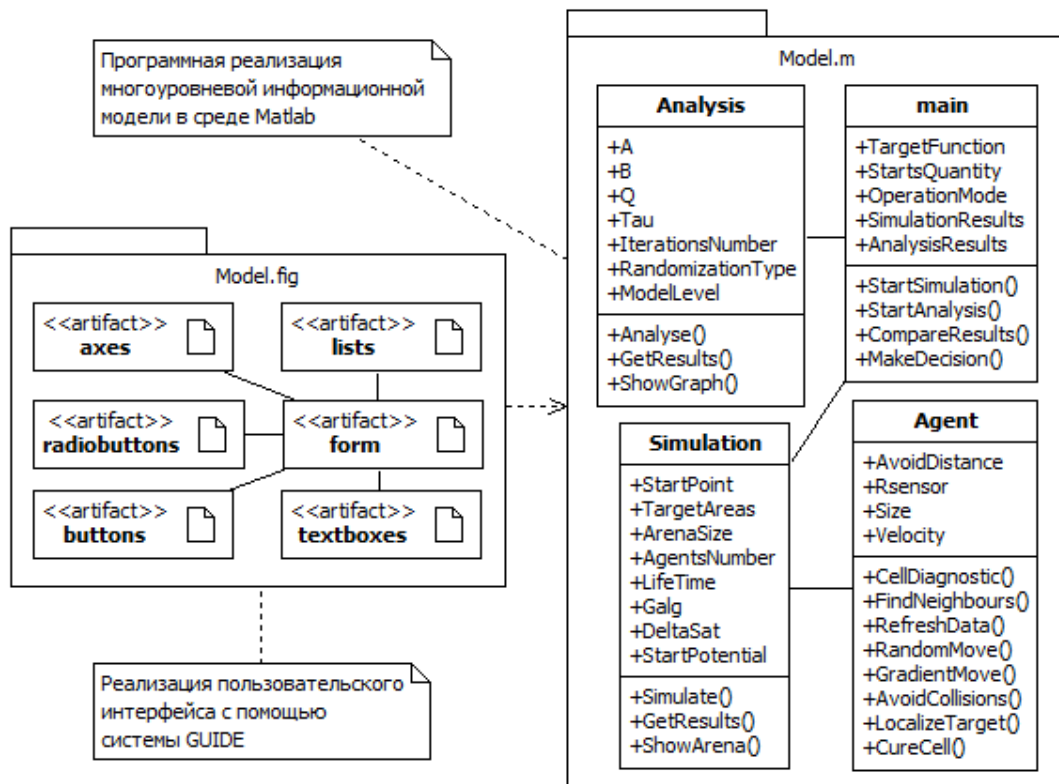


Figure 7 - Software implementation of multi-agent system

On the results of settlement procedures in the simulation there was obtained an average density value of microrobots, which amounted $0.12/d^2$. Table 1 shows the numerical

data for assessing the effectiveness of predicting the behavior of self-organized groups of autonomous intelligent agents.

Table 1 - Results of the evaluation of the prediction efficiency

Criteria	Expectation value		Standard deviation		Correlation coefficient	Standard deviation of the model / Algorithm	
	Model	Algorithm	Model	Algorithm			
Coefficient of gradient ascent steps depending on the potential field g/P	0,37	0,38	0,29	0,30	0,999	0,01	
Number of micro-robots according to their average density (N/ρ)	to the left of the target area	64,34	67,91	27,96	30,38	0,977	8,74
	for the right of the target area	142,95	139,47	28,38	24,62	0,987	2,89
Number of micro-robots, depending on the threshold of association (N/δ_{aggr})	to the left of the target area	69,25	72,73	39,77	36,33	0,989	7,60
	for the right of the target area	151,46	151,76	71,36	71,39	0,999	6,59
Number of micro-robots, depending on the ratio of the radii of the areas (N/r_{rel})	to the left of the target area	77,97	80,45	38,19	39,83	0,995	5,15
	for the right of the target area	77,97	77,96	38,19	40,08	0,997	3,74

Based on these data the estimate reliability of predicting the behavior of self-organized groups of microrobots using criteria developed by the system, which allowed to declare sufficient efficiency of the developed multi-level information model. Consequently, the work provides the necessary scientific basis for further research and practical application of self-organized groups of microrobots in biomedical systems.

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MODEL OF MANAGEMENT OF PROFESSIONAL EDUCATION ON THE BASIS OF INFORMATION TECHNOLOGIES

Bay, T.V.
Chelyabinsk, SUSU

Intensive development of information technologies has impact on traditional forms of education. That assumes change of existing approaches to education, including tourist education. In this regard there is a need of application of new information technologies and for management activities, and for educational process.

Keywords: education, tourist education, educational environment, management of education, model of management of education.

Trends of development of the modern society, its pronounced informatization explain need of more and more wide use of information communication technologies for education.

The modern system of training of future experts of the tourist's industry along with positive experience, traditions and available pedagogical potential bears in itself shortcomings and the contradictions, not allowing providing its compliance to global tasks of the modern being integrated society. In a similar situation special relevance is acquired by development and implementation of model of process control of vocational training on the basis of information technologies.

Projecting model, we proceeded from basic provisions about diversity of scientific models of B. Ya. Sovetov considered in operations, S. A. Yakovleva, the scientific model represents abstracted expression of entity of the researched phenomenon. As working concept of model we used the following determination: the model is the speculative financially implemented system reproducing some essential properties of system original in such relation of substitution and likeness that its research serves as the mediated method of knowledge acquisition about the original. Simulation here appears as an element of cognitive activity of the person.

In research the level of similarity of model of reality was collocated to a research objective that allowed defining type of projected model – a structural logical model. Structural models represent object as system with the mechanism of functioning. We consider projected model as the subsystem of the open type which has been built in a context of system of vocational training of future expert in service.

The model of management developed by us professional education on the basis of information technologies relies on theoretical researches of domestic and foreign teachers and psychologists [2, 5, 6, 7, 10, 11, 12].

In scientific literature control is considered as a multiaspect phenomenon and it is represented at the same time as system, process and activities [8]. In the conditions of reforming of Russian education when educational institutions leave from uniformity and provide to the population variable educational services, actively participate in innovative processes, there is an objective need of application of achievements of the modern management in practice of control of educational institutions.

Practice shows that principals underestimate a role of theoretical knowledge in the field of management informatization. At the same time "specifics of solved tasks predetermine mental, creative nature of administrative work in which setting is more whole, development of methods and methods of their achievement, and also the organization of joint activities make the principal sense and the content of work of the people who are engaged in management. Object of the labor for them is information, transforming which they make the decisions necessary for state change of managed object. Therefore as instruments of labor means of operation with information appear. The result of their activities is evaluated on achievement of the objectives" [4].

Considering information saturation of the modern educational systems, to carry out the analysis and to take necessary measures without information communication technologies, without information analysis difficult, and sometimes it is impossible. Implementation of information communication technologies in control educational attracts with process need of upgrade of mechanisms of control. The majority of educational institutions experience difficulties in case of implementation and use of information communication technologies because of:

- Time deficit;
 - Overloads of pedagogical workers;
 - Frequent change of normative and legal basis in education;
 - Absence of the centralized support with information;
 - Extensions of the nomenclature of specialties and need of guiding of own plan and financial activities;
 - Difficulties of attraction in educational institutions of qualified professionals, etc.
- [3].

The system of informatization of management by educational institution is one of tools for acceptance of effective administrative solutions, thus into the forefront demands for support of a manual with timely, sufficient and reliable information are made. Existing practice of control in education allows speaking about a contradiction between traditional cultures of acceptance of administrative decisions and occurring changes in education. It defines the following problems in educational systems:

- at the level of educational institution different information under specific requests, and further data retrieves gathers remain without use;
- methods of obtaining information don't guarantee their reliability as not unified forms which have no single-digit treatment are used, and also the management system in the most educational institution allows obtaining the same information from different structures;
- the information received during execution of request, analytical interpretation seldom is given, as a result of the decision are accepted without existing regularities and tendencies;
- insufficient level of information culture of the principal leads to that decisions are made on the basis of the principle "from experience".

The aforesaid for us was the base for development and implementation of model of control by professional education on the basis of information technologies. Development by which it was carried taking into account the following factors: timely support with operational information of chair, lowering of straight lines and reverse information streams and

abbreviation of duplicating, fast receiving and processing of the reporting, use of new forms of provision of the information, new forms of the organization of educational process, implementation of system of computer attending of mechanisms of an assessment of quality of education.

All relations developing in information space of chair, first of all are caused by information transfer processes that is movement of information flows, and on their basis decision-making. Basis for decision-making are information and analytical activities [1].

Thus, the traditional diagram of communications where at center of information flows the principal is located will be transformed. The new diagram of communications will allow delivering in center of information flows control model, as means of concentration of necessary information.

Taking into account the modern requirements of support not only functioning, but also system development of educational institution, the general principles of control and the principles of development of educational systems, as the leading principles providing creation of effective model of control of professional education, we selected the following [6].

Principle of the systems concept – it means that the constructed management information model shall be based on systems analysis of chair. That is structural elements, internal and external relations which will allow considering chair as system shall be selected. Thus the model shall provide the continuous development of system that it is possible to implement on the basis of two following principles.

Principle of modular structuring information – basic purpose – to provide information in the most full look allowing the manager in a deep measure to represent a status of controlled system and to provide sufficient tools for implementation of administrative functions.

This principle will allow selecting in model some structural units – the modules which contents needs to be defined single-digit according to criterion. Each module having the measures and indicators will provide the manager with exact information and will give the grounds for implementation of system control by educational institution.

Principle of modification, addition and continuous up-dating – implementation of this principle assumes possibility of extension, up-dating and addition of model of control by additional indicators and indexes. Thus, it can change or be adjusted according to specifics of activities of chair. In a considered context the principle assumes readiness for continuous adjustments and model up-dating on the basis of new requirements and requests, changes of a social and educational situation.

The principle of adequacy which states that the controlled system shall correspond on the complexity, structure, functions, etc. to those conditions in which it functions, and to those requirements which are imposed to it.

The formulated principles following from fundamental regularities of steady control of educational systems, and also from the analysis of experience of creation of information systems in the field of control of educational systems, allowed us to define basic approaches to creation of model of control by professional education which will provide effective management of development of educational institution.

Important element of a management information model is the system of the indexes, allowing describing a control object status. Introduction of the quantitative or qualitative scales of measurement gives the chance to estimate activities of the teacher, the pupil and establishment as a whole, so to create conditions for acceptance of the relevant decision.

Determination of criteria for selection of the indexes characterizing educational institution as social system is one of scientific problems. The most full list of indexes in practice can't be implemented therefore it is expedient to select rather sparse and compact set

of variables which thus will be able to provide a completeness and all-round reviewing of object due to separation of the most essential characteristics.

Traditional resource or financial and economic indexes are insufficient for determination of success of educational institution. For the solution of these tasks we developed the concept of the balanced indexes of activities in the different planes which set allows controlling the factors influencing these indexes, instead of it is simple to trace results. For successful monitoring in achievement of development indexes which will influence results were considered. In our research the system of indexes turns on the following main modules:

- Internal resources (personnel and education material support);
- Social effects;
- Results of training and development;
- Innovative activities;
- Efficiency of use of resources and others.

Separation of such structural elements allowed to envelop, on the one hand, all information processes proceeding in educational institution, and with another – to consider correlation and interdependency of different aspects of administrative information and to avoid duplicating.

Set of the listed indicators and indexes gives rather complete idea of a status of system of educational institution, its achievements and problems.

The technical implementation of model of control of professional education represents an interactive information system with elements of processing and data representation, electronic document management systems, distant education, etc. The system is intended, mainly, for use in an intranet of educational institution, but possibility of remote control and use isn't excluded and is provided in application of Century.

Considering the analysis of ICT competence of employees, the control model on chair was implemented within technologies of Web programming with use of different means and according to Internet network standards. This technology doesn't demand from the user of special additional skills by operation with it and doesn't demand the increased hardware-software capacities from establishment technique.

Process of creation and implementation of model of control showed that procedure of introduction and the active use possesses learning effect. Allows principals to increase the ICT competence, to rethink and evaluate possibilities of the modern means of information processing, to gain new knowledge from the theory of control of databases and information systems, in more detail to study the priority directions of informatization of education and to see development perspectives.

Thus, the following subsystems enter model of control of professional education on the basis of information technologies.

Control of educational process:

- 1) Educational and methodical support;
- 2) Planning of educational process;
- 3) Advertizing activities;

Organization of scientific research operation:

- 1) Formation of scientific and technical projects both their account and monitoring;
- 2) Monitoring of the declared projects in external scientific and technical programs;
- 3) Formation of bank of scientific and technical development.

Such model provides functioning and decision-making on control of educational process, research and development activities and structural subdividing of chair, is provided in a figure 1.

Considering the considerable amount of works on a system design as a whole, and also complexity of design in connection with changing operating conditions (change of the legislation and appearance of the bylaws, new documents, etc.) it is expedient to break operations on design, model implementations. Within our research we were restricted to development and information filling of a site of chair which is a structural component of an information system of higher education institution "Univeris".

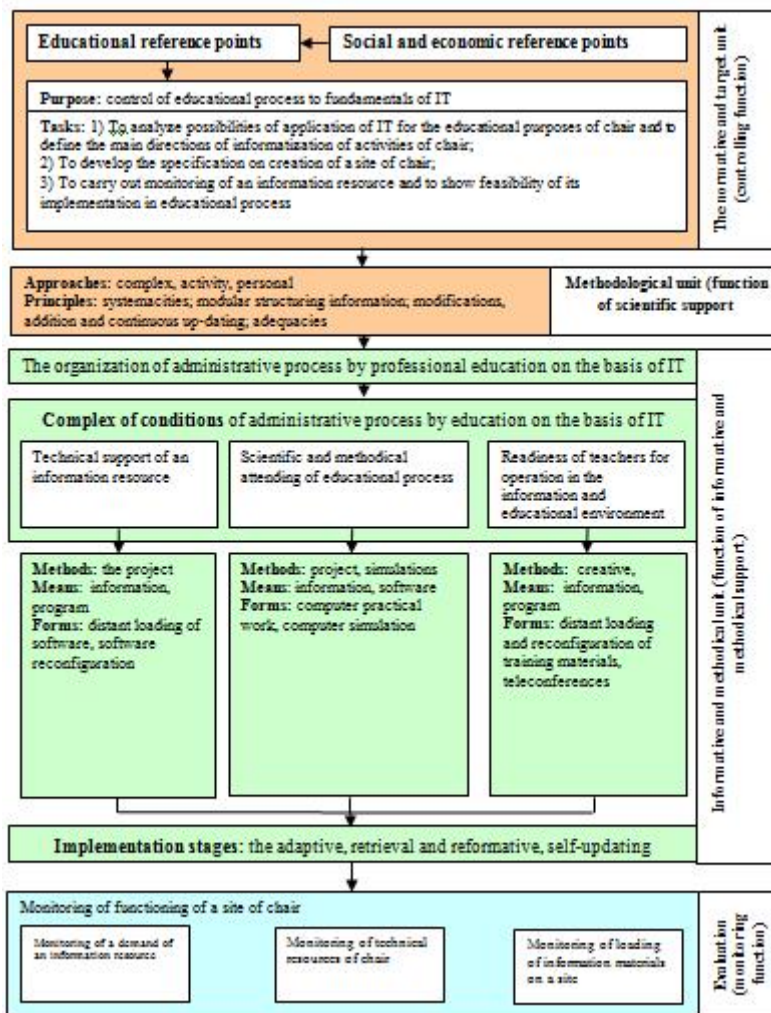


Figure 1. Model of control of professional education on the basis of IT of technologies

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BUILDING THE MODULE "COMPUTER COOPERATION" WITH USING CONSTRUCTIVIST APPROACH AND AXIOLOGICAL APPROACH

Kamalov, R.R.

Glazov, Glazov state teachers training institute

Training of students of pedagogical higher education institutions happens in the conditions of the information educational environment. Using constructivist approach and axiological approach we constructed technology which implemented in the "computer cooperation" module. Result of mastering of technology became: the personal educational environment of the student, skills on interaction on a social network the Internet.

Keywords: pedagogical technology, e-learning, social network, cooperation

Development of the information environment affects the change in the methodology of research's of modern education system. Trends of these changes do associated with increased volume of information, development of communications technology. It is focused on the use of e-learning, social media training, gamification and mobile educational technology. Under these conditions, becomes a leading constructivist approach. In accordance with him, person learns at anytime, anywhere. He man masters curriculum that is sufficient to solve a practical problem. On the one hand, it seems that the constructivist approach changes the valuations of modern education. He orients students to solve pragmatic problems which can be solved from the computer, communicating in a social network.

Note that the system of basic education assessment is person. His knowledge, intellectual culture, the ability to communicate and develop. It is the belief of axiological approach. «Man is the intrinsic value of the highest order. Work, peace, freedom, justice, equality, goodness, truth and beauty in conjunction with each other to form the point of departure from which begins the development of a universal, humanistic culture form the basis of the orientation of the educational system in all its links [1, p.20].

Synthesis constructivist approach and axiological approach determines the need to compare the data and knowledge as the main categories. We can identify the basic form of existence of data and knowledge. Data and knowledge have much in common. The transition from data to knowledge is a natural consequence of the development of information structures. Comparison of data and knowledge we does represented in Table 1.

Table 1.

Comparison of data and knowledge

Knowledge (Kn)	Data (D)
Kn1 – Knowledge in memory of man	D1 - It is result of observation of objects
Kn2 - Knowledge fixed of the textbooks, reference books, etc.	D2 - Data does fixed in information environment
Kn3 - Field of knowledge (structuring Kn1 and Kn2)	D3 – Model of data
Kn4 - Knowledge writing on the language (formalizing Kn3)	D4 - The descriptions of data given in language
Kn5 - Base of knowledge(high level knowledge – mind)	D5 – Database (the structured information resource)
Traditionally allocate three levels of knowledge: Kn1 (knowledge) - Kn3 (field of knowledge) – Kn5 (base of knowledge)	Traditionally allocate three levels of data D1 (external) – D2(logical) – D3 (physical)

Knowledge (Kn1) which are formed during pedagogical process, is result of interpretation of data (D1). Knowledge isn't imparted. They are taken. They are understood. They are coded and decoded. They are represented in shape (Kn2). The knowledge is the phenomenon subjective. It is formed on the basis of plurality of a data set (D2) - and therefore knowledge always makes a lot of sense. In the course of emergence of the formalized knowledge (Kn4) participate types of sign systems (D2), means of interpretation of texts (D3), translation tools of educational texts (D4). Therefore any knowledge (Kn5) exists as possibility of the appeal to the structured information resource (D5). Everything, what we told before it, allow to claim - process of transition (Kn1-Kn3-Kn5) depends on a condition of transition (D1-D3-D5). The analysis of this regularity defines a number of contradictions.

Firstly problem, it is a problem of adaptation scientific knowledge. Transition (Kn3-Kn2-Kn1) is substituted for representation of results on paper (Kn3 – D2 – D1). Realization of the pedagogical technology, which is carried of cooperation between teacher and the pupil is the solution of this problem. Abilities on receiving independent conclusions have to be result of this technology. We have to teach the student to gain knowledge on the basis of discussions.

Secondly problem - the problem consists in heterogeneity of data (D3 and D4), which are used for formation of the only field of knowledge(Kn3) in a certain language of formal logic (Kn4). Expansion of individual educational space is the solution of this problem. The pedagogical technology which expands the personal educational environment is necessary to us.

We can formulate the main requirements to pedagogical technology, which will be constructed on ideas of constructivist approach and axiological approach:

1. Help students use educational networking tools to solve pedagogical problem and communicate digitally with peers and teachers.
2. Use educational networking services with communicate with teaching peers, student and parents.
3. Navigate, evaluate and create professional content on networking sites.
4. Use online networking to create, maintain and learn from a personal learning network - and their students.
5. Follow netiquette, conform to ethical standart and interact appropriately with others, especially students, online.
6. Understand copyright, security and privacy issues on social media sites and share the understanding with students and professional colleagues.

7. Create and follow a personal learning plan to stay informed about developing trends, tools and applications of social media.

8. Participate in the formulation of school and district policies and guidelines related to educational networking and social learning [2].

The implementation of the technology developed by us constructed on provisions described above was carried out within the master program "Control of Educational Operation in Educational Institution". Students consider different techniques and technologies on formation of ideas of a directivity of the personality, research of experience of pupils. These technologies are directed on studies of and studies of the child. Thus the mains are technologies of cooperation.

We developed the Computer Cooperation module which inscribed in structure of this master program. It orients knowledge of students on knowledge of structure of the Internet, knowledge of activities being trained in this environment.

The module of training of undergraduates according to the "Control of Educational Operation in Educational Institution" program. Consists of three sections: monitoring of the content of education on the basis of network technologies, creation of the personal educational environment, use of the mobile courses opened online. The main objective of the module - formation of ideas of educational opportunities of the global information environment. It is supposed that mastering of this module will allow pupils to use Internet resources most effectively. And if, in the section "contents monitoring" we suggest the student to register in social services, for establishment of educational contacts, already in the section "personal educational environment" we direct development of its educational needs: communication, content aggregation, information storage on a network, etc. Acquaintance to courses of MOOC allows to expand these needs and to create "own" way of development of the pupil to the Internet.

At the first stage, technology implemented by us students define area and the purposes of personal monitoring, receive skills of operation with social services, to define the list of experts in the field of monitoring and to follow them. For implementation of this purpose on an internal occupation students get advice where the teacher shows educational opportunities of social services: twitter, facebook, linkln, google +. Further there is an independent operation on creation of accounts in these social services. Students create the blog in the monitoring direction.

At the second stage there is an analysis of the personal educational environment, formation of the plan of its development, студенты create personal area educational networks, receive skills of operation with content aggregators, perform operation with observance of copyright. For implementation of this purpose services for creation of mental maps, N of river of MindMapping are used. Using it is service, students analyze the personal educational environment. Comparing it to the environment offered by the teacher. We will mark that the ideal educational environment doesn't exist. Within implementation of the specified purpose students create a resource and place it in the YourTube service. The blog created on the first occupation gains the development due to installation on it the open educational license creative common.

At the third stage there is an acquaintance to the main tendencies of implementation of technologies of e-learning. Technologies constructed on the basis of the mass courses opened online. For implementation of this purpose students get acquainted with the basic mobile open educational courses. The greatest attention is paid to the coursera service. Students are given opportunity to register in it service, to register in one of courses in the monitoring direction. To describe the operation in the blog.

The main outputs which we drew after implementation of the described technology.

1 . Process of the doctrine was cooperation between all participants of educational process: principal of the master program, teacher, student.

2 . We considered any points of view of the student on the found information resource. Discussion and expert judgement the main criteria for implementation of process of data transformation to knowledge.

3 . Students work in the real information environment. What model situations.

4 . The purposes of training weren't offered as in advance the given. The purposes of training matched the doctrine purposes. In this regard, in case of implementation of course the motivation is important – without motivation achievement of results isn't possible. Students should be stimulated to a self-reflection.

6 . Studies aren't rigidly structured. The role of the teacher consists in helping the pupil to understand the task, instead of to propose its solution.

Replication of the module possibly within implementation of master programs for pedagogical education. Use of materials of the module for professional development of teachers is possible. In case of corresponding change of a theoretical material "computer cooperation" for staff training on production is possible to build course.

Outputs: in a context of this pedagogical technology and informative coordinates of the education oriented on use of an information resource, shall change radically. There is actual a failure from the key didactic principles of a znaniyevy paradigm of education where the formal role relation of the teacher with the pupil in case of the leading role of the first strictly coordinates with assimilation by the pupil of knowledge within subjects of the diagram of activities set by the teacher.

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INFLUENCE OF SPECIFIC VALUE OF INTEGRAL RATING APPLICATION ON DEVELOPMENT OF STUDENT'S PROFESSIONAL CHARACTER TRAITS

Meshcheryakov, A.S., Moyko, M.A.
PSU, Russia, Penza

The purpose of the present work is to introduce a new approach to student studying activity appraisal to the pedagogical community. The article introduces a notion "specific value of integral rating of students" (SVIRS). The researchers provide the student survey results demonstrating the highest objectiveness of studying process with usage of specific value of integral rating of students.

Keywords: self-appraisal, integral rating of students, specific value of integral rating of students.

One of the most significant features of a personality is the ability to self-appraise its actions. Under the notion "self-appraisal" one may understand the opinion and judgment of a person on his/her qualities, potential capabilities, role and position in the society, on social importance and his/her activity effectiveness [13, 4], on self-discipline, on attitude to his/her

own success and failures [10]. Modern pedagogical research reveals the importance of self-appraisal process development and its impact on studying [1, 2, 3, 12], as well as on the degree of conformity of produced labour (product) to standard requirements (in particular to FGOS VPO [Federal State Educational Standard of Higher Professional Education]) [11]. To our point of view, the ability to objectively analyze own work results and achievements, to see the perspectives of self-development and, accordingly, to plan further professional training is an integral feature of professionalism. Formation and development of such skills and capabilities should be founded and embedded on the stage of basic professional education. At this milestone of professional education it is necessary to develop professionally important traits of personality as well as to form discipline, creative activity, good timing and accuracy of work performance, standards of behavior in the society etc.

Considering potential methods of pedagogical influence on a trainee, we concluded that the application of the rating evaluation of students' studying activity effectively influences the completion of the triune task of the teaching and educational process. Application of rating in the educational process is based on the natural aspiration of the majority of people to be more successful, be the first, the best. Thus, the current rating may act as an instrument of pedagogical influence assisting a person in objective appraisal of his/her own educational achievements, capabilities and in well-timed decision making about further study work planning. However, from our point of view, application of the modern method of student appraisal by the average arithmetical grade or calculation of student rating by three check points will not provide objective appraisal of students' studying activity. In this case the quality of work is determined only periodically and the criteria significantly influencing the solution of educational and developmental tasks of the educational process are not taken into account.

The main feature of success in studying activity of a trainee was and remains a grade. Its objectiveness and timeliness positively influences the development of students, directly effects the development of interest to the subject studied, creative activity, discipline etc. As a result of such appraisal the trainees, to our point of view, obtain and develop a firm opinion that the results of their work depend only on them. On the contrary, appraisal bias will blank all the efforts to solve the educational problem. More specific arguments on objectiveness of the given grade may be found in other publication by the present group of authors [5, 6, 7, 8, 9]. Further research and analysis of the results thereof enable us to conclude that any simple increase of the amount of grades will never lead to the objectiveness of the study work performance as long as the resulting grade will be given to a trainee as an arithmetic average of the amount of grades received. This approach to appraisal enables the students to work periodically, not permanently. On the basis of these arguments we concluded about the necessity of fundamental changes in the method of students' studying activity appraisal.

To increase the objectiveness we suggest to use the integral rating of students (IRS) and the specific value of the integral rating of students (SVIRS). The notion and the calculation method of IRS are published previously in [6]. Under the notion "specific value of the integral rating of students" we understand the value equal to an integral rating for a single lesson.

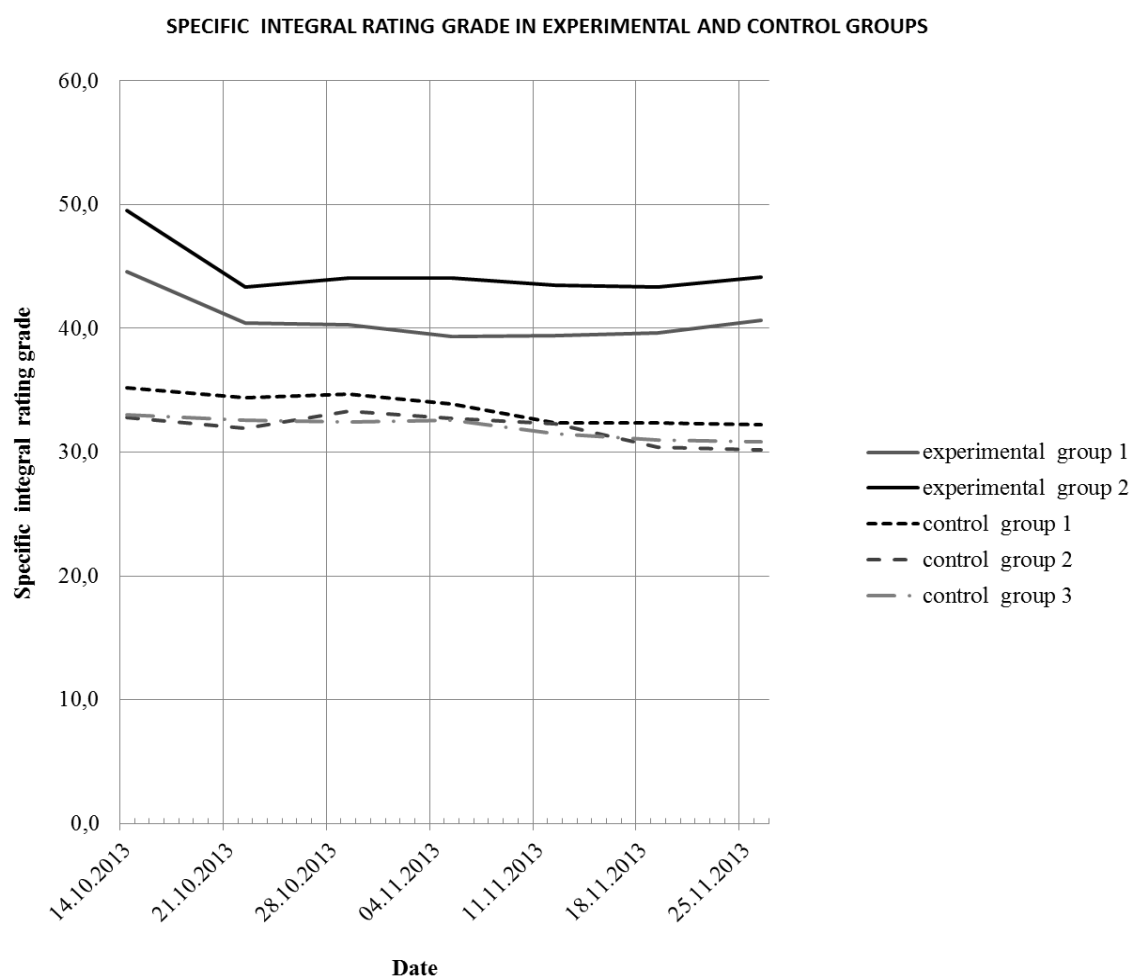
$$SVIRS = \frac{IRS}{N}, \text{ where } N \text{ is an amount of lessons conducted at the moment.}$$

Such method of appraisal allows to distribute all obtained grades over the whole period of study not according to the amount of grades, but according to the amount of lessons. Thus, a student understands that the result of his/her work and his/her success directly depends on the quality of periodically given grade as well as on creative activity, discipline, quality and timeliness of the work performed over the whole educational period, and that,

according to our view, promotes the execution of the law of transition from quantity to quality.

The appraisal system developed by us required to build a special electronic rating table of students' studying activity appraisal (ERTSSAA). Application of ERTSSAA in the educational process allowed to promptly evaluate study work of trainees and to notify them about the results of their current rating in proper time. Partially mathematical mechanism of the table, its form, result of the experiment demonstrating the effectiveness of the application of the table in order to complete the study goal of the educational process are published by us previously in [7, 8, 9].

In 2013-2014 academic year the specific integral rating grade was applied in order to determine the effect of this instrument of pedagogical influence on completion of the educational goal of the educational process. The experiment was carried out on the basis of the college of law of Penza State University. 102 students took part in the experiment. As an instrument of prompt calculation of SVIRS the researchers used the adapted ERTSSAA table. The results of changing of the specific integral rating grade for experimental and control groups are presented in graph №1.



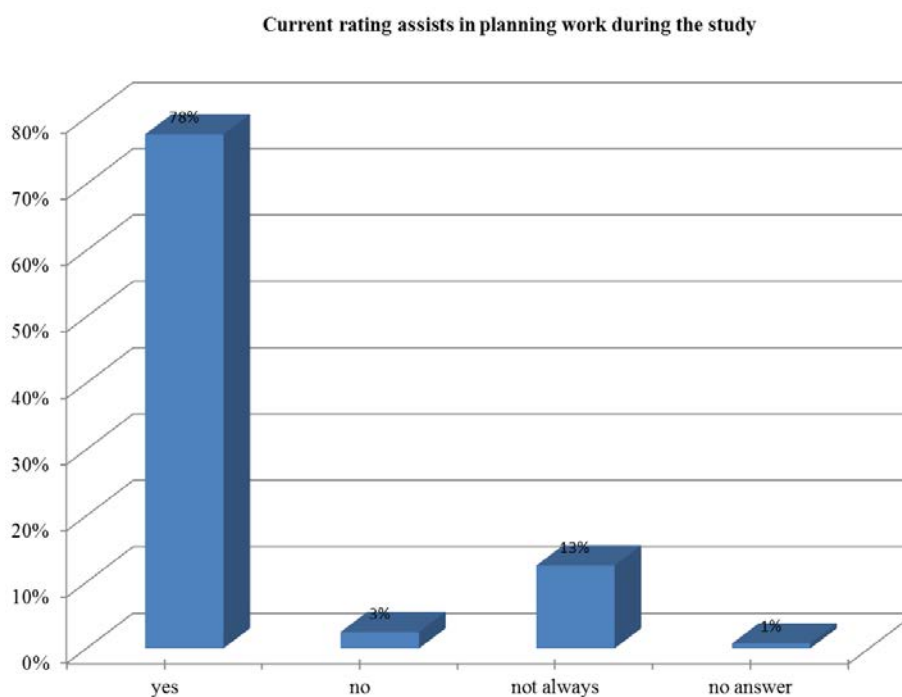
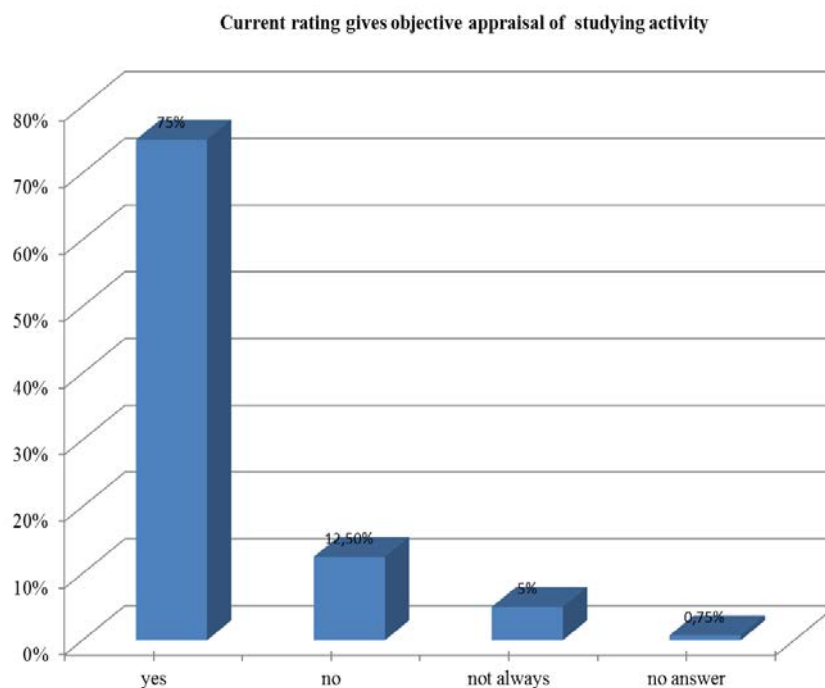
In the course of the experiment new conditions of effectiveness of the said instrument of pedagogical influences were revealed. The significant among them are the following:

- In case of students being absent for valid reasons (diseases, sport competitions, contests, conferences etc.) the rating grade should be no subject to changes;
- It is necessary to provide pathways for students to work off failed assignments and tests and absence;

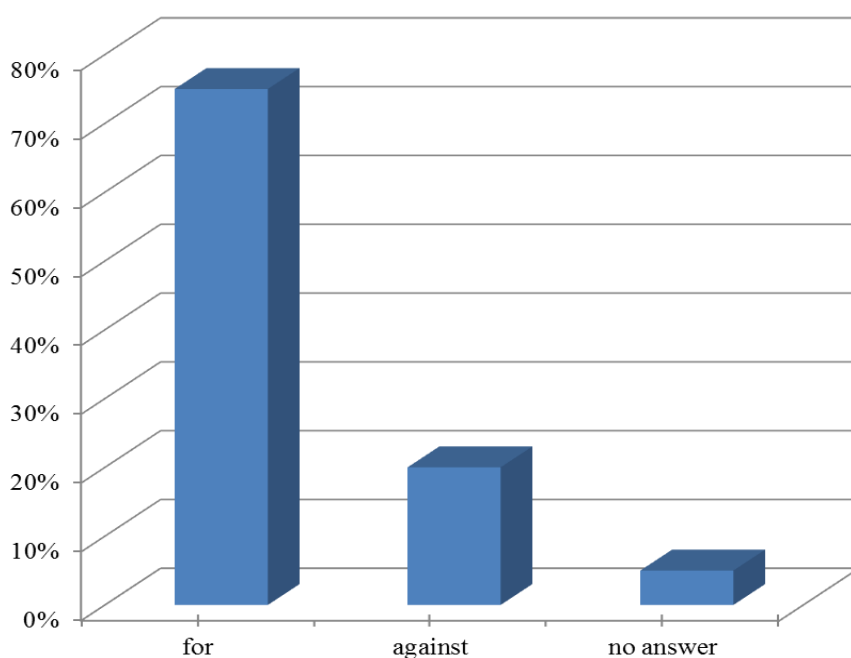
- Amount and types of developed assignments should be clearly set.

It should be noticed that the questionnaire poll conducted among the experimental group demonstrated the results similar to our conclusions.

The students were offered to fill out a questionnaire requesting them to evaluate the objectiveness, perspective of using the specific current rating grade, to reveal positive and negative aspects of using such method of appraisal. The poll results are given in the form of the diagram below.



Voting on application of the rating system as the appraisal of studying activity



Thus, we once again concluded that the modern system of students' studying activity appraisal should not just function as a characteristic of task completion quality, but promote the development of permanent activity of students in class. It is the integral rating and the specific integral grade that, to our point of view, in modern conditions most completely meet the requirements of student appraisal objectiveness and promote the formation and development of those traits of personality that are necessary for further successful professional adaptation in the modern society.

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ON THE PROBLEM OF COPYRIGHT PROTECTION ON THE INTERNET

*Minzov, A., Tokareva, N., Torosyan, Sh.

**Russia, Moscow, Moscow Power Engineering Institute, Dubna, International University of Nature, Society and Man “Dubna”*

The appearance of a big number of various open access information resources on the Internet that allow having students' questions answered and, at the same time, a low level of ethics in information handling cause copyright violation on the Internet. This article is devoted to the analysis of different means of copyright violation on the Internet, and protection mechanisms are suggested.

Keywords: copyright protection, Internet, distance-learning systems, information systems, copyright clearance centers (CCC).

Nowadays the global Internet has become the main source of information for many people and has provided an opportunity to publish information online without any reviewing and even copyright signs. Under such conditions, there have appeared infinite possibilities of access to information assets worldwide. However, it also caused many problems that deal with uncontrolled distribution of materials in electronic form of different quality, unauthorized access to information assets, compilation (Compilation – information producing based on other sources without any processing (aut.)) and plagiarism (Plagiarism – the practice of taking a part of an electronic document produced by another author and passing it off as one's own (aut.)). Presently these negative social events are becoming massive and thwart progress of the Internet in formation of a more qualitative content. In what forms does this negative tendency appear?

First of all, *large volumes of compiled data* in which authors are only redactors of the materials they have taken from other resources without any citing a source. Such textbooks do not include any new approaches; they only present widely known facts.

Secondly, *lack of motivation of user of the Internet to produce materials in electronic form of a high quality and workload*. This includes distance-learning systems: business cases, telecommunication business and role plays, analytical investigations and other forms of education without which the formation of up-to-date effective systems of distance learning and corporate training is impossible [1-4]. *In this case, uncontrolled distribution of information and lack of technologies that provide copyright protection of material of a high quality do not make authors to produce materials and spread them.*

It is important to note that *lack of ethics in information processing of Russian-speaking users of the Internet and lack of effective technologies of information sources control lead to a large-scale compilation of course-works and papers, essays and other forms of scientific and educational works*. However, the most important factor is that these problems cause irresponsible use of information.

Therefore, the problem that appears because of lack of technologies of copyright protection (This problem also contains a legal aspect that is not presented in this paper) on the Internet is a complex and it should be decided on different levels: governmental, organizational, author and user.

1. MEANS OF COPYRIGHT VIOLATION

The analysis show that nowadays there are the following means of copyright violation [5, 6]:

1. **“The forgotten footnote”** - author does not cite the source of information;
2. **“The misinformer”** – author indicates insufficient information about the source of information;
3. **“The too-perfect paraphrase”** – author cites the source, but he or she does not use any quotation-marks;
4. **“The resourceful citer”** – author cites all sources of information and uses quotation-marks, but the work does not possess originality; it just contains information from different sources;
5. **“The perfect crime”** – author tries to pass off some paraphrased materials as his or her own.

Existing means of detection of copyright violation are the following:

1. *Search systems on the Internet.*
2. *Search systems in specialized databases.*
3. *Information systems for plagiarism detection.*
4. *Information systems for originality detection in a document in electronic form.*

Search systems on the Internet and in specialized databases can give source references in accordance with their relevancy provided that cited resource has been previously indexed and the request reflects particularities of a needed document. In fact, the search results' relevancy is defined only by the frequency of words' occurrence in a document of request. That is why words' high frequency in requests may lead to tens of thousands of documents that bear no relation to the resource of copying. Therefore, a condition of a successful detection of a document resource is a word or a phrase in a request the occurrence frequency of which is limited by several or one source reference. Such requests are rather difficult to produce, especially in humane studies. Thus, existing search systems are poorly designed for detection of documents' resources and indication of copyright violation.

Information systems for plagiarism and originality detection are also operate on the above-mentioned principles. These systems gather information from various sources: download from the Internet, use databases of scientific papers and essays, etc. Downloaded

documents go through filtration and cleaning from irrelevant tags. In a request, a text is divided into separate blocks and a search for similar elements of blocks in indexed files is carried out. These systems contain particular limitations and never reveal a detailed description of their algorithms operation. Despite the fact that these systems are very common nowadays, they do not solve problems with the search of compilation or plagiarism resource. According to what the authors of such systems say, they usually use mechanisms that allow detection of compilation or plagiarism in the following text manipulations:

- Use of synonyms;
- Substitution of Russian letters with similar Latin ones (e.g. ‘o’, ‘e’, ‘p’, etc.);
- Bridge the gaps between the words with letters which then are painted white;
- Change the structure of a text;
- Change of a syntactic structure of a text;
- Text translation.

In the latter case, plagiarism detection is almost impossible.

Thus, existing systems of resources’ detection cannot specify whether we deal with plagiarism or not. Such systems just detect similar elements of two documents, but this is only the first stage; to indicate whether the source has been borrowed or not, a further analysis of documents is needed [3].

2. MECHANISMS FOR COPYRIGHT PROTECTION IN DISTANCE-LEARNING SYSTEMS

In our opinion, copyright protection of documents should be carried out on several levels:

1. *User level.*
2. *Document’s author level.*
3. *Organization’s level.*
4. *Information system (IS) level in which the document is published: corporate IS, distance-learning system, a site or a virtual university.*
5. *A level of a government mechanism for copyright protection.*

On the user level, the solution of a problem of copyright protection can be provided by means of the following actions:

1. Correct use of cited sources and references. Familiarity with legal and ethical norms in the field of copyright and intellectual property protection.

On the document’s author level, beside the 1st point, it is necessary to take into account the following one:

2. Ability to specify the problem area of a produced document and its distinctive features from the previously published one. This will allow forming correct requests for search of compiled materials in the document.

On organization’s level:

1. Development of regulatory documents on mechanisms of compilation and plagiarism prevention and detection. Construction of a monitoring and control system on the basis of up-to-date software tools.

2. Rendering help to authors in publishing their intellectual activity and registration of their rights for the information materials, textbooks, developed databases and useful patterns.

On the level of corporate IS:

1. Access control to information resources and accounting the number of copying of educational materials by contract on non-proliferation by users of educational materials that contain copyright.

2. Use of set in stegocontainers and marks that allow indicating author's rights of an electronic document, and indicating information about the user who copied the document and passed it forward: login, IP-address, time, date, PC settings and operation system parameters.

3. OTHER SUGGESTIONS ON DEVELOPMENT OF COPYRIGHT PROTECTION MECHANISMS

One of the ways of solution of the problem of creating the mechanisms of information exchange in the social media is the idea of creating the internet-passports for the participants of such an exchange. It is believed that if every user of the global network had their own identification number, then the number of information crimes and activity of network users will diminish. Now it is important to examine the adaptation of internet-passports in the algorithms of information exchange. It is supposed that for the access to any information resource on the Internet it is necessary to conduct registration of the internet-passport, which will allow marking any message or a document of this user through a particular code. In this case, it is possible to control all actions of the network users and, therefore, prevent or grapple with illegal actions. It is obvious that there is a need for mechanisms that will control such actions. To our mind, the main disadvantages of the suggested mechanism are the following [7]:

- The mechanism of internet-passports is focused on person's identity, but not on the identification of information. It has been already mentioned that democratic societies admit anonymity of users. This fact has caused the strongest objection of the network users towards the idea of internet-passports. Even if the total control of information sources in the network reduces the risks of appearance of threats, it also may lead to more serious social consequences.

- Risks of cybercrimes in the network will stay at the same level, as there is still a problem of theft of internet-passport data of other users, as well as getting several "bot"-passports and other actions;

- There is also a vague idea of protection mechanism of user's personal data, as well as legal issues of creating and implementation of such a mechanism of the Internet users' identification.

We believe that another mechanism of reduction of threats of information security in the social media is more promising. That mechanism is based on the idea of **copyright registration of information in electronic form**, created by the user, who is checked in one of the Copyright Clearance Centers (CCC) on the territory of Russian Federation or on the territory of another country. These centers are connected with the main center (RCCC), which provides interaction among separated CCC and other organizations (Fig. 1).

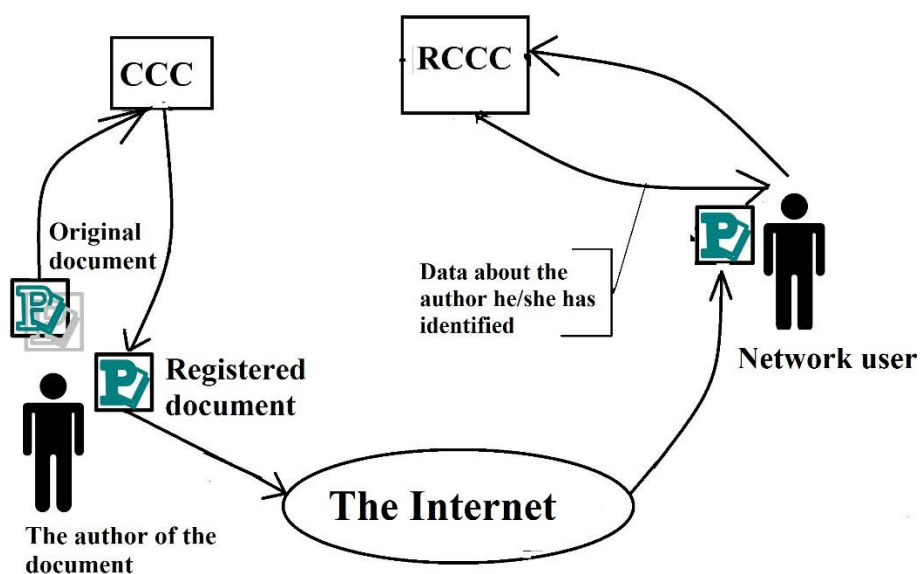


Fig.1. The diagram of information exchange in electronic form with the possibility of copyright registration [7]

At the bottom of the organizational structure of this mechanism of information exchange through the network lies CCC for information in electronic form. The main functions of these centers are:

1. Voluntary registration of information authors (a text, multimedia or other forms of information presentation in electronic form in acceptable formats). In the process of check-in the author indicates personal information in the volume that is not less than while checking in social networks, and then goes through authorization using one of the methods (through mobile connection or other methods). As a result of check-in the author gets: *identification number, one of the keys of digital signature (private) from the generated key pair and the program of document recording in the CCC* (this function may be carried out both in default web browser, or through its add-in).

2. Voluntary registration of any author's documents in electronic form. In order to do this, the author sends the documents to CCC, providing his identification number and the defined value of hash function of the forward document, which is encoded by the author's privacy key. In that document, the author can also outline those parts of it, which will help to identify that document in search systems. Besides this required information, the author may indicate the volume of his private information that can be provided, if there are requirements for it (the author of the document exists, but does not provide any private information; author's surname and initials; nickname and e-mail address etc.). In the case if the document is not registered in CCC, it appears in the network as an "anonymous", which defines the attitude to the author of the document and its content.

3. Provision of private information about the author of the document at request is carried on only for the checked-in users.

4. Interaction with RCCC and other organizations, which according to the law on personal data, have a right to get a complete data about the authors of the documents, published in the network.

This mechanism may be implemented as a government service on the following site <http://gosusluga.ru>, and it may be supported in expense of the government financing. Certainly, its implementation will need the development of legislative action, creation of software for realization of that service. Its implementation even within one country will allow creating "clear" procedures of information exchange in the social media; that will reduce the

level of information theft and illegal use of intellectual property and compilation of information; that will increase the level of responsibility of network users for the information they publish; that will also reduce activities of marginal and extremist social groups in the social media, and, certainly, that will reduce the informational threats to national security.

4. CONCLUSION

One of the most urgent problems hampering the development of scientific intellectual content on the Internet is intellectual property protection in such systems. This problem is particularly topical under the conditions of low level of ethics in information processing and its resources. This fact leads to negative effects such as compilation and plagiarism the distribution level of which in Russia goes beyond all reasons. We believe that the solution of this problem is possible only by means of complex approach.

The paper presented analysis of means of copyright violation and suggested a system approach for this problem solution. This approach contains organizational, technical, technological and other tasks.

The paper also provides with a mechanism for reduction of problems on copyright violation by means of implementation into the management systems of copyright registration mechanisms of information in electronic form. This mechanism may be implemented as a government service.

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SOME APPROACHES TO MODELING THREATS TO ECONOMIC SECURITY OF THE MANAGING SUBJECT

Grigoryev, D.S., Melnikova, O.I., Minzov, A.S.
*Moscow, National research University «MEI», Dubna, International University of Nature,
Society and Man «Dubna»*

The article discusses some of the new approaches to modeling threats to economic security of economic subjects. These approaches are realized in the scientific and educational

process of the UNIVERSITY «MPEI» [1-4]. This approach is based on the use of multifactor models of threats that allow establishing the cause-effect relationships between factors, parameters and threats.

Keywords: economic security, threats, multifactor models of threats.

Existing methods of threats modeling have general descriptive nature, and specialists' recommendations on their elimination are of the same nature. The efficiency of the entire system of economic security of the managing subject depends on quality and detailed elaboration of threats models. The Department of complex safety of the state University «MPEI» developed a **technique of parametric description of threats**. The technique allows to classify the threats according to certain factors and, also, to identify the causal relationships between them. This technique was introduced into the educational process in the form of a business situation, which was intended for trainees to analysis and threats modeling.

1. Parametric description of the threat model

General view of the threats description [5]:

$$T = \langle N, R, A, E, [M, N(-), N(+), D, G, I, K] \rangle, \text{ where} \quad (1)$$

T (*treat*) – *treat*.

N (*name*) – name of the threat (factor or process causing danger).

R (*resource*) – the source of the threat (organization, structure, staff, clients, legal act, a technical tool, the mass media and other).

A (*active*) – asset and/or indicator of financial-economic activity, which is influenced by a threat.

G (*goal*) – the goal of threat implementation (motive).

M (*mechanism*) – mechanism of threats implementation.

E (*effect*) – evaluation of the possible effects of threat implementation in the form of a linguistic variable with some values. In the process of classification, there has been used a random taxonomy, which defines some rules of affiliation of threats t_i to a class ($T_k \subset T$).

$$\{(t_i \in T_k) \mid (t_i \leq t_k) \wedge (t_i > t_{k-1})\}, \quad (2)$$

where $i = \overline{1, n}$; $k = \overline{1, m}$; $T_k = [t_{k-1}, t_k]$.

$N(-)$, $N(+)$ – number of the related previous threat or \emptyset , and number of associated with the following threat or \emptyset .

D (*defense*) – protection mechanism, which affects a threat, if it exists, or \emptyset .

I (*in or out*) – the location of the source of a threat (within the system or outside).

K – sign or event (critical factor), preceding the emergence of the threat or \emptyset .

In square brackets are the indicators, the definition of which can only complement the picture of the threats, but the values of these indicators are not always defined uniquely. Each of these parameters can have several values. For example, in the mechanism of threat implementation, the most probable time, place and conditions for threat implementation can be defined. As a result of the analysis, classification of threats and a description of the nature of their manifestations are carried out; that allows passing on to the risk assessments. According to the results of threat modeling, it is necessary to analyze and determine which of them are interrelated. Relationships in the model are described by means of two parameters $N(-)$ and $N(+)$. When analyzing threats, the following possible forms of relationships between them have been identified:

a) **Linear** consistently related threats:

$$t_1 \rightarrow t_2 \rightarrow \dots \rightarrow t_n \quad (3)$$

In such form of relations, each subsequent threat is generated or connected with the previous one, and, therefore, presents a sequence of dependent from each other chain of

threats. In such systems completeness and recurrence of the same threats in a sequential chain of their occurrence are not permitted.

b) **Unbound or weakly related** threats:

$$\{t_1, t_2, \dots, t_n\} \quad (4)$$

c) **Blended threats**, when threats of the first two types can be interlinked:

$$\{t_1, t_2, \dots, t_n\} \rightarrow t \text{ or } t \rightarrow \{t_1, t_2, \dots, t_n\} \quad (5)$$

Threat modeling in the presented form allows revealing causal relationships between them, determining the necessary sequence of economic security system implementation, and later on substantiating the security policy by different risk management strategies. It is impossible to identify the degree of connection between individual threats; however, it is quite enough to determine the presence of these links and their sequence. The final graph of threats linkages and factors can be presented in both tabular and graphical form, as shown in figure 1.

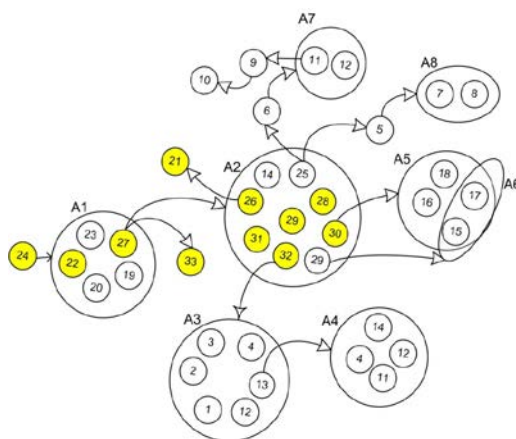


Fig.1. Graph of threats relationships in terms of education business situation

On the presented graph clusters of unconnected threats are marked by letters A1-A8, and those that relate to the high level of danger are highlighted.

2. Methodology of teaching threat modeling

A trainee, after studying the techniques of modeling and familiarization with the example, is offered business situation, which includes:

1. The educational model of an organization for which the system of economic security (SES) is constructed. Completeness and details of the model are defined in each particular case. Requirements to the model have been defined previously [6].
2. Audit results of the current SES.
3. Restrictions for the SES construction: financial, time and resource.
4. Incidents related to economic security.
5. The structure of the existing SES service and employees responsibilities.
6. Results of business intelligence, characterizing the external business environment.

Later in the problem formulation, using this information and templates for threats modeling, the trainees are suggested to develop a threats model and to identify cause-and-effect relationships between factors and threats. On the basis of the obtained results, trainees should make conclusions about the danger degree of identified threats and their interrelations.

The practice in the application of this technique in educational process has shown that all the trainees successfully perform the stages of threats modeling and in the future offer more informed decisions for economic security system management.

Conclusions

The considered approach for the formation of professional competences on threats modeling in the field of economic security refers to a wider class of problems and applies to the information and other areas of security. Such active forms of training correspond to the modern development system concepts of higher professional education in Russia [7].

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INFORMATION EDUCATIONAL ENVIRONMENT INDIVIDUALIZED TRAINING OF UNIVERSITY STUDENTS OF THE SUBJECT DISCIPLINE

Smykovskaya, T.K.

Russia, Volgograd state social-pedagogical university

The article describes the experience of Volgograd state social-pedagogical University on the creation and use of information educational environment individualized training students in disciplines subject training. Educational and methodical complex discipline and system tasks are the base for creation of the environment, and information technology – instrumental basis for implementation. The main attention is paid to the role of information technologies in the organization of individualized training.

Keywords: individualized training, individual educational trajectory, information educational environment individualized training.

For a modern system of higher education in Russia, in our opinion, the situation is typical of the implementation of individual training and individualization. Individual tuition is the model of organization of education process when the teacher interacts only with one student when the student works with books, computer and other. Currently in Russian universities is mainly implemented curricula, providing training in groups. Individualization

of education is the organization of educational process, in which the choice of methods, techniques, the rate of learning is determined by individual peculiarities of students (I. Unt). Using the provisions of the individual approach is limited to several reasons: 1) teachers in most cases work with a student for 1-2 semesters, 1-2 pairs per week; 2) universities do psychological services, диагностирующих individual peculiarities of students; 3) the curators of the groups are not sufficiently aware about the individual peculiarities of students. In this regard, the teacher selects the methods, techniques and rate of education, based on personal methodical experience without consideration of individual peculiarities of students.

In our practice we rely on the idea of individualized training. Under individualized training we understand this training, which provides a personal promotion of each student on an individual educational trajectory when implementing common for all students, program and is characterized by a certain detachment in the work of individual students.

We highlight some of the organizational and pedagogical conditions of individualized training of students.

1. Introduction subjectively new student concepts developed within the discipline of subject training, should be different levels with preserving the integrity of the content. The student can learn a thing as on the level of perception, reproduction and handling, and combinations of these levels. The lecturer represents all levels. Student selects a suitable level of concept development. The practical sessions and in the course of independent work performs the tasks for the current level. The preservation of the integrity of the content requires consideration of the logical relationships between concepts, United around key concepts. The teacher designs a «neighborhood» concept: the links between known concepts and new concept, the concept of the investigation, actions which defined the term and the other. As a teacher forms the case of tasks for practical classes and for the organisation of independent work of the student. In case necessarily created a task group for all levels of concept development.

2. Organization of the process of study of discipline subject training based on the structure of modules in the training material: objective, professional and applied research.

3. For construction of individual educational trajectories teacher selects one of the models of learning: linear, network or affiliate. The model takes into account typical levels of subject training students in the group and the degree of completeness of their General skills. The choice of the model is determined by the logic of development of concepts and operations, as well as the degree of independence of students with learning and recognition of the professional meanings content.

4. The prevalence of independent work of students on the front of classroom work. The possibility of personal conscious choice of the student ways to organize individual work with multi-level case studies. In cases include a system of tasks (or exercise).

5. Organization of educational-cognitive activity of the students involves the selection of special methods of training, aimed at the activation of cognitive activity of the trainees, the organization of interaction and communication between teacher and student on the confidence level; promoting the development of individuality of students.

6. Should be built adaptive individualized training, in development of which is constantly involved teachers and students.

We have established the following trends of training of students of subject disciplines in the universities of Russia: low motivation of students to study the disciplines of subject training; the desire of a teacher based on the basic knowledge and skills acquired during previous stages of education; reduction in reality the level of basic training; the predominance of hours of independent work of students over hours of classroom and other Updating these trends identified the need to review the functions and usage of information technologies (IT)

in the organisation of classroom and extracurricular work. What was the source of creation of the information-educational environment of individualized training.

Let us characterize the structure of the information-educational environment of individualized training at the University disciplines subject training.

Proceeding from the fact that today's students have extensive experience in social networks, should suggest placing the materials of educational and methodical complex discipline in the thematic network groups created either in social networks, or on the platforms, keeping the interface of social networks. Volgograd state social-pedagogical University productively used thematic network groups syllabi, which are created at the corporate educational portal of the university edu.vspu.ru. Teacher creates a thematic group of the closed type, the participants become students of a given discipline. The teacher becomes the moderator of this group, only he has the right to post or to remove the documents. The material of the thematic group is structured as follows: the «News page» (general questions of the educational process - news, announcements), «Documents» (folder - materials of lectures, practical and laboratory works, tasks for independent work of students, information materials, control and measuring materials), «Forum» (created theme forums for brainstorming, discussions for practical and laboratory practical classes, as well as the reflection of each lesson). The materials of the educational-methodical complex of students work as in class instructor-led and self extracurricular activities. To get an advice from a teacher is carried out through internal system of the portal through the exchange of personal messages, email, or chat in the forum on a topic given by the student. When implementing linear or network model individualized training appropriate to the systematic use of all resources of the cluster at all stages of classroom lessons and extracurricular work independently.

Work with the materials of the educational-methodical complexes of disciplines, placed in the thematic groups of the educational portal is not the only area of the use of information technologies in the process of individualized training of subject disciplines. When implementing the network model individualized training work in the thematic group on the portal by using technologies of interaction between all students and teacher in the local network of the cabinet, as well as topical webinars. When working in a local network cabinet used special software: remote access to desktop students, synchronous and asynchronous modes of working with digital educational resources, text chat, transfer of information for presentation on an interactive whiteboard. Webinars allow to provide support to students with different level jobs, educational-research work professionally oriented students to explain the difficult questions.

Open Internet services allows you to personalize the training within the framework of specific training and increases efficiency of the network model individualized training. «Google Presentation» can be used to create collective presentations on the materials he used to listen to lectures; «Google image» – to build flowcharts or perform tasks on the block-schemes; «Map of knowledge» (BubblUs, Mindmeister, Mindomo) and «Google Document» – to systematization of educational material and separation of the main ideas when working with the concepts or during the development of methods for solving problems of a particular class.

A modern teacher strives to continuously improve electronic educational-methodical complex. In this regard, the demand for such information technology, which allowed him to be independent from the information systems used in the University, yet easy to integrate with it. We believe that the cloud most perspective for the solution of this problem. Cloud data storage allows the teacher to shape its own information space and to integrate it into the information space of the University and of any specific person. Lecturer on the local computer to create and continuously upgrade certain folders of educational complex, which is constantly synced to the cloud. Cloud services allow you to share information as with all and

with a limited circle of users with information protection password; use additional services: testing, sites, photo presentation, binding to social networks and other. When working with cloud storage data is primarily implemented by a partnership model individualized training of subject disciplines. The teacher chooses a convenient him a cloud service: Google Drive, Microsoft Live SkyDrive, Apple iCloud, Yandex.Disk, DropBox, SendSpace, Cloud.Mail.ru and other. Teacher, taking position of the student «I want to work in a social network», through links to folders or files provided in General use, organizes integration of materials from the cloud data into the information system of a student group or student. The information space of cloud storage is divided into the sector through the system folders. Students are given the opportunity to replenish materials of the electronic educational-methodical complex built and is constantly replenished by the teacher, the author's materials: summaries, essays, projects, video, or audio, interactive posters, artwork, made with the use of mathematical or graphical program-packages. Students also take part in examination material provided to classmates: check through the «Anti-plagiarism», assessment according to the criteria expert sheets, opposing.

The information-educational environment of individualized study at the University disciplines subject training reflects the educational-methodical complex of the discipline and includes cases with systems of tasks for individualized training. This environment is integrated in the information-educational environment of the University and individual students. Instrumental basis for integration are information technologies described above. When designing individual educational trajectory students choose one of the models (linear, networking, partner) individualized training or combine them.

This experience is being successfully implemented more than five years in Volgograd state social-pedagogical University. Monitoring results confirm an increase in the quality of training disciplines subject training in the teacher and has the information-educational environment of individualized study at the University disciplines subject training.

ROBOTICS AS AN INNOVATION TENDENCY IN INFORMATION SCIENCE TEACHING AT SCHOOL

Sofronova, N.V.

Chuvash State Pedagogical University by the name I.Y. Yakovlev, Cheboksary

The article presents a system for teaching robotics in school. Teaching is done in two possible ways: out-of-school activities and profile training (including optional courses). Combining with some school subjects (physics, information science, technology) is also possible. The article considers both.

Information science school teaching has been undergoing changes since the moment of its introduction in 1985. First, it was programming (BASIC or programming calculating machine), then studying of application software (which took about 80% of the school course). With the introduction of New Educational Standard we can see, that information science has become interdisciplinary subject with bigger attention paid to programming. We must not forget, that the subject of information science is supposed to prepare school children for living in information society, which develops and lives according to its own rules. Could we imagine 20 years ago the existence of the world in which our children are communicating (actually living) now!? Net technologies have rooted in our lives. What is next? We think, the future of information science is robotics.

Robotics – an applied science developing computer-based systems. Robotics is closely connected with different areas of electronics, mechanics, programming, artificial intelligence. In broad meaning robot can be defined as technical system able to substitute a human or help us to perform different tasks. Robot interacting with the environment must comprise the following systems: controlling system, information-measuring (sensory) system, communication system, actuator (motor) system.

In this article we would like to attract your attention to the problem of teaching robotics at school. We would also like to mention about other opportunities of using robots in educational establishments. For example, R.BOT technology creates endless opportunities for disabled school children to study, play, entertain themselves and communicate with others. It also supports social adaptation of millions of disabled people who are often doomed to live in isolation depending on others [1].

To study robotics at school several systems have been developed:

- Robotis Bioloid;
- LEGO Mindstorms;
- fischertechnik;
- Arduino.

Let us consider all of them.

Robotis Bioloid

Robotis Bioloid – a construction set by Korean company Robotis [2]. It is intended for educational purposes and people interested in robotics. The set contains small servomechanisms Dynamixels which are independent modules to build different wheel- and walking robots. Bioloid set is very much alike LEGO Mindstorms by LEGO and Vex Robotics Design System by VEX Robotics Company. Bioloid set is often used at international competitions RoboCup.

The set contains servomechanism Dynamixels, a sensing unit, software for 3D modelling and programming in C-like language.

LEGO Mindstorms

LEGO Mindstorms — a construction set to build a programmable robot [3]. It was first introduced by LEGO Company in 1998. In 2006 they produced LEGO Mindstorms NXT, in 2009 – LEGO Mindstorms NXT 2.0.

LEGO Mindstorms set contains standard details LEGO (sticks, axis, wheels and pinions) and a set of sensors, motors and a programmable block. There can be two variants: standard and extended.

Standard set can be of two types: for public at large and a basic school set. Both sets can be used at robot competitions e.g. World Robot Olympiad. The extended set contains a bigger number of elements.

LEGO Mindstorms set contains standard software NXT-G and Robolab but some companies have developed their own software for LEGO Mindstorms robots. The languages of programming are text and graphic.

fischertechnik

Fischertechnik – a construction toy for children, teenagers and adults invented by Artur Fischer in 1964 and is produced by fischertechnik GmbH in Waldachtal, Germany.

Fischertechnik sets are often used in education for teaching about simple machines, as well as motorization and mechanisms. The company also offers computer interface technology which can be used to teach the theory of automation and robotics in educational establishments of different levels. Many plastic fischertechnik girders look like miniature versions of extruded aluminum framing of the T-slot nut design. A few fischertechnik girders actually are made of aluminum. Other companies make fischertechnik-compatible aluminum

bars of any desired length. Fischertechnik sets are available for robotic process control using “Robo-pro” software (the successor to Lucky-logic), on-board process controllers with flash memory, infrared and radio-frequency remote control, and pneumatic-activation. Robotic models can follow preprogrammed routes or lines on the floor, sense obstructions and change course, detect and move objects, and simulate everyday devices such as vending machines, passenger elevator systems, and traffic-control lights. In early 2010, fischertechnik introduced the ROBO TX Explorer kit, which includes a color sensor [4].

Arduino

Arduino boards are also of great interest of course. Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists and anyone interested in creating interactive objects or environments. Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators.

The microcontroller on the board is programmed using the Arduino own programming language (based on Wiring) and the Arduino development environment (based on Processing). Arduino projects can be stand-alone or they can communicate with software running on a computer (e.g. Flash, Processing, MaxMSP).

The boards can be built by hand or purchased preassembled; the software can be downloaded for free. The hardware reference designs (CAD files) are available under an open-source license and you are free to adapt them to your needs [5].

One more prospective area in robotics is creation of anthropomorphous robots. Learning the basic principles of which starts with protohumanity of these systems. Easy usage of such systems is the result of human body similarity of the robot. At present SPA “Android Mechanics” has developed robotic device AR-600 with the capabilities similar to the ones used on the orbiting station [6].

In this model, built similar to human skeleton, an innovative system of interactive control is implemented.

Executive part consists of the base with a two-hand robot and a check unit. Control unit is installed on the operator's remote control center and is similar to the structural scheme of the manipulating mechanism. The robot can see and the information is showed on the operator's screen. The exact repetition of operator's movements by the robot is the main virtue of such robot-technique systems. What is also important is its universality because it is much easier to take to the space one mechanism than dozens for different ones. There are also many other systems for robot development.

Let us describe school system from primary to high school considering the fact, that teaching robotics is not a part of Federal Educational Standard yet. Teaching is done in two possible ways: out-of-school activities and profile training (including optional courses). Combining with some school subjects (physics, information science, technology) is also possible. Let us describe school system of teaching robotics for the first way.

Table 1

Teaching robotics in optional classes and profile training

<i>Level of teaching</i>	<i>Goals and objectives</i>	<i>Recommended equipment</i>	<i>Peculiarities</i>
Primary school	Robot assembling, components of robot mechanics	LEGO, LEGO Mindstorms, fischertechnik	Teaching is based on the children's demand in constructing
5-7 class	Learning robot mechanics	LEGO Mindstorms, Robotis Bioloid,	Many areas of physics are not studied yet. It's

		fischertechnik	necessary to take some theory first
8-9 class	Programming of robots with system resources	LEGO Mindstorms, Robotis Bioloid, fischertechnik	Robot programming correlate with information science studies
10-11 class	Robot programming with programming languages and external devices	LEGO Mindstorms, Robotis Bioloid, fischertechnik, Arduino	Out-of-school activities master children's skills in programming and physics

There are no actually schools nowadays (except some specialized schools in the system of additional education) to teach robotics on regular basis. As a rule, the teaching is done on one or two levels showed in Table 1. That is why Table 1 can be observed as speculative only. Meantime, the constructors mentioned and the peculiarities of teaching at each level are used in practice but haphazardly.

If teaching robotics starts at primary school it's quite logically to use LEGO. Many children in kindergartens play with it very eagerly and assemble composite LEGO constructions. These creations can be used as samples to stimulate further complication of the units. But we must admit that construction sets like LEGO are not robotics yet. A robot must perform certain actions like rotating anything with the help of cam gear etc.

In 5-7 classes teaching robotics can be based on building moving mechanisms. The only problem here is that physics is taught at 7 class only and children don't know the basics of mechanics yet. Elements of physics need to be explained here in a clear and simple way.

In 8-9 classes elements of programming are taught and that makes the use of system control commands available for children. Pascal - the structured programming language is usually taught at information science lessons at this level. Built-in robot languages also have commands for building basic algorithmic patterns: condition, cycle, procedure. Sorry to say the tasks in school information science text books and exam tasks are not intended to write programs to control robots, but basic elements must be similar.

In 10-11 classes school children are usually oriented on their professional training and robotics is done by the children who associate their future career with information science and physics. Programming languages like C and C++ and working with construction motherboards and sensors become available at this level. The recommended systems here are Arduino which demands knowledge of electronics.

One more thing to increase children's motivation to study robotics is the opportunity to use mobile technologies to operate robots. It should be noted here, that mobile technology is one of the most intensively developing areas of scientific and technical progress which is not supported by the Educational Standard yet.

Let us consider the opportunities of using robotics in school subjects.

Table 2

Combining robotics with different school subjects

<i>Subject</i>	<i>Goals and objectives</i>	<i>Recommended equipment</i>	<i>Peculiarities</i>
Information science	Mastering programming and modeling skills	LEGO Mindstorms, Robotis Bioloid, fischertechnik	Practicing information science, modeling and social informatics
Physics	Gaining practical skills in mechanics	LEGO Mindstorms, Robotis Bioloid,	Physics elements involved: basics of kinematics,

	and electronics	fischertechnik, Arduino	basics of dynamics; basics of electrodynamics, electrostatics etc.
Technology	At primary school – working with construction sets	LEGO, LEGO Mindstorms, fischertechnik	According to Educational Standard in “Industrial technology”

Telling stories about robots at information science lessons can be started at primary school irrespective of children’s age in the context of “social informatics”. When teaching programming and modeling, teacher can demonstrate algorithmic patterns and methods of modeling on robots. But there also must be a group of pupils to help the teacher. Usually they are the school children who study robotics at extra lessons.

At physics lessons a robot can demonstrate real embodiment of major mechanics and electrodynamics laws. The main problem of such integration is the absence of methodical literature and methodical manuals. Creation of a course book “Robotics at school” has been started at Chuvash State Pedagogical University by the name I.Y. Yakovlev. In Chuvash republic there are 123 schools using LEGO Mindstorms construction sets which were bought by the Department of Education and Youth Policy. Two years' experience of using LEGO Mindstorms construction sets will be set forth in electronic teaching aid which is being developed now. It will also include the examples of using the construction set at the lessons of technology.

We consider creation of robots to be not only an exciting process but also the one having a great didactic and educational value. First, robots make children get back to reality. Since the early childhood our children play computer games with their own rules (reviving opportunity, unreal jumps and swimming underwater without scuba etc.) Children begin to mix up real and unreal life. Robots exist in real life and under real life laws. Second, boring for many children programming becomes an exciting work of creating programs to operate robots. For children to understand programming languages better, we have invented many Executives with the famous LOGO turtle among them. A robot is also an Executive but it exists in real life. To crown it all we must mention an integrative value of robots because to construct them one has to get a good knowledge of programming, technology (to assemble it), physics (work with sensors) etc. In general, teaching robotics at school keeps in line with the main idea of New Standard is not only to form knowledge and skills but also make use of them.

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SIGNIFICANCE OF INFORMATION TECHNOLOGY FOR FULFILLING EDUCATIVE POTENTIAL IN TEACHING NATURAL SCIENCES

Trubina, I.

FGNU ISMO RAO, Moscow

The article considers the impact of information technology on the education of students in the teaching of natural science subjects cycle. In the subject disciplines, there are general principles that can be used to evaluate and analyze the information.

Keywords: the information, the information technology, the general information conceptions, on shaping individuals capable.

Man has been known to obtain information from two main sources:

- direct perception of an object via sense organs;
- description of these objects.

However, as I. Kant argued, there are always ideal, a priori objects present in human mind, which always, independently of a person, get involved in the process of shaping views of an object under study. Of course, in itself the human "direct perception" of some object may strongly vary. It may depend on many factors, such as place and time, internal state of a person, his/her knowledge and psychological peculiarities, tools and instruments used, etc. Nevertheless, in all cases, direct perception of an object can always be contrasted with its description.

Balanced use of the above two sources has been customary for the national education. A well-developed system of laboratory work classes was established, as well as manual labour classes, which played a very substantial role in developing the sense of reality. The situation changed radically with information civilization progress. A modern individual receives information, largely, through descriptions, very often via Internet. The fact has been recorded in all educational documents without exception. For instance, in UK it is conventional to set forth the following requirements:

- systematic use of information to solve problems, answer questions;
- use of information search methods consistent with a set goal;
- selection, qualitative and quantitative evaluation of information;
- systematization of information.

All the above requirements are certainly very important for successful activity. However, in our opinion, these are just necessary but not sufficient conditions for this activity.

The problem seems to be in the operational nature of the information circulating in modern society. Such information is not meant to be integrated into a certain system of views of a given object, but only serves to support an immediate response ("fix it and forget it").

Of course, tackling complex life problems requires a profound and continuous analysis of all the incoming information rather than just reflex actions. Traditionally, the standards of such analysis are traced back to fundamental sciences, primarily to mathematics and physics. The fact was emphasized early on by M. V. Lomonosov, who argued that, for example, the importance of mathematics was, among other things, in "putting one's mind in order." In addition to the subject matter, the said disciplines set general principles, which can serve as guidelines for evaluation and analysis of information. These principles are typically not discussed in the context of the relevant academic subjects. However, these principles seem to be very important as a tool for structuring the operational information and are essential for transforming it into knowledge.

Furthermore, such principles seem to be essential in developing an information science syllabus meant to meet students' need to cognise the world around, in nurturing scientific conceptions, and must be explicitly formulated.

These principles include:

- the principle of reductionism;
- the principle of systematicity;
- the principle of symmetry and the related laws of conservation;
- the principle of uncertainty and the related principle of complementarity;
- the principle of incompleteness;
- the principle of considering inter-system communication.

One of the most important purposes of general scientific principles is pushing the scope of world cognition beyond the limits of direct perception or, in terms of information science, towards obtaining the maximum amount of information about the external world. By way of illustration, the principle of symmetry tells us that the laws of nature in remote parts of the universe are the same as in our solar system. This principle underpins all achievements of contemporary cosmology.

The role of such principles in establishing one's world outlook and forming the analytical component of a professional activity is immense. They do not only set a certain "matrix" of understanding the world, but are also implemented in various human activities. The way a person solves a problem depends not only on specific knowledge and competencies but also on his/her pre-structured world view.

This information environment is exceptionally dynamic. In terms of a systemic approach it is an open system obeying the law of non-linear dynamics (I. Prigogine, H. Haken et al.). The dynamic is characterized by appearance of the so-called "bifurcation points" where the deterministic process branches. Moreover, there is no telling which way the process is going to follow. It is impossible to "nest" such processes in any automatic routine, i. e. there is no chance of coming across a required algorithm. An ability to take decisions i. e. to choose either branch of the process on the basis of a current situation analysis becomes critical in this case.

To this end, one must have an adequate understanding of the information environment containing this information process and, in a more general case, have an understanding of the information picture of the world at large. In this case reflecting on information activity is possible in the broadest context to add precision to the prediction about options of the process further development. This, in turn, requires comprehending the process of problem solving as such.

The information technology the students learn has conventionally been but an "algorithmic" part of the described process flow. However, information systems based on information technologies are overwhelmingly open and characterized by extremely unstable dynamics. Specifically, these systems, as stated above, may contain bifurcation points. E. g., most economic systems are of this kind. In this context it is utterly impossible to program the behaviour of a process. Accordingly, reducing a problem-solving procedure to developing and implementing an algorithm or to using standard information technologies produces little effect.

In an open system, information technology with its models building and evaluating element is more adequate. This enables reflecting on current activities and consequently shaping a skill in making decisions on choosing either way of further information activity.

A number of studies (S. A. Beshenkov, E. A. Rakitina, K. K. Kolin et al.) have shown that evaluation of models is based on general conceptions associated with a currently accepted vision of the world. Thus, the problem-solving information technology in an open information system must include a stage of addressing the general information conceptions. These

conceptions form a context necessary for making decisions on choosing the way for further information activity.

It should be noted that integration of various ways humans learn the world, development of systemic, holistic processes in science, philosophy and practice are yet to be adequately reflected in contemporary education. Further subject differentiation of scientific knowledge is taking place as a means of attaining to efficiency of learning and teaching. The entire system of education, as ruefully observed by contemporary researchers, simply replicates the increasing differentiation of science and strives to embrace the non-embraceable. Narrow specialisation and professionalisation generated partial, disrupted knowledge, detached from man. Along with getting ready-made differentiated knowledge students also adopt a reproductive pattern of thinking. Thus, development of creativity in the system of information-related training of students is directly linked to forming their conceptions of contemporary scientific view of the world.

According to contemporary studies conducted at the Russian Academy of Sciences Institute of Informatics Problems (I. M. Gurevich, R. B. Seiful-Mulyukov, R. S. Gilyarevsky et al.) this system's main features are as follows:

- it is the least complex variant of a system that is realized, survives, gets selected (the law of simplicity of complex systems);
- the rate of interaction between elements and individual parts of a system is finite (the law of finiteness of complex systems characteristics);
- for a system to function effectively the variety of its controller needs to be at least matching the variety of its controlled object (Ashby's law of requisite variety);
- it is the form of a system's development which maximises information growth in the system that gets realized (Onsager's law of entropy reduction maximization);
- an external input shifting the equilibrium of a system generates processes therein to reduce the imposed changes (Le Chatelier's principle).

Relying on these principles paves the way for education focussed on implementation of educative potential of information technologies and on shaping individuals capable of finding their bearings and making reasonable decisions in contemporary information environment.

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SYNTHESIS OF INFORMATION -COMMUNICATION AND TRADITIONAL EDUCATIONAL TECHNOLOGIES IN TRAINING OF SECONDARY PROFESSIONAL EDUCATION STUDENTS AT THE UNIVERSITY

Kvach, T.

Toglyatti, Samara region, Volga region state university of service

This article presents the discussion of different innovative directions of modern education. It gives formation of pedagogical methods of forming requirement for knowledge and studies levels of teaching in the limits of information technologies in details.

Keywords: informative-educational environment, information technologies, educational process, forming of teaching environment.

The widespread introduction of equipment, systems of automation and Informatization in all fields of educational, public and production activity, forming of information environment are accompanied by the appearance and wide spread of new methods of management of educational process. Modern education is closely connected with information technologies. School system of education does not always use modern methods and means of informational and methodical provision of training and this gap in the system of continuous education are designed to prevent universities with a set of students on the faculties of intermediate vocational education.

In this regard, it becomes topical direction of the introduction of progressive methods of training, increasing effectiveness of studying of disciplines. Special attention deserves the introduction of new information and communication technologies, which are important in conditions of a constant rising of the volume of educational information and increase the deficit of the time is allocated for its assimilation. They allow to create methodically substantiated flow of information, give opportunity to understand the nature of the object itself, engage actively in the process of its knowledge, promptly and objectively reveal the level of mastering the material etc.

Mainly the expediency of using these information and communication technologies is determined by their using as a means of visualization and individualization of educational information to meet the best cognitive abilities and students' personality of secondary vocational education. In contrast to the traditional way of teaching, a new way differs large information flow and allows faster to pass the stages of the systematization and classification, to sum up the facts under the concepts and proceed to the identification of the different entities.

The main task of this kind of training is to put the students in the same conditions before learning the new material and the time is allocated for the work they had effectively. Apparently, it can be achieved with a combination of various teaching technologies.

The process of implementation these information and communication technologies in training students of secondary vocational education is rather difficult and requires a fundamental understanding. To solve this problem, is necessary to use with traditional methods of teaching apply information and communication. Using various teaching technologies, we train students with different methods of the material' perception: read the pages of textbooks, the perception of the teacher's explanations, receiving information from the computer. On the other hand, teaching and controlling programs should allow the user to build its own algorithm of actions, and not to enforce him ready, created by the programmer. Thanks to building of your own actions' algorithm of the student begins to organize and apply existing knowledge to real conditions, which is particularly important for reflection.

Analysis of the researches on the problem of application these information - communication technologies in the teaching process showed that not enough attention was paid to the questions of consideration of the basic forms of a combination of traditional and information and communication technologies of teaching.

From the entire spectrum of information technologies in the training of students of secondary vocational education students would like to highlight the following technologies which are the most important for educational purposes: the first is the means and objects of education, improving the teaching process. We are talking about the software of modern computer and about material equipment of educational process. Secondly, are the means of information and methodological support. In development of this direction, a special attention is paid to the development and delivery to the student all electronic educational resources of the University. Thirdly, it is the means of Informatization processes of control and computer testing. Fourthly - it is a means of automating the processing of the results of the laboratory experiment or practical tasks. And last is a means of communication.

Using in a complex of traditional teaching and new information technologies as a whole helps to increase the interest of the secondary vocational education student in the studying of material.

Informatization of education is also considered as a new area of pedagogical science, which includes subsystems of education, upbringing and education, which integrates the psychological, social, physiological-hygienic, technical-technological and scientific-practical researches, located in certain interrelations between each other.

Creation of a unified distributed telecommunication information system of teaching students will receive competencies demanded by the labour market, and also increase the interest of professionals seeking to increase its production capacity through the acquisition of new knowledge.

The main function of information and information systems of the University is the possibility of Informatization monitoring and quality control of educational process, to maintain the optimal structure of teaching and capacity building from one educational level to the next. Using of information technologies influence on the quality of education at university.

INNOVATIVE TECHNOLOGIES WITHIN TECHNICAL ENGINEERING EDUCATION: SOCIO-PHILOSOPHICAL ASPECT

Kochetkova, LN
Russia, Moscow, MIREA

Report is devoted to the transformation of engineering activities from the perspective of appearance of new professions and specialties. Therefore, there has to be a competent approach to technical education, as a result of which a student acquires the necessary skill competitiveness in market economy. The report then goes on to explore problems of new causes and basis which foster the development of innovative society from the perspective of philosophy.

Keywords: education, innovative technologies, engineering and technical activities, the engineering professions, competence approach, competence, innovative economy, creativity, innovative society.

We live in the age of high technology, innovation and inevitable modernization. Although Russia has long "held" on the Soviet technological developments, it is now obvious that sustainable economic development can only be done through innovation and technological development, which are the major subjects of modern engineering and technical personnel. Currently emerged following paradox whereby the development of science and technology are on the rise yet prestige, popularity and social status of traditional engineering professions are dwindling.

The results of sociological studies in technical university of MIREA in years of 2010 and 2011 indicate that only one third of students in the future plans to work on the chosen specialty. The vast majority of students consider only technical college as an opportunity to obtain a higher education degree, which has nothing to do with their chosen profession and future life prospects.[2] This paradoxical situation is not only a big social problem in terms of technical modernization of Russia, but also the actual scientific problem, causing the turn to an analysis of radical transformations in the field of economics, engineering and educational activities. In our view, there are several reasons for this situation.

One of them is that some of the engineering profession ceased to be popular in the labor market and new topical specialty are not yet formed. The traditional image of Engineering is disappearing. Innovative economy requires a flexible specialist, able to respond quickly to market changes. Practice shows that today only specific knowledge is not the only thing in demand, but also the methodology of solving the problem; the ability to distinguish the main objectives and identify mechanisms to achieve them. Market has new requirements for modern high school graduate. Such requirements are not taken into account in the training of specialists. These new requirements are not strongly bound to a particular discipline, they go beyond the subject nature and are universal as a result. Their formation requires not so much new subject content, but many new educational facilities.

Why is there a need for a reorientation of higher education? The answer to this question can be found in the analysis of the situational differences between the quality of graduates, given by the educational institution, and requirements for skilled production and employers. According to experts of the scientific journal «Harvard Business Review» most popular work in the twenty-first century will be the profession of data scientist - a scientist working with the data. Five years ago, this specialty was basically non-existent, and now it is becoming more and more popular not only in the West, but also in many Russian companies.

According to the participants of the International Forum «IT- Leader 2012 " by the year 2030 more than 2 billion jobs associated with certain professions, cease to exist. [5] Significant changes occur in the energy industry, the automotive industry, robotics, broadcasting, etc. For use high technologies have arisen two new professions: knowledge engineer and tagger. The latter is already there, television for example. Professions related to the description of business processes and project management are soon to disappear. The AI will fulfill the managing functions of a company and AI itself will be maintained by the knowledge engineers.

International University of Nature, Society and Man (Dubna) has already begun to attract students to specialized laboratories and training programs that generate new professions, which binds further innovative development. Job transformation is accelerating. In the past a profession could remain unchanged for 200-300 years, but now, if we talk about the general category such as digital, profession exist on average no more than 5 years. Of course, some jobs will exist for a long time, such as programmers and managers, but they in turn will constantly change their content and tools, and the higher education system should be ready for this. Such inevitable transformation takes place due to the fact that innovations in the world are increasing. Over the last 3-4 years increased the demand for the specialists in 3D - modeling, «Cloud Computing», etc. Many new professions are not born from scratch.

They arise from other specialties, which bolster further retraining. Given the need to accelerate the metamorphosis of professional development of new educational technologies like self-scaling and distance learning has to be required.

The case of MIT is worth to have a look at. In 2001, MIT began to record their lectures and put them up on the universal online access. Now anyone can educate himself by having an access to more than 2,080 courses that have been downloaded over 131 million of times. It is interesting to note that among those who are actively studying courses MIT, are students and post graduates of Russian technical universities. America's leading technological institute followed by many foreign universities, addressing the critical issue of the accessibility of new knowledge. Moreover, this trend shows the process of globalization of higher education, which poses new challenges to national educational systems

In Russia, advanced educational technologies need time to become a working tool. In this regard, schools have the opportunity to fill a gap in the training of specialists, consisting in the fact that it forms a system of subject knowledge and skills, educational institutions do not pay enough attention to the development of many personal and social competencies in determining the competitiveness of the graduate in market conditions, and especially at the global market.

In other words, now the main objective of the higher education system is not to transfer concrete knowledge (although this cannot refuse), but to make sure that graduates are competent enough. Competence is a measure of involvement in human activity, making it possible to establish the connection between knowledge and problem situation, and to discover ways to solve problems that easily go beyond the standard specialty. From here derives the need for ongoing education, which must hold at the height of professional problems.

The youth of today is the only hope. In Russia and in other countries alike, the level global computerization has drastically risen, as well as active consumption of network information that furthermore expose, unlimited opportunities for development, which formed many in the high self-esteem with high expectations. Authoritarian teaching paradigm is uniquely outdated. Education that only revolves around obtaining and transferring knowledge is not a thing of the past. In a rapidly changing world, the vocational education system, especially a system of high-tech engineering education should be aimed at the formation of new qualities (competencies) of an engineer such as creativity, innovation, initiative, flexibility, mobility, dynamism, constructiveness; these are largely associated with the improvement of the form and content of technical education. Otherwise, Russia will be doomed to catching up with the type of development, and the development of innovative and leading position in the global economy and will remain so for us unreachable goals.

The need to reform the higher technical education is also due to the fact that today people with higher technical education are included in the so-called creative class society. Popular term "creative class" is obliged to work of R. Florida – a contemporary American sociologist who investigated the causes of prosperity and decline of various cities and regions in the modern United States. Scientists believe that the creative class is emerging as a dominant force because of the development of new and modern economy. «If the source of power of the feudal aristocracy and class identity served hereditary control of the land and the people, and for the bourgeoisie - its inherent representatives 'role' merchants and manufacturers, it features creative class defined creative function of its members. Since creativity - is the driving force of economic development, the creative class to date has taken a dominant position in society» [6] Indeed, creativity is understood as the ability to create significant new forms become the main source of competitive advantage. And since people are the source of creativity, thus it is an important resource of a new era.

Currently about 30 million people belong to the creative class that is 30 % of all working Americans. Creative class core is composed of people engaged in scientific and technical sphere, architecture, design, education, art, music and entertainment, whose economic function is to create new ideas and technologies. In addition to the core, this class also includes a large group of creative professionals working in business and finance, law, health care and related areas.

Radical difference between the creative and the other classes is that what they are getting paid for. Representatives of the working class pay and service class are paid for their planned work shift, while the creative class makes money by designing and creating something new, and it does it with a greater degree of autonomy and flexibility than the other two classes. In other words, members of the creative class are paid for the end result, whereas service workers and people are paid for working hours.

In today's world, no one will argue with the fact that creativity is the source of new technologies, new types of industries and many other economic benefits, in fact, so it is valued higher and is encouraged. As a result, post-industrial society is infused with creative ethos. You can select the following characteristics creative ethos:

1) Creativity - is, above all, the ability to synthesize and not merely the development of intelligence, or the accumulation of knowledge. At the same time, however, to create a new and usable combination should be able to analyze the facts and theories.

2) Creativity requires self-confidence and ability to take risks. Not surprisingly, the creative ethos marks a dramatic turnaround from last conformist. In fact, creative activity is often openly subversive because it breaks the stereotypes of thinking and behavior.

3) Various forms of creativity, usually perceived as independent, for example, technical creativity (or invention), economic creativity (entrepreneurship) or artistic creativity, in fact closely linked. They do not only refer to the total thought process, but also reinforce each other through the «cross-pollination» and mutual stimulation.

4) The motivation is the need for creative fulfillment.

5) Although creativity is considered to be an individual phenomenon, it inevitably acquires the features of teamwork. Even a solitary scientist relies heavily on their (sometimes virtual) colleagues whose opinion matters to him, and often cannot do without assistants.

6) In addition, creativity flourishes in a specific social environment (locus), stable enough to ensure business continuity, while stimulating creativity even in his provocative forms.

7) Creative process does not resume automatically, and thus requires constant attention and investment in economic and social forms, supporting the creative impulse, of which education is one of the most important places. It is also necessary to bear in mind the conditions under which creative activity can be realized and reproduced.

Common to all creative people is an urgent need for external structures and conditions that would be conducive to creativity - give an adequate assessment of their activities thus to encourage them to be even more creative; having mechanisms for mobilizing resources around ideas and were equally susceptible to minor changes and new ideas on the large scale. Companies and geographic points that satisfy these requirements, regardless of their size, have priority in all that relates to the treatment of creative talent, attracting and motivating

Based on the analysis of creativity one can amend the theory of the knowledge society, whereby capital, natural resources, and labor are no longer the prime economic resources. They obtained knowledge. But in fact, in the light of new realities now the main resource of economic and social life is creativity, the creation of knowledge based on practical new forms. "Knowledge" or "information" - it's only working material creativity. A product of this process is an innovation. Therefore, based on the analysis of contemporary social

transformations, as a priority action to create conditions for innovation are seen following steps

First thing you need to do is "to develop the institutions of the welfare state , which can act to guarantee a decent foundation of human life and the social rights of citizens , including in post-industrial society holds a prominent place right to education ." [3]

Secondly, we ought to significantly change the attitude towards technical education and engineering work. That could be fulfilled in the institutionalization of a professional self-regulatory organization. Its objective would be to develop a code of ethics of the profession, an active motivation among young engineer ethos, as well as the implementation of relevant professional licensing. In Russia, there is a positive experience of the self-regulatory organizations in the field of auditing and the legal profession. In these areas, not only a certain professional ethos was created, but also their social status was enhanced.

Thirdly, the prestige of technical education is closely related to the availability of changes in social status of engineer from employee to innovative entrepreneurs. Therefore, it is crucial to develop public and private investment institutions that could carry out venture financing of engineers with the potential to become entrepreneurs innovators. It would also be beneficial to create a network of such institutions across the country, instead of localizing all innovation in Skolkovo.

In conclusion, we note that it will be impossible to put Russia on road to innovation without these and other measures to modernize the technical education and improve the social status engineer by creating political and economic conditions for domination ethos of creativity in contemporary Russian society.

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QUALITY CRITERIA FOR COMPUTER LEARNING SYSTEMS

Mikheyev, I.V.

Balakovo Institute of Technic, Technology and Management, SSTU

This article describes and highlights the major criteria and attributes of quality assessment of computer training systems. The importance of an automated system that can be developed on the basis of these criteria and attributes.

At the present stage of development of information systems and technologies of

various kinds designers and editors for creating information resources are becoming very popular. Due to the prevalence and development of the Internet, computer based training systems and information resources of educational institutions usually implemented as a Web application or Web sites. In the global Internet can find a lot of personal information resources (blogs) school teachers, lecturers and academic institutions, which in most cases implemented by designers or ready systems, as well as using visual editors and templates[1,2].

Despite the fact that the use of such automated systems is a convenient, significantly reduces the cost and development time, these systems have several disadvantages, which are primarily related to the quality of resources generated in this way[3].

Often, developers and designers of such visual editors pay more attention to an aspect of convenience and ease of use of the system and less criteria regarding aspects of safety and security that is not unimportant in relation to educational information systems. Therefore it is necessary to identify a number of criteria according to which it is necessary to carry out the development of computer-based training systems and information resources.

By the quality of the software will be understood is how the software meets its requirements. Extendable requirements may depend on many criteria determined on the basis of the scope of the software [4].

In accordance with ISO/IEC 9126-93 - "Evaluation of software products. Quality characteristics and guidelines for their use. "Identify the following characteristics of the quality of software products [5]:

- functionality. One of the key characteristics that defines the purpose and functions to be performed by the system. As part of the characteristics are the following attributes: availability, interoperability, compatibility and security. Under the attribute of understanding the software resources specifically to the task. Under the attribute refers to the correctness or suitability of matching results or effects resulting from the operation. Interoperability attribute defines the possibility of sharing with other software or systems. Consistency - attribute defines the corresponding software standards, agreements or provisions of law. Under the protection of an attribute is the ability of a software tool to prevent accidental, intentional and unauthorized access. Attributes above characteristics can be realized as a function of differentiation of user access rights, the function of restricting access to information, the quality of the evaluation function of mastering the material covered, etc. Features related to this characteristic can be obtained on the basis of terms of reference for the development of a software product, if it comes to the design and development, or of a set of documentation for the software, if it is a finished product and functioning;

- Reliability. Under this feature is the ability of the system to function properly in the given conditions and at a predetermined time interval. Here you can select attributes such as protection against external influences, or targeted attacks on the system, as well as errors that occur while the system is not identified in the testing process, or errors arising from errors and inaccuracies in the process of designing the system. In consequence of the impossibility of a complete check of efficiency of software testing process, within the framework of the reliability characteristics necessary to allocate attribute error resilience arising during operation of the software. Just under this characteristic it is necessary to allocate attribute recoverability, the implementation of which allows to recover your system, for example using a backup in case of errors or system failure;

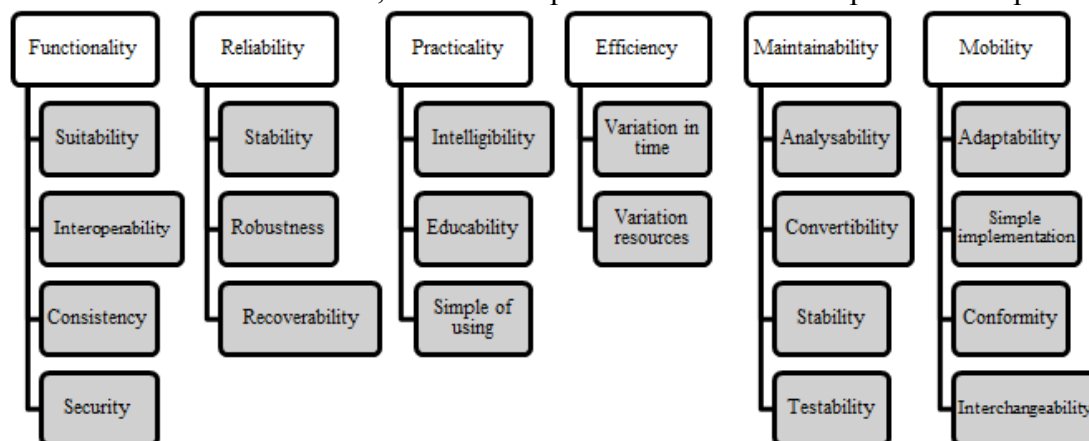
- Practicality. This characteristic is caused by a set of attributes that affect the usability, effectiveness and usefulness of the product. To this characteristic can be attributed attributes usability controls, ergonomics and accuracy of their location. In practice, this criterion is, as a rule, to determine the correct position of convenience and passive control elements of the user program workspace;

- Efficiency. This feature allows you to define the attributes describing the user's understanding of the logic of the system, and the applicability of the concept of a software product. Understandability attribute allows us to characterize how easy-to-understand user interface is designed and logic of the program. Attribute learning to determine the amount of effort and speed of adjustment member to work in the system. Attribute ease of use allows you to determine how convenient and easy to operate user software. In practice, this criterion allows to evaluate how correctly and logically grouped controls, the accuracy and adequacy of the location of its facilities;

- Maintainability. Defining characteristic of processes and operations necessary in maintaining health software tool. Within this attribute characteristics highlight analysability which defines the efforts required for the diagnosis of deficiencies or errors that occur during the operation of software. Changeability attribute determines the amount of effort required to implement the modifications of an existing software product. Attribute defines sustainability risks and contingencies of modifications. Testability attribute determines the amount of effort needed to verify that the implementation of a software product after modification. In practice, usually the criterion shows the reaction rate of the resource administrator or software on error situations arise;

Mobility. Characteristic, allowing the software's ability to identify funds to be transferred from one environment to another. Attribute to determine the adaptability and ease of adapting software to various specific operating conditions. Ease of implementation attribute specifies the amount of effort needed to implement existing software to the specific environment. Attribute correspondence defines compliance software required standards or agreements within the mobility characteristics. Interchangeability attribute describes the simplicity and complexity of application specific software in exchange of another. In practice, this criterion evaluates the possibility of the developed system to function in a different hardware or software environment.

The above characteristics, and their respective attributes are represented in picture 1.



Picture 1 - The criteria for assessing the quality and attributes of software products

The above criteria for assessing the quality of computer-based training systems will avoid uncertainty in the description and measurement of quality indicators developed or already functioning software.

On the basis of these criteria for assessing the quality of computer-based training systems it is possible to develop an automated system to assess the quality of functioning of information and education, and computer-based training systems, which in turn will definitely improve the quality and reliability of such resources, as well as such a system would help to

reduce uncertainty and arbitrariness in the description and measurement of quality of software products in the field of pedagogy and education.

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IMPROVING THE EFFICIENCY OF TRAINING REQUIREMENTS FOR EMPLOYERS

Guzairov, M.B., Martynov, V.V., Filsova, E.I.
Russia, Ufa, Ufa State Aviation Technical University

This paper discusses how to automate the design and formation of instructional support, educational programs using a new generation of object approach and in accordance with the requirements of employers that improve the quality of training in higher education.

Keywords: designing educational programs, the competence, the object approach, the requirements of employers

Training at universities today must meet the rapidly changing conditions of development of the country's economy and information society. Currently, the labor market there is a demand for qualified personnel in a number of professions that are not fully corresponds to the proposal, that formed by educational institutions. Also, according to employers, a large number of graduates of educational institutions are not able to put into practice the knowledge and skills, have low motivation to work and often do not have the required for a specific job competencies.

Increase the effectiveness of the quality of training can be achieved by in-depth analysis of requirements of all the stakeholders involved in their competitiveness (high school – the state – the employer), automating the process of learning and assessment system competitiveness specialists.

Training should be carried out with a focus on criteria evaluating the quality of training. When training in a technical college such criteria are primarily:

- degree of mastery of competencies graduates;

- intellectual, personal, social and psychological characteristics of the future specialist (eg, such as communication skills, availability and development of creative thinking, etc.);
- focus on the future professional activity (the desire to work in the specialty and high motivation to work) .

Besides the common forms of education quality improvement specialists, currently becoming increasingly urgent task of operational training specified number of students with the required competencies employers. It is solved by forming dynamically changing educational programs up to create individual learning plans that reflect the relationship between theory and its practical application of specific , relevant professional inclinations of the future bachelor , specialist or master . Also the formation of dynamic learning plans can be useful for improving the skills of workers of various industries to master the missing competencies.

The process of forming dynamically changing educational programs may be aggregated in the following way [1]:

- 1) develop and formalize the requirements of the employer to appropriate specialists;
- 2) to develop professional competency model required employers specialist;
- 3) to determine the closest to the developed model for the structure and content of basic competencies federal government standard of higher education;
- 4) determine the structure of the missing competencies required expertise;
- 5) carry out the design (change) curriculum closest to the competence model training areas;
- 6) carry out the design for missing formation of professional competencies of academic disciplines and to determine their complexity;
- 7) develop a set of training and methodological support to add or change disciplines based on the integration and continuity of educational levels;
- 8) provide information support to the amended curriculum: display transformations in a learning management system, the site of the university, the schedule, etc.;
- 9) to substantiate and develop criteria for evaluating the effectiveness of employers to develop the necessary professional competencies in students and professionals to experimentally verify them in the operation altered the educational program.

In the near future for a new job can only specialists compliant professional standards [2, etc.]. These standards have been developed for a number of business areas and plans to introduce them for another 800 jobs. The first problem that arises in the selection of experts employer becomes discrepancy qualification requirements prescribed in these standards or requirements of the job descriptions (if the standard is not yet developed) those competencies that are registered in the standards of education. Therefore, the first task is to reach an agreement forming domain thesaurus, construction and use of a mechanism for determining the necessary competencies.

To solve this problem, we propose to use the technology ontological modeling and knowledge bases. Ontology – a formal specification of a shared conceptual model. It consists of classes of domain entities, the properties of these classes of relations between these classes and assertions built from these classes, their properties and relationships between them.

Important role in the formation of ontology plays a domain object model, which can be transferred to the ontological model, as is the natural hierarchy of domain concepts [3]. Said object model is a look at a common base of knowledge, understood as a distributed system of ontological information. From the standpoint of the internal organization, the object domain model represents the structure of the ontology classes, where the relationship between the concepts implemented in a hierarchical class model described in UML.

In terms of the ontological approach entity specified domain represented by the classes, which are then arranged in a taxonomy (class – subclass). When processing requirements of employers to the training system can be isolated following concepts that have certain properties:

- complex requirements of employers to the training system, which is manifested in sets qualification requirements of professional standards;
- competence models of the graduates;
- educational program – can be considered as a separate ontology;
- training system;
- stakeholders of the learning process: the customer, the state, the applicant, a student, his parents, etc.

Fragment of such an ontology is shown in Figure 1. It allows you to solve a number of problems related to the organization of the educational process in higher education and to ensure the dynamic needs of the industry (the employer).

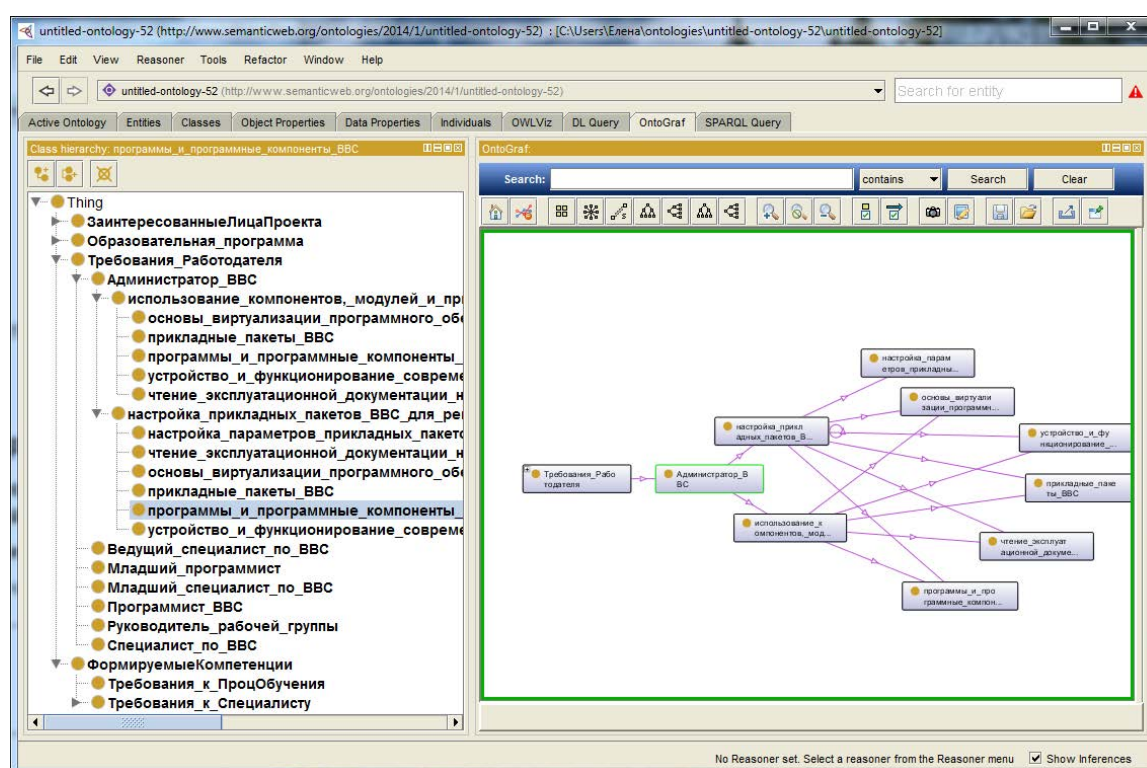


Figure 1 - Ontology professional requirements for high performance computing systems administrator

On the basis of the ontology built produced general requirements according to which there is a formation of the new curriculum. Model of the formation of curriculum requirements of the employer is shown in Figure 2.



Figure 2 - Model of the formation of curriculum requirements of the employer

For the design of professional competency model required employers specialist (in a certain direction), the following steps:

- analyzed qualifications in the relevant professional field, formed the base list, including knowledge requirements for occupational groups, which can be mastered by students enrolled in this direction;
- requirements decomposition is performed on the scope of activities, each of which specifies the basic functions to be performed by graduate after training;
- for each function are determined in accordance with the educational standards of professional competence areas close that the student must acquire in the learning process;
- define additional (special) professional competencies to better reflect the profile features, regional characteristics of the university, excluding the requirements of production, the special competence of the department.

In the next step to create a matrix defined closest to the developed model, the structure and content of basic competence of the federal government standard of higher education [4]. Areas of training that satisfies a set of required competencies and minimally different from the competencies formed on the basis of the standard of training, is based on the intersection of the sets of competencies and professional competence sets federal state educational standard (FSSES). Remains so many unmet competencies whose satisfaction comes by filling the variable part of the basic education program (BEP), consisting of national and regional components (NRC) and elective courses students (ECS).

The next step to solve this problem is to determine the disciplines that will satisfy the whole set of necessary competencies within the specialist requirements.

For the design or change the curriculum closest to the competence model training areas qualification requirements are decomposed to the level of competence and, further, to the level of discipline. Made on the basis of matrix decomposition designed matching competencies and forming their constituents BEP (discipline, training blocks) on the basis of which further formed an educational program and curriculum in this area of study. Curriculum development in the direction of (specialty) shall be based on the relevant

requirements of the FSES complex to the complexity of the disciplines, the recommended student teaching load during the school week, the schedule of the educational process for the entire period of training etc.

Designing missing for developing professional competencies of academic disciplines is based on a list of competencies, presented to a specialist who is not satisfied with the selected FSES. If you cannot meet all the requirements of the employer, for whatever reasons, such as restrictions on the complexity of implementation and the like, is formed supplementary education program that will be implemented parallel to the main. Afterwards the analysis and approval of the curriculum. This process involves checking compliance of this curriculum educational standards and educational standards of the university. After the approval is necessary to develop a complex training and methodological support to add or change disciplines.

Currently, many universities conducted a study aimed at developing an automated system creating educational complex. The analysis showed that most of them are aimed at automating access to developed materials, as well as to provide support for the design of this document. The disadvantage of the proposed solutions is the lack of support the development of training materials themselves and their automated search for relevant disciplines or formed by competencies.

To solve the presented problems are developing an automated system to create and support educational complex (SEC) [5]. The implementation of this subsystem will form in the shortest time training complex in accordance with the curriculum. Reduce development time is achieved by generating a set of required documents, the system automatically based on the curriculum and a list of competencies that need to be covered.

Work on the design documentation SEC will also be carried automated. The curriculum contains a variety of disciplines and competencies that should be developed as a result of the teaching of this discipline. For each of the disciplines to be developed SEC or selected from the Knowledge Base (which contains already developed educational-methodical complexes).

Mathematical model of choice of SEC knowledge base can be represented as follows:

$$\forall D_i \subset \cup \Pi_k \exists YMK_i \subset BZ_{YMK}$$

$\cup \Pi_k$ - set curriculum;

D_i – a subset of subjects from the curriculum;

YMK_i – SEC for the i -th discipline;

BZ_{YMK} - many developed SEC.

In the case where the Knowledge Base SEC have developed materials requires the development of new SEC.

$$D_i - YMK_i = \Delta,$$

where Δ - missing SEC.

Each discipline implements a subset of the plurality of existing competencies:

$$D_i \cap K = K_i,$$

where K - the set of competencies;

K_i – competence, produced using the i -th discipline.

Set of knowledge includes internet, the library, new developments, scientific journals, etc. When a new SEC sets of knowledge (SoK) in accordance with the competencies are generated by (K_i) selected suitable materials (M_j).

$$\forall \Delta_i \in K_i \exists M_j \cap K_i.$$

Matching educational complex will be in the style of modern document management systems remotely, which saves time when agreeing SEC. This system will help faculty and

students make better use of information resources to prepare for the disciplines through clarity and completeness of the provided materials.

To ensure information support changes to the curriculum must reflect changes not only in the learning management system, which must be new curricula, but also on the website of the university and the timetable. For communication between different information systems of any company (including the university) requires construction of an optimal information architecture.

Evaluating the effectiveness of building the necessary professional competencies employers often conducted on the basis of statistical data on the status and results of the individual achievements of students. This evaluation aims to check whether the knowledge on specific subjects taught in the curriculum, and skills for their use in typical situations. To do this, currently used procedures for licensing of educational institutions, psycho - diagnostic studies, physiological monitoring, monitoring the development of a regional system of education, examination and certification procedures.

Symbiosis of the traditional concepts of the learning environment, new information technologies and Internet environment leads to the formation of a new concept in education - educational information environment. Under such an environment is a complex of information, technical, training and methodological support, ensuring full implementation of targeted educational process. Using the object approach to structuring knowledge, competence-based approach and new information technologies enables to increase the effectiveness of training with the requirements of rapidly growing industries. An opportunity to optimize the learning process: build flexible, personalized learning technologies fundamental to improve the quality of education through organic integration in the educational processes of monitoring, analysis and competences obtained adaptive learning process.

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PRINCIPLES OF THE FORMALISED REPRESENTATION OF THE INTER-DISCIPLINARY KNOWLEDGE IN THE INTELLECTUAL INFORMATION SYSTEMS

Nadezhdin, Ye. N., *Smirnova, Ye. Ye.

*Moscow, IIE – RAE; *the Tula State Pedagogical University (Tula)*

The problem of performance of poorly structured fields of knowledge in the intellectual information systems of educational purpose is considered in the present publication. With a view of creation of toolkit for the formalized description of interdisciplinary knowledge of problem area the principles of the completion of the device logically-linguistic and production models and semantic networks are proved.

The important place in the concept hi-tech informational-educational environments occupy the intellectual information systems of educational purpose. As one of the perspective types of the intellectual information systems of intellectual purpose we consider the problem-oriented intellectual training systems [1, 2].

The intellectual training system (ITS) represents a complex of hardware-software means of engineering of knowledge where the submitted knowledge are used for the directed formation at trainees of functional structure of activity and construction of system of accumulation of the individual experience, adequate to requirements and conditions of the future professional work.

Let's allocate base components of prototype of the intellectual training systems: the knowledge base of problem area; the interpreter of knowledge; model of the trainee; model of process of training; the testing module; the module of the control of the formation level of competencies; the module of updating of strategy of training; the intellectual interface. The modern level of the theory of computer science limits an opportunity of creation in the universal system of performance of procedural knowledge, suitable professional work for several areas. The problem of performance of knowledge consists of the discrepancy between data on the given subject domain, available at the expert, the methods used by it at the decision of problems, and existing opportunities formal is (unequivocal - limited) performances of such information in a computer memory. The general problem of performance of interdisciplinary knowledge (IDK) includes a number of the individual sub-problems: performance of declarative knowledge as the data allocated semantics; performance of procedural knowledge as relations between elements of model, including as procedures and functions; performance of metaknowledge - rules of processing of the facts, ways of the organization of a logic conclusion, methods of the decision of problems the user, generations of new knowledge, etc.

The account of the multi-aspect semantic objects can be theoretically executed by decomposition of problem area of the IDK S on the basis of its performance as compositions of skeletons [3]. The final result of such decomposition is the construction of structural models of semantic objects $S(P)$ with the purpose of a presence(finding) of the best display $\lambda : S(P) \rightarrow L(D)$ of set $S(P)$ in formal language $L(D)$ with grammar D . In our case formal language represents the concrete mathematical circuit.

The basic ones at the decomposition and formalizations of interdisciplinary problem area are the following conditions:

- the achievement of the reasonable compromise between complexity of formal performance of a set of models and the set level of detailed elaboration and abstraction from insignificant properties of the object - original;

- the use at the synthesis of semantic models of the conceptual device and methodical receptions of the theory of similarity and modelling of complex systems;
- the substantiation of splitting into subsets and the types of attitudes forming treelike networks, which can be adequately submitted with the help графов (tops and connections between them accordingly) and the device of the theory of indistinct sets;
- the allocation of hierarchy of semantic subsystems of problem area and maintenance of uniformity of models (objects) inside semantic subsystems of various complexity with the purpose of structurization of problem languages on problem sections, grammatic blocks and separate designs.

The successful realization of the specified requirements is possible at presence of the certain formalism of performance of the inter-disciplinary knowledge of the problem area. It is established, that the most effective way of the formalized performance of knowledge in the ITS are the semantic networks.

In the theory of an artificial intellect allocate three paradigms of performance and processing of knowledge: logic, structural and procedural. Experience of development of the information training system shows that at transition to the complex conceptual models including knowledge of various types and objects of the various physical and chemical nature, overlapping in one language of performances of knowledge of several concepts is necessary. Only such approach guarantees adequate display of knowledge of the interdisciplinary nature.

According to the classification of types of objects of problem area at construction of semantic networks use the following types of semantic relations): syntactic (subject, objective, spatial, time) and paradigmatic which reflect constantly existing connections) between concepts.

The best prospect for development and applications in the framework of the information training systems have mathematical circuits [2,3,4]: logically-linguistic models, adaptive semantic models and expanded time the Petri networks. The specified models possess the advanced toolkit for hierarchical performance of thr property concepts and multidimensional relations and connections between them, suppose an opportunity of adaptation, adjustment and synchronization of components that is essentially important for integration of models into interests of the formalized description and processing of interdisciplinary knowledge.

In the course of our research the necessary conditions of the completion of the probable-linguistic and production models and semantic networks (the expanded time Petri networks) for display of problem area of the inter-disciplinary knowledge are determined:

- for the substantial description of problem area (knowledge) the unified terminological device should be used;
- the functions of the information-training systems should be formally set; it actually means the presence of the ITS in the software of the subset of models of tasks of the automated training and a subset of tasks of their information-analytical support; characteristics of models in the information-dependent tasks of the semantic analysis should be coordinated;
- information-training system as the specialized information system should be integrated into the information-educational environment of educational establishment;
- special rules and typical circuits of information interaction of subjects of educational process (the trainees training, experts) and hardware-software complex of the information-training system should be determined;

- the information-training system should use the uniform system of readout of the modelling time, coordinated with the norms working in the information-educational environment;

- special requirements to formats of the initial data, criteria of quality assurance of the analysis and a rating of adequacy of used models at various stages and levels of training should be established.

Thus, for the formalized performance of poorly structured areas of the interdisciplinary knowledge in the information-training system joint application logically-linguistic and production models and semantic networks which in aggregate support process of the automated training is represented as the perspective one. The completion of the models in tasks of performance of knowledge is justified at the coordination of their characteristics through the specialized program module - "intermediary" [3].

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PROFESSIONAL COMPETENCIES OF COMPUTER SCIENCE BACHELORS IN U.S. AND RUSSIAN UNIVERSITIES FOR COMPARABLE IT-PROGRAMS

Khenner, E.K.

Perm, Perm State National Research University

The aim of this paper is the analysis of professional competencies formulated in the course of Computer Science bachelors training. The analysis is based on comparison of the educational programs “Fundamental Informatics and Information Technology” (Russia, Perm State National Research University) and Computer Science (North Caroline University, USA).

Key words: Computer Science, professional competencies

The competence paradigm of higher education requires understanding of the essence of professional competencies and exact wording. The first version of such wording given in the Federal State Educational Standards of the third generation (2009-2011) was unsatisfactory. The ongoing process of updating of the standards is primarily aimed at the revision the list of professional competencies and fresh wording.

In this paper we compare professional competences formed in the process of realization of two undergraduate programs: "Fundamental Informatics and Information Technology" (FIIT) in Perm State National Research University, Russia, and "Computer

Science" (CS) in the University of North Carolina, the U.S. (where a year ago the author conducted the research devoted to ICT-specialists training with the assistance of Fulbright program).

Despite the fact that in the USA there are no educational standards each US university regularly, once every 5-6 years, accredits its educational programs in specialized non-government agencies, which place unified requirements on each program. The program Computer Science can only be accredited by one agency – Accreditation Board for Engineering and Technology (ABET, <http://www.abet.org>), accrediting more than 3 000 programs. That determines the essential similarity of the one-type programs in different universities.

The detailed comparison of FIIT programs and CS [1] leads to the conclusion that they have similar structure, content and levels of graduates training. It determines the detailed comparison of the requirements to the professional competencies presented in the descriptions of these programs.

First of all, we must take into account the differences in terminology regarding of learning outcomes in epy universities of Russia and the USA. We are starting with the definition. "Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the *knowledge*, *skills*, and *behaviors* that students acquire as they progress through the program" [2].

The set of characteristics mentioned above may be to a large degree identified with the so named "competencies". Most of English-language dictionaries consider "competency" as a synonym for *capability*, *capableness*, *capacity*, *competence*, and *ability*. Many sources divide human competencies in "general culture competencies" (or "key competencies") and "professional competencies". Set of key competencies include systems-thinking competence, anticipatory competence, interpersonal competence, communicative competence and so on.

The discussion of the results of graduates training in the universities in terms of "professional competence" is not unusual for engineering education in the U.S. "Competence statements accommodate different types of work, for example design, research and development and engineering management by using the broad phases in the cycle of engineering activity: problem analysis, synthesis, implementation, operation and evaluation, together the management attributes needed. The competence statements include the personal attributes needed for competent performance irrespective of specific local requirements: communication, ethical practice, judgment, taking responsibility and the protection of society" [3].

One of the differences between the descriptions of the educational programs in Russia's and the U.S. universities - on/not on the list of the outcomes (U.S. terminology)/list of competencies (Russian terminology) - is the so named "general cultural competencies" (another term is "key competencies"). As usual, the U.S. universities limit themselves by the professionally-oriented outcomes while Russian universities necessarily add the key competencies, formed in the educational process, to the list.

Appropriate outcomes are not usually included in the list of the outcomes of engineering training programs (including IT-specialists training) in the U.S. universities (they are partly contained in the list of curriculum objectives). However, if we look at the problem in a broader context, we shall see that the development of personality traits is considered by the leaders of engineering education in the United States as an important objective [4].

ABET Computing Accreditation Commission (CAC) mandated the following outcomes for the Computer Science curriculum [2].

(a) An ability to apply knowledge of computing and mathematics appropriate to the discipline

- (b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
- (c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
- (d) An ability to function effectively on teams to accomplish a common goal
- (e) An understanding of professional, ethical, legal, security and social issues and responsibilities
- (f) An ability to communicate effectively with a range of audiences
- (g) An ability to analyze the local and global impact of computing on individuals, organizations, and society
- (h) Recognition of the need for and an ability to engage in continuing professional development
- (i) An ability to use current techniques, skills, and tools necessary for computing practice.

The U.S. universities in the process of accreditation of education programs develop their own curriculum objectives and curriculum outcomes which based on CAC-mandated but more detailed. As an example, below is the list of upon curriculum objectives and learning outcomes of Computer Science graduates North Caroline State University [5].

Curriculum Objectives of Computer Science students of NCSU

The CS undergraduate program at NCSU prepares its graduates to achieve the following career and professional goals:

1. To apply their knowledge of computer science to problems encountered in their professional careers or in pursuit of advanced degrees.
2. To use evolving technologies, analytical thinking, and design to address contemporary issues.
3. To communicate well orally and in writing, interact professionally, and work effectively on multidisciplinary teams to achieve project objectives.
4. To uphold high ethical standards, including concern for the impact of computing on individuals, organizations, and society.
5. To engage in lifelong learning to enhance their professional capabilities.

Graduation outcomes of Computer Science students of NCSU

1. Be competent in theoretical and mathematical foundations of computer science and be able to	
1.1	Apply fundamental concepts of discrete mathematics such as logic, proofs, set theory, relations, functions, and combinatorics to model computational problems
1.2	Demonstrate the application of abstract structures such as graphs, finite state machines, and recurrence relations to the solution of computer science problems
1.3	Analyze and evaluate comparative performance of algorithms and data structures appropriate to solving computer science problems
1.4	Apply concepts related to data structures such as lists, stacks, queues, arrays, graphs, trees, heaps, and hashing to design and create algorithms
2. Be proficient in one programming language and have a basic knowledge of several others and be able to	
2.1	Write efficient solutions to specific problems using an object-oriented programming language
2.2	Write programs in assembly language
2.3	Write programs in a procedural programming language
3. Understand the hardware and software architecture of computer systems and be	

able to	
3.1	Explain the function and interaction of computer processing units, memories, and input/output devices
3.2	Define and explain elements of operating systems such as memory management, process scheduling, synchronization and interaction, and input/output devices
3.3	Distinguish computer network elements and understand issues related to computer security
4. Demonstrate the ability to participate in professional practices related to software engineering and be able to	
4.1	Negotiate, clarify, and document customer requirements
4.2	Apply knowledge of fundamental algorithms, programming language concepts, and design patterns to determine an overall design for a software system
4.3	Implement a fully specified system
4.4	Test a fully specified system
4.5	Plan and monitor the progress of software projects to ensure on time delivery of a high-quality system
5. Be able to communicate effectively about CS-related topics and be able to	
5.1	Deliver an audience-sensitive oral technical presentation
5.2	Write an audience-sensitive technical document
5.3	Contribute effectively on software-based system development teams
6. Demonstrate the ability to be responsible practitioners of computer science and understand the social and ethical implications of computing and be able to	
6.1	Demonstrate ways in which computers pose new ethical questions or pose new versions of standards, moral problems and dilemmas
6.2	Recognize and, when appropriate, to resolve ethical problems or dilemmas related to the computing profession

As it was mentioned above, in Russian universities a great number of programs is connected with IT-specialists training. The list of the professional competencies (PC) for each program is presented by the appropriate Federal Educational Standard.

In spite of the differences in the professional competencies wording for different IT specialist programs they have much in common, as well as the programs do. The results of the analysis of 20 programs [6] (methodology of the analysis is described in the paper) allowed making up a list of common to the undergraduate group professional competencies.

On the basis of the list we formulated the competencies of undergraduate training within the program “Fundamental Informatics and Information Technology”. They are included in the educational standard of Perm State National Research University in this field. These competencies are divided on two groups: “generalized” and “professional”. The professional competencies are structured accordingly the kinds of professional activity of IT-specialists.

Generalized competencies of FIIT students of PSU

1. Ability to use information technology in scientific and cognitive activity.
2. Ability to solve standard problems of professional activity using ICT.
3. Ability to support information security of computers and computer nets.
4. Ability to interact with customers and partners in solving the tasks of management of IT environment lifecycle of a company.

Professional competencies of FIIT students of PSU

1. Research activity

P1.1	Ability to comprehend and use the existing mathematics apparatus, fundamental concepts and systemic methodology in research
P1.2	Ability to make calculations and perform experiments using computers
P1.3	Ability to build computer models and perform research using special software
P1.4	Ability to interact and cooperate with professional network research communities and international consortiums, to monitor the dynamics of development of chosen information technology programs
2. Productive and technological activity	
P2.1	Ability to use basic knowledge in mathematics for efficient solving of the tasks, related to development and use of information technology
P2.2	Ability to apply the methods of computer modeling, digital libraries and collections, appropriate toolkits
P2.3	Ability to apply modern paradigms and languages of programming, and database languages
P2.4	Ability to apply the methodology of system and program engineering
P2.5	Ability to carry out high-performance (concurrent and distributed) computing
P2.6	The ability to apply the methods and skills of networking, configuring operating system and platform environments
P2.7	Ability to apply professional IT standards for working out and maintain documentation according professional norms and requirements
P2.8	Ability to project and develop IT-infrastructure of a company providing support for business processes
P2.9	Ability to develop and implement the processes of lifecycle of information systems and software
P2.10	Ability to develop and manage company content and web resources, to control development and use of information services (content services).
P2.11	Ability to develop new businesses using information and communication technology innovations
3. Service and analytical activity	
P3.1	Ability to perform installation, setting and service of IT systems
P3.2	Ability to evaluate and analyze functioning of information technology systems and means
P3.3	Ability to analyze IT environment and activity of a company and develop recommendation on its improvement
4. Educational activity	
P4.1	Ability to teaching computer science-related disciplines
P4.2	Ability to develop educational content and use modern technical hardware and software in education
P4.3	Ability to design local educational information systems
5. Consulting activity	
P5.1	Ability to consult customers on the IT infrastructure improvement
P5.2	Ability to consult customers on the issues of rational selection of information systems and information and communication technologies for business management

We shall compare particular groups of competencies, taking PSU list as a basis. We should emphasize that the types of activity on the list of the competencies are borrowed by PSU's standard from the Federal State Educational Standard and are typical of such documents.

Research activity.

It should be mentioned that the curriculum objectives and graduation outcomes of the NCSU Computer Science program do not contain any requirements for undergraduate research work. It is apparent from the content of the program which does not require the graduation thesis and does not contain what in Russian education is called “research practice”. Research activity for the Bachelor’s degree is not mandatory; researches are carried out only by those students who plan to do a Master’s degree or Postgraduate studies. But undergraduate research activity is encouraged and supported by the university (it even gives special research grants for undergraduates). It should be noted that no less than a half of Computer Science undergraduates continue their training in the university.

From my point of view this approach is close to the concept of the bachelor degree course and education realities of Russian higher educational institutions where students’ preparation for research activity is rather declared than implemented.

Productive and technological activity. Service and analytical activity. Consulting activity.

In American higher educational institutions, as well as in the Russian ones, many students doing the Bachelor’s degree, work in IT companies, thus, the competencies, connected with their direct responsibilities are consciously formed in the course of their study. In practice-oriented types of activities the requirements for Russian and American undergraduates almost coincide though they are differently structured and expressed by different terms. This tenet is supported by the analysis of the structure and content of the programs. There is no doubt that different aspects are emphasized in the programs, but in both of them the fundamental component of professional training (mathematics, and theoretical informatics) and the applied one (programming, information systems, information technology, etc.) are almost equally implemented.

Educational activity.

In the NCSU program educational activity is not mentioned. I think the typical of Russian competencies lists the competence “Ability to teaching computer science-related disciplines” and the similar ones (borrowed by PSU’s standard from the Federal standard), not supported by anything in the program, are the result of the inconsistent statement that teaching does not imply any additional to the subject area knowledge and abilities.

If in comparison to take the NCSU list as a basis, in the PSU list there are no corresponding to the following points: 5 “Be able to communicate ...” and 6 “Demonstrate the ability to...”. It is explained by the fact that communication skills, public speaking, group work and ethical issues in the computing profession are in the PSU standard, but following the tradition they are included in the “key competencies” which are not analyzed in this paper.

General conclusion: the requirements for professional competencies formed in the Computer Science bachelor training in the Russian and American universities, being expressed by different terms, do not contradict but in many points even coincide.

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COMPREHENSIVE ASSESSMENT OF COMPETENCE IT-SPECIALIST IN PHASE SELECTION OF PROFESSIONAL

Naseykina, L. Sokolova, I.
Orenburg State University

The problem of determining compliance with the level of training of specialists in the field of networked information technology requirements of employers on IT-services market. Developed a reference model, allowing for an assessment of formation of certain professional and general cultural competence to provide assistance in selecting the appropriate supervisor vacant post of IT-department. Basis for the formation of the necessary competencies are significant professional and personal qualities of the candidates.

Keywords: reference competence model, professional and general cultural competence, professional and relevant personal qualities.

An important feature of the present stage of social development is the process of informatization. To date, it is safe to say that no one organization can not do without the use of information technology, including network and capabilities of computer networks and telecommunications. As a result, experts in the field of networked information technologies in demand not only in companies operating in the market of IT-services, but also in virtually every sphere organizations. Today's labor market offers a large number of competitive professionals engaged in computer hardware and software for computers - programmers, system administrators, network and software engineers. As a result of the high competition in the labor market of IT-specialists, managers becomes more difficult to implement the choice of candidates for a certain position in the department of system administration.

In this context, the requirements of steel to rise to the level of training of graduates of universities and technical directions, including students and programmers enrolled in the direction 230100 - "Computer Science". In particular, in order to meet the requirements of employers in the IT- sector, graduates of this group should be able not only to the development of software systems and complexes, but also be able to realize the design of computer networks, setting up network equipment, maintenance of existing software for customer service, that is to be competent in the area of network information technology.

In work [1], we noted that under the competence of the student programmers in the field of network information technology as "an integrative quality that determines the ability to solve professional problems and common tasks in the area of network information technology, resulting in real-world situations in professional activities to work with computers network".

In the course of pedagogical research, we have developed an integrative model of competence students programmers in the field of network information technology, reflecting their level of preparedness, after graduation, to successfully implement the professional activity in the field of computer networks and telecommunications.

The developed model consists of two main elements - the professional and general cultural competencies identified on the basis of analysis of the requirements of the educational standard in the direction 230100 - "Computer Science" [2]. Basis for the formation of the common cultural and professional competence are significant professional and personal qualities that you must have a graduate in order to successfully implement a professional activity in the field of computer networks and telecommunications.

Professionally-meaningful and personal qualities are individual human characteristics that provide success in mastering the profession, promote the formation of positive attitudes towards people with whom one works and communicates help to develop the desire for personal growth and self-improvement in a chosen field of activity, that is, the quality which are necessary for the successful implementation of professional activity [3].

We have suggested that the basic elements of professional competence are the following professionally significant qualities of graduates:

1. Knowledge of network technologies, which include information about network topologies , design methods and the creation of a structured cabling system , diagnostics, and troubleshooting computer networks. In addition, they also include knowledge of network protocols and methods of developing distributed applications using databases based on client-server architecture.

2. Ability to network design, which include the ability to construct circuits IP-based networks using a mask of variable length chains. Installing and configuring communication Ethernet equipment, diagnostics and troubleshooting local area networks. Installing and configuring the system and application software. Server Administration . Working with clients on remote access. Recognition and problem solving hardware and software.

3. Network protocols by software (network programming skills), which include the development of algorithms programs, configuring the system and application software to support the network mode of operation using the protocol TCP/IP, the use of modern integrated programming environments for writing, debugging, and testing network applications operating on client-server architecture. Development of distributed data processing systems, including web-based interface.

4. Professional experience, which involves deep immersion in the professional environment, the solution of practical problems of system administration to ensure the smooth operation of hardware and software organization , and implementation of computer network information security.

5. Motivation for self in professional activity, which is characterized by passion for their chosen profession, awareness of the importance of their work, self-realization in his chosen field . Employees with this quality, a very high level of satisfaction with the profession , interest and willingness to perform the proper operation of the post , the desire to improve the professional level and skill.

In order to determine personality traits graduate, required for a successful career in the field of networked information technology, we have studied the wishes of employers as well as the requirements of professional IT-standards (qualification requirements for the specialist system administration) [4].

As a result of the analysis, we have found that those personality traits are:

1. Leadership, which is manifested in the ability to form a team and lead it to their targets on the basis of personal authority. Possession of personal data quality is characterized by the presence of organizational skills, ability to manage a group of employees, guide them in everyday tasks.

2. Sociability, which is characterized by the ability to establish contact with colleagues as well as with the leadership, to listen and hear, ask questions. Sociability manifests in possession skills competently and convincingly express their thoughts, self-presentation, its

services, as well as writing skills information.

3. Teamwork, which is characterized by the ability to communicate and interact with their peers, courtesy and respect to them. Manifested in the ability to understand other people, their position. Employees with personal data quality, actively discuss all the problems in the team and make all the decisions together.

4. Stress stability, which is characterized by easy adaptation to emerging employees stressful situations in a professional environment, performance and endurance at high physical and mental stress for a long time.

5. The desire for self-learning and development, which is characterized by the possession of intrinsic motivation for the acquisition of new knowledge and the desire for self-education and professional excellence throughout life. Involves the study of new products of domestic and foreign professional literature.

6. Creativity, which is characterized by innovation and creativity in solving problems in daily professional activities. This personal quality involves finding unconventional solutions employee challenges of the profession.

7. Responsibility, which implies the ability employee make decisions in difficult situations and be responsible for their consequences. When making decisions involves an assessment of expected impacts and the fulfillment of its obligations. When it can not promise , the employee is taking every effort to minimize damage and notifies changes stakeholders.

8. Independence, which manifests itself in the independence of the employee, his ability to act without constant intervention and practical help from outside in everyday work.

9. Accuracy, which includes a number of employee work without errors, mistakes, errors.

10. Perseverance, which manifests itself in patience and self-exposure in solving professional problems, usually requiring prolonged sedentary work . It should be noted that each of these personality traits is the basis for the formation of specific general cultural competence of graduates direction 230100 - "Computer Science" [2].

Table 1 - Compliance with general cultural competence and personal qualities of students programmers

Personal qualities of graduates	General competence
- Leadership	- Owns a culture of thinking, able to synthesize, analyze, process information, goal setting and choice of ways to achieve it;
- Sociability,	- Can logically true and clear arguments to build oral and written language;
- Teamwork;	- Ready to cooperate with colleagues, teamwork;
- Responsibility, - Independence, - Stress stability, - Creativity	- Able to find organizational and managerial solutions to unusual situations and is ready to take responsibility for them;
- Accuracy, - Perseverance	- Able to use legal documents in their activities;
- Desire for self-learning and development	Введите текст или адрес веб-сайта либо переведите документ Отметка - stremitsya k samorazvitiyu, povysheniyu svoey kvalifikatsii masterstva; - umeyet kriticheski otsenivat'

	<p>svoi dostoinstva I nedostatki, nametit' puti i vybrat' sredstva raziztiya dostoinstv i ustraneniya nedostatkov.</p> <p>Возможно, вы имели ввиду: В результате проведенного анализа, нами <i>было</i> выявлено, что таковыми личностными качествами являются: 1 Лидерство, которое проявляется в способности формировать коллектив и вести его к намеченным целям на основе личного авторитета. Обладание данным личностным качеством характеризуется наличием организаторских способностей, умением управлять группой сотрудников, направлять их при решении профессиональных задач. 2 Коммуникабельность, которая характеризуется умением устанавливать контакт как с коллегами, так и с руководством, слушать и слышать, задавать вопросы. Коммуникабельность проявляется во владении навыками грамотно и аргументировано выражать свои мысли, презентации себя, своих услуг, а также навыках письменного изложения информации. 3 Умение работать в команде, которое характеризуется умением общаться и взаимодействовать со своими коллегами, вежливостью и уважительным отношением к ним. Проявляется в умении понять других людей, их позицию. Сотрудники, обладающие данным личностным качеством, активно обсуждают все проблемы в команде и принимают все решения совместно. 4 Стрессоустойчивость, которая характеризуется легкой адаптацией сотрудников к возникающим стрессовым ситуациям в профессиональной среде, работоспособностью и выносливостью при высоких физических и моральных нагрузках в течении длительного времени. 5 Стремление к самообучению и развитию, которое характеризуется обладанием внутренней мотивацией на приобретение новых знаний, стремлением к самообразованию и профессиональному совершенству на протяжении всей жизни. Предполагает изучение новинок отечественной и зарубежной профессиональной литературы.</p> <p>- Is committed to self-development, improve their skill mastery;- Able to critically evaluate their strengths and weaknesses, and identify ways to choose the means of development merits and deficiencies.</p>
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Identified significant professional and personal qualities of students programmers characterize Maturity of certain professional and general cultural competencies. This is the basis of forming a graduate a certain level of competence in the area of network information

technology. Possession of a given quality, ultimately determines the availability of the graduate for professional careers in the field of computer networks and telecommunications.

In order to determine the direction of professional correspondence graduates 230100 - " Computer Science " modern requirements of employers in the field of IT- services , we have developed a competence model reference specialist in the field of network information technology.

In the model presented demands to the level of formation of significant professional and personal qualities that are needed specialist in networking information technologies in order to be competitive in the IT-services market. Consider the possibilities of the model. In the department of system administration vacancy may be the following: Head of system administration , senior systems administrator , network engineer, technical support , network operation, the operator access. These include job responsibilities, you need to perform the employee, according to his job description, certain professional standard [4] (Table 2).

Table 2 - Matching job descriptions of vacant posts of System Administration

Name of posts	Function
1 Project manager	Development Planning Department of system administration, organization of effective interaction with other departments, the development of information security policy and policy monitoring computer network; business conduct regulatory and technical documentation, planning optimal use of hardware and software resources to prepare proposals for the purchase of hardware and software.
2 Senior system administrator	Participation in development planning information infrastructure, ensuring the smooth functioning of software and hardware, monitoring of compliance with information security policies, control acceptance, installation and testing of new hardware, software, computer network, monitoring the market for new hardware and software solutions , participation in the development and implementation growth strategies in the field of information technology, the organization of professional training, technical documentation control .
3 Network engineer	Installing and configuring the system software update server operating systems and software, maintenance of operating status server software , system and network administration software, ensuring acceptance, installation and testing of hardware, software and communication facilities of the network infrastructure , implementation of information security policy; development of proposals for the modernization of the network infrastructure, control inventory , organize and conduct technical reporting.
4 Support engineer	Maintenance of equipment in the deployment of software and hardware systems, the definition of obsolete equipment and software, technical inspection of incoming equipment repair, preventive maintenance at the facilities of the network infrastructure and

	workstations, technical maintenance and reporting documentation, participation in the commissioning, installation and testing of new software and hardware, participation in the development of disaster recovery scheme performance computing network.
5 Operator manual access networks	Maintenance of office equipment, installation and setup of the system software on the computers, monitoring the technical state of the incoming peripheral equipment repair, maintenance and technical reporting.

According to the developed reference model to perform their duties in accordance with the requirements of the vacant position, employees of system administration, you must have significant dominant professional and personal qualities at a high level. Moreover, other attributes may be poorly formed. So, the head of the department should be formed at a high level qualities such as consistency and flexibility of thinking, teamwork, while care and accuracy can be average. The leader system administrator should be formed at a high level team work and stress, but, for example, perseverance can be average. In turn, from a technical support engineer to be formed at a high level qualities such as knowledge of network information technology, as well as the ability to design computer networks, while creativity may be at an average level.

Correlating the level of formation of the dominant qualities of applicants for a particular vacancy in the department of system administration with the requirements provided by the standard of competence models allow the employer to make a selection of the best candidate (Figure 2).

It should be noted that the model developed specialist in networking information technology can be used not only in a professional environment. It can be used in high school, students in the preparation directions 230100 - "Computer Science", for the organization of professional training in the disciplines of the block. According to the educational standard in this area of training, to those disciplines are "Networks and Telecommunications", "Operating systems and networks."

The evaluation of formation of common cultural and professional skills of students, the teacher will be able to determine their level of competence in the field of network and information technology to correct ways of organizing information and training activities [5], contributing to the formation of the necessary competencies of students.

The study must be summarized as follows:

- In a situation of high competition in the IT-services market becomes more difficult for employers to implement the most appropriate choice of the employee in the department of system administration duties , in accordance with the requirements of the vacant position;
- Reference model competent specialist in the field of information technology allows network based on the evaluation of formation of certain dominant professionally meaningful and personal qualities of candidates to provide assistance leader in the recruitment of IT-department;
- Use in high school competency reference specialist in the field of information technology network model will allow the teacher to adjust the appropriate ways of organizing information and learning activities of students programmers.

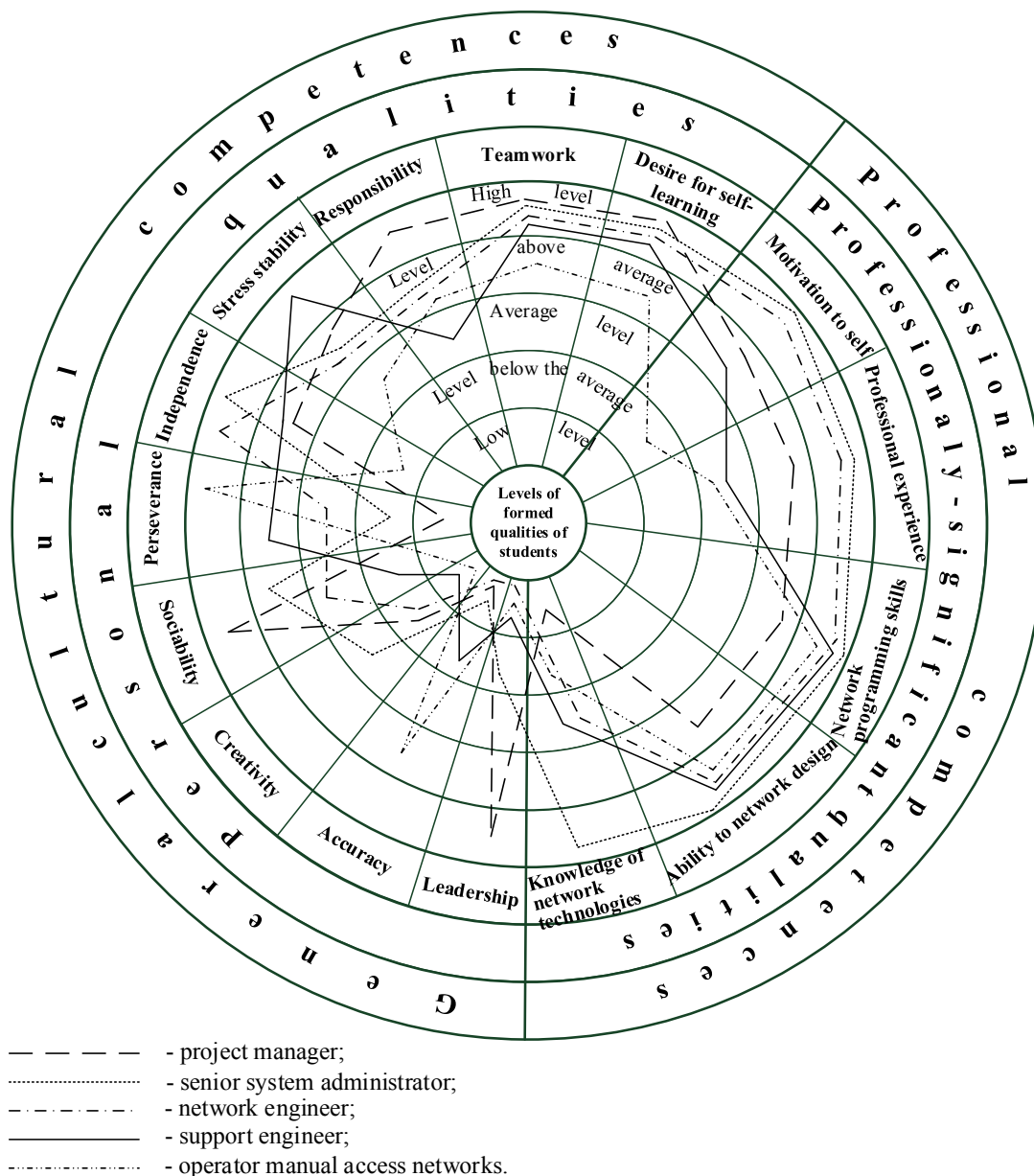


Figure 2 - Reference competence model specialist in the field of information technology network

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INNOVATIVE TECHNOLOGIES IN MODERN PRACTICE, TEACHERS OF PRIMARY SCHOOL

Tereschenko, A. S.

Moscow, Moscow state mining University of a name of M. A. Sholokhov

The paper will consider the following aspects: implementation of innovations in modern educational system, methods and tools to ensure the effectiveness of the implementation of these innovations in the education system of the country; the complexity of adaptation of teachers for modern information process.

Currently the progressive development of a new system, in education, aimed at the world system. This process is defined as changes in the pedagogical thinking and practice of the educational process. Observed improvement of the system with the new content, methods, tools, approaches, behaviors and innovation activities. In this article one consider the level of knowledge of modern information technologies for both pupils and teachers, the teachers depends largely competent mastering various new technologies in education. First of all, let's define what is meant by the term «innovation». So, innovation (eng. innovation is innovation that provides quality increase in the efficiency of processes or products, demanded by the market.

Under the qualitative growth in education will understand the level of formation of universal education, efficiency of processes or products is the end result progressive, market - education system throughout the country [2].

The next step would be to define the concept of «innovative technologies» Innovation technologies is a set of methods, tools and activities, providing innovative activity [4].

Thus, in this article will address the implementation of innovations in modern educational system, methods and tools to ensure the effectiveness of the implementation of these innovations in the education system of the country; the complexity of adaptation of teachers for modern information process.

Many teachers, especially the «old school», believe that this «innovation» is the introduction in educational process of information and communication technologies (ICT). This is, undoubtedly, «revived» modern lesson, brought brightness and colors, allowed to use visibility in training, with less loss of time. However, to use ICT in teaching, you must have a minimum set of 3УНОВ to effectively apply these technologies in the educational process:

- make selective use of ICT resources in their professional activities (text, graphics, computing, multimedia environment, search engines);
- have an understanding of existing media and educational resources in the Internet, recommended for use in educational process on the subject, to be able to use them, make an order and subscription;
- be able to choose informative resources, aimed at training and development of students;
- be able to selectively apply the professional activities of various models of ICT use in the educational process, depending on the actual equipment of educational institutions.
- be able to transfer experience to students and parents.

Indeed, it's hard to teachers, not grown in this information environment, comply with the contemporary requirements for teachers. A list of these requirements over time grows even more. Only list some of them: creation and maintenance of e-portfolio as a whole class, and the class teacher; daily maintenance and filling of the electronic journal and electronic diary; submission of reports of different kinds of e-mail; communication with parents by e-mail; daily compilation of didactic material for lessons; preparation and printing of forms, tests, schedules, control of work, additional work and other

Us, young specialists, simpler and easier to use all the means and resources of modern information space through the ownership of programmes modern means of information. And, as a novice teacher, I will say: it is convenient to apply ICT in the preparation of lessons, as this saves time and allows you to actively use the demo material at lessons, helps to find information in the Internet, feel confident with pupils and much more.



Model ICT - competence of the modern teacher [2]

In conclusion, I would like to give some recommendations for future elementary school teachers in the use of information and communication technologies:

- The intelligent use of modern technologies can help students to efficiently learn the material;

- It is necessary to rely on individual peculiarities of each child (one child more productive to see the other to hear, third - tactile accept the information);

- Conducting multimedia lesson, do not put to amaze child, your task - implementation of a developing didactic functions ;

- ICTs can be used for the following purposes: the exercise of control and self-control (verification of the standard), showing images for the formulation of the learning task, the problem situation and others, as a means of confirming or disproving ideas and opinions during the lesson as a means to provide an environment of success, consider carefully each

step of the lesson using the projector or an interactive whiteboard or another tool, the critical towards the already prepared «downloaded» presentations, and the main thing is to TEACH the CHILDREN to LEARN!

Teachers who use ICT, concluded: information technology only for the seekers, creative, loving to learn new teachers. For those, who care about the level of their professional competence and development of students who are concerned about how he is a teacher of the modern Russian schools, meets the requirements of the coming century!

SCIENTIFIC CULTURAL AFFILIATION FOR UNDERGRADUATE AND GRADUATE STUDENTS

Timoshenko, A.
Moscow, MIET

Present technical education process with technological changes need to adapt to the growing amount of information and knowledge. In this paper the aspects of training in the future technical specialist in university in the sphere of science, education and high technology are described. Educational challenges and opportunities are identified and analyzed. The approaches of an educational environment organization are presented.

Keywords: scientific projects, students projects, educational roles, knowledge transformation, scientific method, inculcation to the scientific culture.

Continuous development is one of the defining features of modern society. According to IT experts current generation is living in the era of information explosion [1]. The amount of information and knowledge has continued to increase avalanche. However, the accumulated knowledge and information has increased proportionally to scientific discoveries and technological advances in the past. At the present time there are a lot of duplicated information in the Internet. The trustworthiness of that kind of information is challenge.

We most acutely faced with this issue with students for work in the field of telecommunication systems and IT. One of the main professional competencies of our graduates should be: the ability to understand the nature and value of information in the development of modern society, the ability to be aware of the dangers and threats that arise in this process, knowledge of the basic methods, ways and means of production, storage, information processing, etc. The goal of modernization of educational process is creating a professional competence of the graduates in the various activities. One aspect of such training in the future technical specialist in university is a large-scale involvement of students in the sphere of science, education and high technology.

Professors of our department had to take a whole range of work simultaneously:

- We fully adopted the BS/MS system of higher education. Four years we have not only to give them the fundamental knowledge in telecommunication but their interest value of their own research on the chosen field of study. Students are waiting for they will get a qualification just to use various technical means necessary for a successful career. In fact the number of practical courses on special subjects are reduced. The first place there independent research development of students. Professionally successful is only one graduating student who understands the importance of constant self-improvement and self-education [2]. Bent for effective solution of issues encountered in professional activities will be implemented in readiness for such activities.

- Simple transmission of knowledge – does not work. Students do not trust us

more than Wikipedia [3]. Today, we are faced with a fundamental problem: knowledge are devalued. The value of information is the difficulty in obtaining it. Students had to work hard to remember a wide variety of data from the training program, to work with a large number of reference books, to make complex mathematical calculations manually for the development of knowledge. Now they use phones and tabs with Internet and Wikipedia inside. Internet is not a source of knowledge but a means of getting ready answers.

- Students – it's another parallel world. They've got their own culture, their own values. But they have its communication environment. They are better understand what systems for the collection, processing and transmission of information are our future. Information explosion was just because of the technical simplicity of recording and copying processes. And this is just what students own. We left the students the right to choose mainly means and methods of its educational process. But focused on the task to involve students in scientific culture.

Organization of an educational environment is most important for research focus of the educational process in the preparation of students. That environment should show and support the significance of scientific research not only as a specific professional activity scientists, but also as a lifestyle. We should impart research high social relevance. To implement this requirement the following decisions and actions:

- stimulating administrative action;
- high material and technical base;
- multi-level scientific and social partnership;
- systematic consultative and coordination support scientific research supervisor;
- positive creative atmosphere, etc.

Research focus of the educational process principle focuses on the variability of scientific knowledge of the world. It is impossible without the development of universal cultural values. Thus there is a formation of a research culture of the students. Research culture – is part of the general culture of the individual and society associated with individual and public knowledge and worldview determines how the organization intellectually and cognitive activity in this area. It's promote to:

- be aware of the scientific picture of the world based on the learning process in the human spiritual knowledge (scientific, philosophical, religious, aesthetic, etc.);
- see the multidimensionality of the world and the diversity of systemic linkages causing that multidimensionality;
- use a system of categories of dialectics in understanding the laws of its development;
- critically evaluate empirical evidence practiced methods to predict a long-term results of their decisions and actions;
- reflect upon and revise the way of their actions and the principles of justification of this method ;
- see and correctly determine the measure of freedom and responsibility of researchers in the scientific search.

Research focus of the educational process principle establish a methodological and theoretical framework for the study as a result of professional competence of methodical preparation of students and the quality criterion. The organization of research activities students should be directed to multilateral research world with a support for the development of universal cultural values. It promotes familiarity with the humanistic approach to science to examine it through the prism of the human person. This provides a deep connection with the tendency of the principle of humanization of the educational process [4].

Professor give a research project and students are begin project and promotes its course by asking questions to the professor. Professor must ensure that the group is going according to the project plan and discusses sufficient material expended in the period. With a suitable frequency (perhaps once every question from the list of questions, or at the end of each question), students draw conclusions, summarize the discussion, the preliminary results and make the changes. Students are listen to others and professor then explain it in they own words. The original speakers should correct his / her interpretation. Student tries to match the current discussions and communications with previous topics or course as a whole.

Student research activities means using roles:

- Master under the group research: this student is responsible for the final preparation reliable and complete project, its presentation, meeting all technical and formal requirements of the professor.

- Researcher: this student or group of students a preparing all work that was given by Master for the project. They are responsible for the technical aspects of the report or project, the conclusions of the work done, its weaknesses and ways to improve it.

- Technical writer: this student is making notes on the process of preparing the project and is responsible for the information and its sources used to prepare the report and coordinates and distributes parts for all participants. The role can be combined with validation used in the project, a source of information, figures and tables for readability and correctness.

Master make a plan of the research project, trying to take into account the temporary regulations, distributes and provides jobs to the decision of the research topic, manages the ongoing discussion, resolves disputes between the project participants, provides the necessary theoretical discourse in case of questions to solve problems, etc. Students are written two essays-reflection devoted to the results of the project and their reflection on the system of knowledge of the individual and the group. Essay have to questions leading the project with teacher topics related to a deeper understanding of the material covered at the course. Typical project plan for students is:

- collection of scientific-theoretical and methodological material relevant to the problem at structuring the conceptual apparatus to determine the conditions for carrying out the experimental work;

- making discussion, observation, interviews , questionnaire, etc.;

- conducting formative phase of the project, the purpose of which is to find effective ways in the context of the chosen topic and search for ways to develop the desired qualities of the students;

- making improvements in the project.

Professor is familiarize oneself with the project plan including assignments for students and presentation of the project. Ranked correctness and completeness of coverage of the topic, the acquired knowledge and skills He evaluates the activity and participation in the project of each member of the group, proposes assessing the effectiveness of implementation roles as well as estimates for the solution of problems, reports, essays, etc. The main point is that the evaluation exhibited professor should include a reasoned justification and students are able to improve their marks by remake the research. professor prepares table estimates and collects impressions project participants of their contribution according to the results of the research. The table or portfolio [5] is consist of time limits and maintenance plan project, evaluation activity / participation in the project each of the participants with the rationale, preparation table feedback. Professor should focus on the problems and shortcomings of the project prepared by the leading themes and disclosure, ask questions, formulate lack of coverage approach, method or solution, cover the application area and the limitations these

methods, concepts and theories. It is recommended to use the Socratic method of discussion [6].

The training of the future technical specialist in university in the sphere of science, education and high technology have to use the educational environment organization. That environment provide the scientific research as a lifestyle. High material and technical base, multi-level scientific and social partnership, systematic coordination support by professor or supervisor and other are necessary for that creative environment. It permits students to prepare educational scientific projects. If the student does not accept in any way involved in the project it becomes difficult to inculcate him to the scientific culture.

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THE APPROACH TO THE CONSTRUCTION OF THE SCIENTIFIC CONFERENCES ORGANIZATION SYSTEM

Shiryayev, O.V.

Ufa State Aviation Technical University

This article discusses an approach to construction of the system organizing scientific conferences. Are the main features of the developed system allows to reduce the cost of managing paper documents.

Keywords: information technology, science, conferences.

Organization of scientific and educational conferences is an important part of the learning process and research university. Conduct a serious scientific effort enhances the prestige of higher education makes it possible to establish new contacts and cooperation. Automating the process of organization of scientific conferences is an urgent task. Automation objects are the business processes related to the conference (registration applications of the participants, review and selection of reports, creation and publication programs and conference proceedings, etc.).

System organizing scientific conferences are class content management systems (CMS – Content Management Systems). CMS used for the organization and the process of creating and managing text and multimedia documents. Requirements for CMS systems and organizing scientific conferences presented in [1].

The most part system the organization of scientific conferences are designed for the following tasks:

- automation of work conference organizers;
- improve the quality of information support conferences.

The scientific work has been developed and implemented a system of software registration papers of the conference [2] with an ergonomic user interface that allows the participants and organizers of the conference to get the necessary information with minimal effort. For the development of this system was selected bunch PHP, JAVA and MySQL.

This system provides for three categories of users:

- system administrator – the user, providing technical support for the system and carrying out work with the system at the server level;
- administrator – the user to operate the system in a mode of viewing and editing, providing reports;
- user – a user working with the system when viewing the information, reports, and fill the application form.

User category «system administrator» must have knowledge of the operating system Microsoft Windows NT 4.0 Server, Software Microsoft Internet Information Server 4.0, Microsoft SQL Server 7.0, Microsoft Exchange 5.5, as well as knowledge of the protocols TCP / IP. Members of categories «administrator» and «user» must be able to work with the program viewing World Wide Web (browser).

Category «user» has access to the following modes (fig. 1):

- mode «registration»;
- mode «system statistics»;
- mode «registered participants»;
- mode «registered participants by sections»;
- mode «participants did not register in the system».



Fig. 1. User control panel

Registration mode used for entering data about the scientific work (fig. 2). After filling in the appropriate fields is attached work and send it to the server (fig. 3). Script send articles to the server assumes automatic renaming file name with Russian letters to the Latin alphabet.

[данные об авторе(ах)]	
Фамилия, Имя, Отчество - если авторов научной работы несколько, УКАЗАТЬ ЧЕРЕЗ ПРОБЕЛ например: "Иванов Петров"	
Название работы	Подсистема мониторинга оценки знаний студентов в балльно-рейтинговой технологии
Название секции	1.Современные проблемы проектирования и эксплуатации двигателей и энергетических установок
Фамилия	Шевцов Ширяев
Имя	Александр Олег
Отчество	Игоревич Валерьевич
Домашний адрес	450000, Российская Федерация, Республика Башкортостан, г. Уфа, ул. К. Маркса, д.12
Факультет	ИНЭК
Группа	Аспиранты 2-го года обучения
Контактный телефон	+7-962-530-29-30
E-mail	yeter-dead@mail.ru
[данные о научном руководителе]	
Фамилия	Мартынов
Имя	Виталий
Отчество	Владимирович
Учёная степень	д.т.н.
Учёное звание	профессор
Должность научного руководителя	зав. каф.. ЭИ
Место работы научного руководителя	кафедра ЭИ

Fig. 2. Data entry window for scientific work

Mode «participants did not register in the system» has the function of multi-criteria selection records (fig. 4). This mode displays the data on participants committed one of the following errors:

- made a mistake in the registration form;
- after registration in the system the article was not sent.

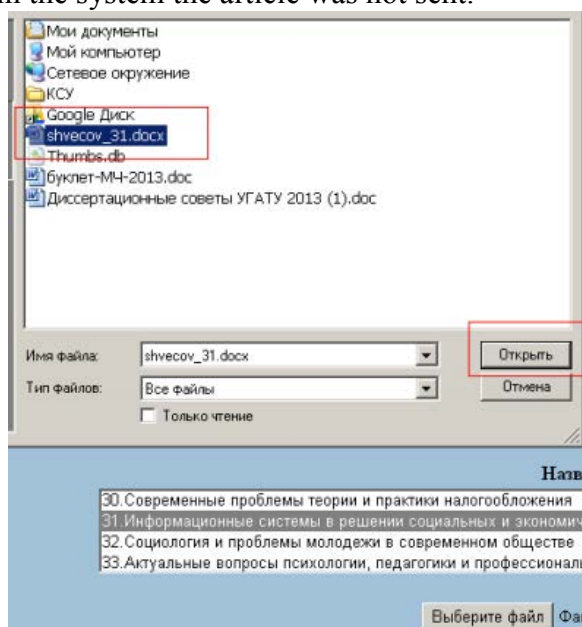


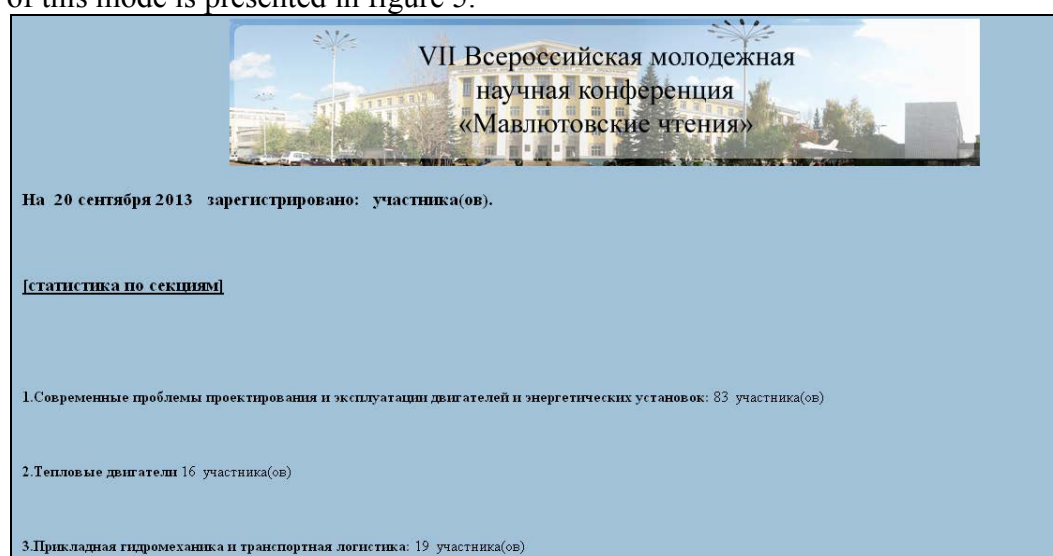
Fig. 3. Submitting articles to the server



Название работы	Название секции	Статус работы	Фамилия	Имя	Отчество	Факультет
Исследование химического состава и структуры образцов сплава АК4-1	15 Наноматериалы и обработка металлов давлением	при регистрации допущена ошибка	Искандарова	Индира	Рифатовна	ФАТС
Анализ Российских фондовых бирж	18 Актуальные проблемы финансов и банковского дела	при регистрации допущена ошибка	Игнатъева Карповский	Дарья Роман	Борисовна Витальевич	ФИРТ
Противодействие коррупции и экономическая безопасность	18 Актуальные проблемы финансов и банковского дела	при регистрации допущена ошибка	Сайфутдинова Хамматова	Алина Диана	Эдуаловна Радиковна	ФИРТ
Оценка инновационного потенциала	27 Конкурентоспособность и инновационное развитие	при регистрации допущена ошибка	Должиков	Сергей	Александрович	ИНЭК

Fig. 4. Mode «participants did not register in the system»

Mode «system statistics» shows the number of registered participants in sections. The interface of this mode is presented in figure 5.



На 20 сентября 2013 зарегистрировано: участника(ов).

[статистика по секциям]

- 1.Современные проблемы проектирования и эксплуатации двигателей и энергетических установок: 83 участника(ов)
- 2.Тепловые двигатели 16 участника(ов)
- 3.Прикладная гидромеханика и транспортная логистика: 19 участника(ов)

Fig. 5. Mode «system statistics»

Search for articles and data about the participants of the conference is carried out by the administrator. The system generates a list of scientific articles based on multi-criteria selection. Search result appears in a list. The list consists of: title of the article, section, data about the participant, data about scientific adviser and the brief summary of work (fig. 6).



Введите параметры фильтрации. Несколько параметров вводите через "пробел"

ИД	Название работы	Название секции	Статус работы	Фамилия	Имя	Отчество
2	Выявление последствий глобальной компьютеризации при анализе ассоциативных полей	34. Языковая коммуникация в образовательном пространстве технического вуза	работа находится в рассмотрении	Навалихина	Адель	Исмагиловна
3	Модельно-методический инструментарий обоснования управленческих решений в коммерческом банке	28. Актуальные проблемы управления финансами	работа находится в рассмотрении	Абдюкова	Элина	Ильдаровна
4	Исследование алгоритмов вычисления контрольной суммы сgc	16. Вычислительная техника и защита информации	работа находится в рассмотрении	Мыцко	Евгений	Алексеевич
5	Совершенствование системы управления оборотным капиталом	28. Актуальные проблемы управления финансами	работа находится в рассмотрении	Багаудинова	Гульназ	Римовна
6	Совершенствование системы управления оборотным капиталом	18. Актуальные проблемы финансов и банковского дела	работа находится в рассмотрении	Багаудинова	Гульназ	Римовна
7	Система автоматизированной обработки данных по публикациям сотрудников университета	31. Информационные системы в решении социальных и экономических задач	работа находится в рассмотрении	Швецов Ширяев	Александр Олег	Игоревич Валерьевич

Fig. 6. Mode «articles search»

Articles conference registration system is implemented and operates at USATU by address <http://www.smus.ugatu.ac.ru/mavlutov/>. Implementation of this system allowed: to increase the efficiency and reliability of obtaining information, compile statistical reports, increase employee productivity by automating work and reduce time spent on routine operations. In the future we plan to automate the following business processes: the formation and publication of the conference program, the formation and publication of the conference proceedings.

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SDR TECHNOLOGY FOR EDUCATION IN FIELDS OF RADIOPHYSICS AND RADIO ENGINEERING

Ananin, A.A. *, Dubatov, A.V. **, Krivozubov, P.A. *

Moscow*, *Novosibirskk, National Instruments*

Software-defined radio (SDR) is a radio-telecommunication platform that consists of software-controlled programmable hardware that can be tuned on an arbitrary carrier frequency and receive modulated signals of different types. Use of the hardware-software platforms with SDR technology makes possible to create laboratory seats for practical (in fields of radiophysics and radio engineering) and research works with the same hardware. All parts of such laboratory complexes can be configured and controlled with a unified software, which design provides functionality extension and laboratory development for new experimental and educational tasks.

Key words: SDR, FPGA, FPLD, PXI, PXIe, programmable radio, LabView, HF, SHF, RF.

The increase in number of used radio protocols, followed by complication of both prototyping tasks and implementation of multifunction and multistandard systems resulted in software defined radio widely implemented in certain applications, namely, cellular services, radar, and tactical communications.

Software-configurable system is a radiocommunications installation with its major hardware components software-based.

Such hardware components can be filters, amplifiers, modulators or demodulators. Since these components are fully customizable software, it is possible to modify such a system without any significant changes in the hardware configuration.

When using SDR virtually all signal processing is performed by software, which can run on a digital signal processor or quick-operating FPLD with special DSP-application. This approach is aimed at establishing of systems able to both send and receive almost every RF signals with any types of analog or digital modulation [1].

Due to its parallelization and real-time performance FPLD is mostly used for digital signal processing. While designing their projects National Instruments Company actively uses most advanced technologies based on FPLD, supplementing them with a wide range of libraries and solutions for programming with LabVIEW FPLD [3].

The application of software-defined radio allowed to prepare lots of laboratory works in various fields and programs in “radiophysics” and “radio engineering”. Table 1 presents brief descriptions of some of them.

Table 1

Laboratory works and facilities created using SDR technology

Title of laboratory work / facility	Brief description
Wireless technology	The standards studied include Bluetooth, EDGE, GSM, WiMAX, WLAN, as well as measuring methods for main parameters of such signals.
Test facilities for radio components	The laboratory facility enables practical studies of the basis of building, transmitting, receiving and analyzing main characteristics of SHF signals with either analog or digital modulation, as well as parameters and operation principles of radioelectronic components.

Basis for HF-signalling	This course enables student to perform practical studies of the basis of building, transmitting, receiving and analyzing main characteristics of RF signals with either analog or digital modulation.
Laboratory-based practical on antenna	The laboratory facility is designed for practical studies on definition of direction patterns of various antenna (i.e. whip, double square wave channel, horn, parabolic, in-phase array antenna).
Universal receive/transmit platform for designing of microwave systems	The platform presents a wide range of possibilities for studying the basic disciplines in designing telecommunication systems, as well as conducting research works.
Radar systems	The laboratory “Radar systems” is designed for laboratory works on such courses as “Radar systems”, «Statical theory of radio engineering systems”, «Radio engineering systems”.

Let's consider more precisely one of the solutions, namely, laboratory “Radar systems”.

The laboratory “Radar systems” is designed for laboratory works on such courses as “Radar systems”, «Statical theory of radio engineering systems”, «Radio engineering systems”.

The laboratory consists of worksites, each equipped with a training set of nodes of the radar system. Students using wires connect the individual nodes of each other, thereby forming the desired type of radio frequency transceiver or tract. Using components of the platform instrumentation enables students to transfer the signal from one or another modulation type and explore conversion and signal generation in the process of transmission and reception, as well as to study the influence of different types of distortion and interference on the transmission quality.

The laboratory facility includes the following laboratory works:

12. Generator and matched filtering for impulse signal with linear frequency modulation (LFM);
13. Generator and matched filtering for impulse signal with pseudorandom phase shift keying (PSK) code Barker;
14. Generator and correlation processing of impulse signal with pseudorandom phase shift keying (PSK) M code;
15. Digital special-purpose processor for incoherent processing of radio impulses pack in surveillance radar;
16. Digital quasi-optimal non-parametric detector with stabilization of the probability of false alarm modified by landmark detector;
17. Digital detector coherent impulses pack against passive jamming.

The complex of laboratory works on studying the working principles of modern radar systems (RS) as well as the included equipment based on simple examples to makes students familiar with the principles of operation, calculation and characteristics measurement for some basic types of radar signals. The complex allows to analyze the functional block diagram of the radar, as well as study their characteristics and parameters. All the laboratory works are presented based on common technical positions and are performed with the help of PXI hardware/software platforms. The workshop is specially designed for students lacking practical training in radio engineering.

The laboratory consists of the teacher's worksite equipped with PC and 10 worksites connected via local network, including:

16. NI PXI modular system including:
17. Ostsillograf, 2 channels, 100 MHz
18. Generator, 100 MHz, 14 bit
19. FPLD unit, Xilinx Virtex-5
20. External switching unit
21. Personal computer with monitor
22. Methodological materials (description of exercises and special software) [2]

As mentioned above, software-defined radio allows to create various systems with software-based functions and no need for replacing the hardware. Besides, the functions of one hardware configuration can be frequently shifted to another one. Thus, the functions of the discussed above laboratory set which used generator and oscillograph with sampling frequency equal to 100 MHz, was subsequently moved to the platform analyzer and microwave signal generator equal to up to 6.6 GHz to create a system for monitoring space debris in near-Earth space. Thus, it is seen that SDR technology allows to use the same algorithms both for specialists training of and further research, as well as effortlessly transfer algorithms use from some frequencies to the others by only replacing measuring modules.



Fig. 1. Student's worksite

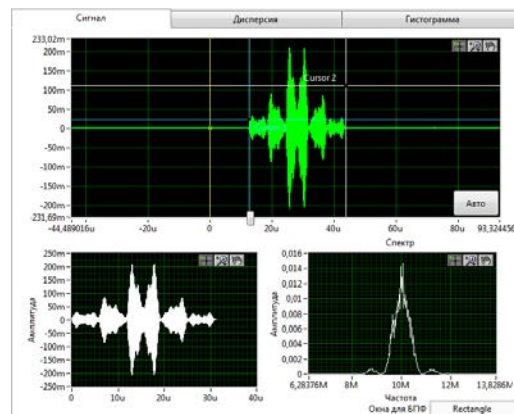


Fig. 2. Example for front panel of software

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THE ROLE OF DISTANCE LEARNING TECHNOLOGIES IN THE INFORMATION SPACE OF PEDAGOGICAL HIGH SCHOOL

Yarikov, V.G.
Volgograd VSSPU

The features of organization of information educational space of the multi-level pedagogical University are analyzed. There is also described approaches to software distance

learning for using the whole spectrum of modern information and communication technologies in the implementation of a variety of learning activities.

Keywords: digital educational resources, information educational space, information support of the educational process

In development of human potential the most important role, of course, belongs to Education. Pedagogical high school graduate is going to enter the world of today, with the stock of knowledge that meets the needs of the workmarket, economy, social-cultural interaction between people and, accordingly, use the latest achievements of science.

Consequence of rapid informatization of society was the general crisis of the education system. The need to modernize the content and structure of teacher education at the moment requires a significant widening of the scope of information activities of the university. In a place with that, the paradigm of pedagogical science, the structure and content of learning theory are changing under conditions of informatization of education (AA Andreev, Brazovsky KS, Demkin VP, Kaplan SL, Lobachyov SL, ES Polat, Soldatkin VI, Timkin SL, Karpenko MP, etc.).

Changes in the system of higher education goes far beyond the local changes in the organizational and methodological aspects of the training, the content of individual units of the educational process. They affect all educational space of pedagogical high school, a feature of which is interaction of research and educational processes. New educational technologies participate in the redistribution of educational resources from traditional subject teaching in research activities using the information sphere, stimulating changes of value and meaning, and system characteristics of activity of subjects of educational process.

For Volgograd State Social Pedagogical University as for many other higher professional educational institutions priority tasks today are well grounded implementation in the learning process of modern educational information resources on the basis of telecommunications and distance learning technologies (DLT), as well as teacher training, able to effectively use them in the learning process.

Introduction of distance learning technologies in the information space of Volgograd State Social Pedagogical University allows to expand the potential student audience improve the quality and accessibility of education, which is important in today's educational world. The emergence of powerful multimedia computer systems and interactive computer programs allow students to create educational-methodical complexes accompanying the learning process at a high level, and that influence the intensive development of distance learning (DL).

Solution of educational problems in the modern world of information requires a much higher professional qualifications of university teachers than it was in the traditional system of higher pedagogical education.

To solve these problems it requires understanding, analysis and search for ways to develop a multi-level system of teacher education, which implements training bachelors, specialists, masters. Educational process using DLT has the ability to remotely support as full-time and correspondence courses. Distance education technologies considered in this model, not only as a technology to support the cognitive process itself, but also as some dynamic tool to increase the mobility of participants in the educational process, as well as comfortable and productive labor of university teachers.

Analysis of innovative projects of modernization of the education system allowed to give a definition of information educational space of Pedagogical University as a collection of databases, data banks and knowledge, technologies in their use, specialized software to implement and support the educational process, telecommunications and networks

functioning on the basis of uniform principles and general rules that provide information between subjects of pedagogical high school and employers.

The information space of the multi-level pedagogical University is a complex of five complementary automated information systems such as:

- information system for remote support of educational process in multilevel Pedagogical University - the basic level of the first higher education, complete higher education, the level of post-graduate, doctoral and support of continuing education;
- information system for support of scientific research;
- organizational and legal system: the administrative control, the educational process, the legal support;
- system of information and technical support, and in particular the system of access to the information space of Pedagogical University;
- information system for social support for students.

The term "distance education technologies" is used for pedagogical technologies aimed at the inclusion of technical means to work with the information (information educational resources).

For Pedagogical University distance education technologies is educational technology-mediated communication using electronic telecommunications and didactic tools. Thus under didactic means of distance learning we understand materials, methods and techniques of teaching, forms of teaching and learning activities, taking into account the limited communication with the teacher and implementation of feedback mode on-line and off - line.

In Volgograd State Social Pedagogical University, as in other higher professional educational institutions it is virtually undeveloped a number of problems such as designing the structure and content of the information space for the implementation of the multilevel higher education.

The greatest attention is paid to realize three basic information requirements in creating information resources for teaching - it's integrity, reliability information, readiness (information and appropriate technology should be available to users without the limitations of time and space), confidentiality (provides gradual mastery of a set of necessary knowledge for a subject).

At the same time, informatization of university gives necessary social and economic impact, provided that the information created and delivered facilities and technologies will not by foreign elements, and will be naturally integrated into the educational process of pedagogical University.

Solving these problems in walking in the university information and educational space is provided in the implementation of the following requirements:

- connecting to computer networks, information banks;
- priority of the development and implementation of information technologies and training facilities and educational purposes;
- creation of information and educational space of multilevel pedagogical university.
- system integration of information facilities and technologies;
- information support of the educational process by new information technologies.
- the gradual formation of an information resource (simultaneous and comprehensive university informatization sometimes is impossible for economic reasons);

In Volgograd State Social Pedagogical University at the initial stage the main tasks of implementation of education and information model were:

1. introduction of information and communication technologies in teaching and activities of university;

2. organization of effective interaction between educational institutions with the Internet resources;
3. development of a regional component of educational information resources;
4. provision of services for distance learning (networking courses and seminars, teleconferencing, remote support of the educational process, etc.);
5. providing specialized courses, seminars with using network technologies in the training high school teachers and the development of modern hypertext technologies;
6. training and support of users in a telecommunications network.

The use of computers for education and development DLT was the beginning of creating a specialized software functionality supported implementation of educational tasks in information and educational space of University.

However, the desire to master and use the information technology in education can move away the basic idea - to set the target understanding of the logic of the educational process (through the principle of systematic vision of the information space of the university), and be the basis for the construction of this space.

At each stage of designing information space it must be claimed and combined various disciplinary and interdisciplinary modules. We are talking about the possibility of having the choice of combinations of different kinds of knowledge: mathematics and sociology, management and psychology, etc. The use of such modular programs is possible at the undergraduate and master's level. Thus the solution of this problem involves the need to create a specific structure of information space in the university characterized by accessibility, scientific and educational logic.

In the process of entering University in informational and educational space it is taken into account a necessary educational support those who are facing with learning difficulties using distance learning technologies.

The structure of pedagogical support distance learning education is seen as a process of information exchange and disclosed through the external factors influencing the interaction. Sources through which implemented information support in education are bank university pedagogical information, scientific and methodological foundations of faculties, departments and offices of the university, scientific and pedagogical university library; official information of higher education management. Network Internet in this process plays an important role and can cover a large number of students .

All possibilities of the remote support are used during creation of information and educational space in University. This is, first of all, access to information and educational resources, tutorials and test systems in computer training classrooms, as well as access to education resources from students' work places. Distance learning provides an opportunity for consultation mode and chat in the forum, the possibility of exchange of emails between the teacher and students. Particular attention is paid to the intermediate and output testing to prolonged monitoring of the quality of educational services; control and evaluation of students knowledge and learning efficiency.

Currently, science gives a variety of approaches to software distance learning. For the best orientation in the information space we have defined and systematized modern software tools, which can be divided into information educational resources, programs for the providing of distance learning courses, programs for the educational process, the system for distance learning.

In this regard, there is a need to undertake a comprehensive analysis of each item of software information and educational space of Pedagogical University.

Information Learning Resources (ILR) serve as textbooks, reference or control systems (online courses, e-books, encyclopedias, etc.). ILR can be divided into two groups:

information sources, which are understood as the whole set of different materials in a digital format used in academic work - text, static and dynamic images, animated models, etc.; tools (software), providing work with information sources and methods of delivery.

More valuable and informative sources can be represented as follows: distance-learning courses and training programs, trainers, officials for processing and fixing technical problems for monitoring programs, training database.

Distance training courses and computer training programs are program-methodical complex for self-study, which helps not only to acquire new knowledge, but also to acquire the knowledge and skills to work with information, and to fix self-acquired knowledge. Complex should contain structured text description of the contents of the course, definitions, tasks, illustrations, audio and video materials, exercises, tutorials, a glossary, links to additional sources of information, addresses (email address, regular mail address), as well as phone numbers of all participants in the educational process (tutors, other students, office organization, providing educational services, technical center, etc.). Computer training programs combine the properties of the usual textbook, reference book, the book of problems, laboratory practice. Program-methodical complex should allow to study the course, using only data allowance and its affiliated software, the instructions for using the software must be given in the text.

Simulators are used for processing and fixing technical skills of solving problems. Working with simulators allows you to get skills in drafting, models of organization of psycho-pedagogical experiment. Pedagogical requirements for simulators are: access to theoretical knowledge, except for the control part, the presence in the simulator mode all possible solutions, the ability to determine the pace of the student himself.

Program for the development of distance learning courses and computer training programs, that are instrumented systems, object-oriented environments, such as Web pages editor Microsoft FrontPage, a word processor Microsoft Word, Delphi, Corel Draw, etc, as well as specialized software for creating and managing distance learning courses Moodle.

Programs to ensure the educational process include programs for e-mail (Microsoft Outlook Express, The Bat), electronic document (e-mail, document, database, etc.), as well as programs viewer (Microsoft Internet Explorer, etc.). Programs of connection are due to providing the educational process: the sending of various educational information, communications with the teacher and students together, conducting group sessions, discussions (using, for example, Internet Real Chat). Programs electronic document provides e-dean's office and the other offices.

Systems for distance learning - integrated software packages organised activity of Distance educational institutions from schools to virtual universities. An example of such system can be NetSchool (integrated information system for the modern school), which can effectively solve the administrative tasks and maintain current educational process, establish operational communication between all stakeholders. Distance Learning System "Prometheus" allows you to build in the Internet or Intranet Virtual University and conduct remote training a large number of listeners, while automating the entire training cycle - from receipt of applications to reach the final extradition certificate.

Thus, programmed distance learning software solves such scientific and methodological goals and objectives, as differentiation and individualization of the learning process, the implementation of feedback, training and self-study student, diagnosis of learning outcomes, strengthening the motivation of training, the formation of information culture, modeling and simulation of the investigated facilities and processes.

All software tools are designed to support the student in mastering the necessary information. Education based on distance learning technologies means to assimilate the material in his logic and interconnection; provides autonomy, consciousness and an active

position of the student, independent actions of educational information retrieval, ensuring mastery of the material strength involves the development of skills of self-control and self-regulation. Requirement of interactive dialogue enables choices of content educational material. The requirement to provide feedback involves getting trained, guidance, advice, promotions, etc.

Since the software is transmitted distance learning training functions, each program must conform strictly didactic principles : providing scientific content (should provide scientific and reliable knowledge) the availability of the studied material (correspond to the level of training of trainees); adaptability (to implement an individual approach to the student) ; sequence.

The main didactic requirements for distance education software are:

- implementation of didactic conditions of introduction DL;
- organic entry into the information space of the university;
- ensuring the right direction when learning;
- using technologies that integrate students and not isolate them from each other and provide better individual support;
- taking into account the different levels of preparedness of the trainee;
- definition of the role of tutors and student, as well as the introduction of new ways of processing information and training delivery methods and other information.

The most significant difference distance learning from the classical sample form is the lack of direct contact between teacher and student as well. It loses a significant part of the necessary information for transmission, emotional contacts. Then it is very difficult to regulate the supply of material depending on the individual abilities of students. In addition, DL provides additional physiological load, such as a prolonged visual concentration, hazardous pulsating screen monitor, disrupt the visual analyzer; student forced posture, causing static spine; monotony process. All of the above and more lead to overvoltage sensory systems.

In turn, for most people, students in the system, it is the only option for education, if for different reasons full-time education is beyond their reach. Distance learning educational technology allows independently establish the duration of study of material, to choose for entry into the teaching process a convenient time, so to have the opportunity to stop and think about the most important moments, or quickly get the necessary support. From this perspective, the remote system can improve the quality and accessibility of education and lets you upgrade the educational process at the Pedagogical University.

System of professional teacher education now actively uses qualitative digital educational resources (DER), which together with the use of telecommunications and DLT, in practice allow the following:

1. use various options curriculum planning, which have a modular structure;
2. provide a new quality of education through the DLT;
3. provide the organization of training activities with their wide use forms of an independent group and individual research activities, forms and methods of the project organization of the educational process, to strengthen the independence of the training of students, create self-skills, self-development, self-improvement, self-realization;
4. use the whole spectrum of modern information and communication technologies in the implementation of a variety of learning activities, including such as the registration, collection, storage, information processing, interactive dialogue, modeling of objects, phenomena, processes, functioning laboratories, etc.;
5. objectively diagnose and assess the level of preparedness for specific classes on subjects through the use of a set of tasks (such as training and diagnostic nature),

- focused mainly on innovative ways of solutions in accordance with the requirements of state educational standards;
6. provide multilevel study material for differentiation and individualization of learning, to offer learning activities that guide students to gain experience in dealing with life (including domestic) issues based on knowledge and skills developed in the framework of a specific subject;
 7. manage the learning process of students adequately to their level of knowledge, skills, motivation, taking into account the peculiarities of psycho-pedagogical features and the existing differences in the cultural experience of the target group of students;
 8. promptly provide teachers and students with timely information relevant, consistent with the objectives and content of education, provide access to databases for educational purposes of the institution;
 9. create a framework for continuous and rapid communication of teachers and students, aimed at improving the efficiency of learning.

The use of new information technologies must be pedagogically appropriate. Therefore, the foreground it is necessary to put the corresponding substantive content of training courses and educational services, not only the introduction of information technologies. This requires different working methods based on remote communication, including the mode of deferred response, specific information and methodological support, software and tools that facilitate the creation and use of educational information resources. Information technology changes the way of delivery of educational material, traditionally carried out during direct communication between teacher and students. The teacher has the ability to:

- receive information about the educational programs offered by the university;
- view lists of groups in which classes are held in the discipline;
- keep in touch with students via forum, chat, private messaging system or e-mail;
- fill a library of electronic educational resources;
- keep a log of student achievement,
- leave all the necessary information on the site.

In this case the teacher can only work with those groups, classes in which he currently leads.

Students are grouped together for convenience, but it is possible and individual training. Set of courses studied a study group may vary depending on the chosen path of learning. Number of students in the study group is not limited. Methodist responsible for the learning process is attached for each group for teaching and leading training courses. Learner is able to:

- familiarize themselves with the content and curriculum of educational programs;
- choose individual learning paths, form the curriculum of the proposed modules.
- download or engage interactively with electronic educational resources necessary to study in their chosen program or course;
- view schedule, and messages left by teachers and supervisors on the bulletin board;
- get information about their classmates and teachers, and, if necessary, to send any of them a private message in the system, or by e-mail;
- chat forum and chat mode with teachers and classmates;
- undergo intermediate or output testing;
- access the monitoring system.

One of the main features of distance learning technologies is that Learning occurs by using a variety of individual forms of work - from video lectures, self-study textbooks specially designed, knowledge through educational computer programs with feedback - to

various active learning methods (business and operating games, discussions, etc.), in which the interaction of students with teachers based on the study of the most important and complex issues of educational material. Methodical provision of distance learning also includes video, audio, laboratory simulators, resources on the Internet, printed text materials, etc.

Students receive much greater opportunities for independent study work. They can use the information educational resources and tools for different ways of working with the "finished" educational information, engage in research, to quickly assemble, simulate studied phenomena using digital tools and laboratory environment; propose and test hypotheses training, to create, to represent and protect the development, showing the results of their research activities.

Modern educational situation is changing infrastructure of educational and research activities of students, so much is the question of training students to use digital books, e-books, essays, research papers and educational sites. Job using electronic technologies is seen as a mean of self-development and self-bachelors and masters.

Prompt communication of teachers and students is also an integral part of distance learning. During this dialogue, students can consult with teachers to discuss with them projects, solutions, evaluation. It also allows teachers to observe the learning material and organize training based on individual approach.

On the basis of specially designed computer software enhanced efficiency and timeliness of monitoring students' knowledge, provided opportunities for learning and self-acquired knowledge, thus relieving the burden on a teacher.

Thus, one of the main directions of development of educational information space is defined pedagogical high school distance education. Information support of the educational process of pedagogical university is determined by the purpose of the educational process, the nature of future professional activity (subject, means and results), and at the same time includes the material conditions that are already available (technical equipment) and are created in the process of information and educational activities (scientific and training and methodological support).

The role of distance learning technologies in the information space of pedagogical high school, is certainly in expanding educational opportunities, and Volgograd Pedagogical Social University attaches great importance to this. The rapid development of information technology in the world is changing self education market and educational environment within which the learning process is realized. Global trends show the future for flexible electronic model of the educational process, which will actively use a variety of modern tools, methods and technologies, including distance remote.

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MATHEMATICAL EDUCATION INFORMATIZATION AND DIRECTIONS OF ITS DEVELOPMENT

Martirosyan, L. P.

RAE Institution “Institute of informatization of education”

The article deals with informatization of the mathematical education and the directions of its development are considered: theoretical basis of mathematical education informatization; methodical systems of the mathematics teaching with ICT; pedagogical-ergonomic conditions of effective and safe ICT use in the mathematical education; standardization of ICT use in the mathematical education; preparation of the mathematics teacher in the field of ICT use in the professional work. The pedagogical purposes of ICT use in the mathematical education are defined: development of person's skills of a trainee during experimental-research activity, cognitive interest development with ICT use; the social order execution of a modern information society at the expense of the trainee's ICT use as the means to improve educational activity, and the research tool in the conditions of the applied orientation of math teaching; mathematical teaching improvement with a help of didactic ICT possibilities realization.

Keywords: Informatization of mathematical education, information and communication technologies in mathematics teaching, complex use of electronic editions of educational purpose on mathematics, development directions of education informatization, teacher training preparation on ICT use, pedagogical purposes of ICT use in mathematics teaching.

The modern period of information society development of mass global communications is characterized by need to modernize the educational system and, above all, the school system as one determinant and long stage in life of every human. That is why the education informatization plays a significant role, providing a transition to a modern system of educational level and training of the younger generation for life in the conditions of information society of mass global communications.

However, in the school system is not given due attention to the informatization of subject areas, including **mathematics education informatization**, by which we mean specifically organized process of scientific and educational, teaching, software and technology development creation and use aimed at achieving objectives of teaching mathematics, in the implementation of the capabilities of information and communication technologies, taking into account the pedagogical and ergonomic conditions for its effective and safe use [5].

Modern approaches to teaching mathematics by means of information and communication technologies (ICT) are considering interests of the individual, the relationship to a person, his creative development as a priority. This is because the purpose of education is to develop a student's personality, the most achievable when using ICT tools [8]. At the same time the most essential for the **individual development** is cognitive interest forming that is particularly evident in the conditions of ICT tools use.

In the works of many researchers [1; 3; 6; 10; 11] the importance of the formation of cognitive interest in teaching for the successful acquisition of knowledge is shown. According to these authors, if the motive is cognitive interest, then involuntary attention and memory, active thinking, the activity is productive and successful, and the deep knowledge and strong. Therefore, the formation of cognitive interest is one of the most important for the **development of individual** student, which is particularly evident in the conditions of ICT tools use.

Expanding the capabilities of ICT use in mathematics teaching, it should be noted that the tools themselves are actively developing. This allows to set the task of preparing school students for their systematic use in daily learning activities that prepare them for future careers in the information and the global mass communication in modern society.

Thus, for the social order realization there must be purposeful use of ICT in learning the basics of science, including mathematics. In mathematics it is, first of all, formation of generalized approaches to the ICT capabilities use in order to find the necessary educational information, processing information about the studied objects in mathematics and their relationships, their modeling, research in the study of mathematical patterns. It is important to emphasize here that students should be able, where appropriate, to develop and apply skills with use of ICT in mathematics learning. All this allows to establish some importance and need to identify aspects of the ICT use in mathematics learning.

In the traditional methods of teaching mathematics perception of still images of geometric shapes in the form of pictures and drawings, graphs, functions, geometric interpretations of the various mathematical laws, as well as their model does not provide adequately understand the essence of the object or process, formation of spatial representations. ICT didactic opportunities enhances the quality of the mathematics learning process [8, p. 13]. For example, the ability to visualize the training material is one way to improve the quality of student learning and development of their academic achievements [8, p. 186]. The teaching material, based on the visualization of processes and phenomena, mathematical relationships, the objects of study, the student creates a memorable visual image, promotes awareness of perception, increased research activities. Visualization of the studied patterns, objects and their relations in conjunction with an interactive dialogue (the user interaction with the information system, which is characterized, in contrast to the dialog, use of more advanced means of dialogue and choice options for the contents of educational material, mode of operation [8, c. 182]) activates the process of perception and understanding.

It should be noted that the use of the Internet distributed information resources has a significant impact on the quality of learning mathematics. The process of teaching methods, scientific, educational and scientific-organizational work is carried out at today's level, which implies the use of Internet resources and information databases of scientific and educational, research, development, regulatory and legal documents in the field of education with the ability to provide this information for direct access not only each employee to the school, but parents and students.

Thus, the pedagogical goals of the ICT use in mathematics education are:

- development of the individual student by student initiation to experimental research, formation of cognitive interest in the use of ICT tools;
- realization of the social order of modern information society by familiarizing the students to use ICT as a tool that improve the training activities and research tool in the implementation of application oriented mathematics teaching;
- improving of the learning process quality through the implementation of mathematics teaching capabilities of ICT.

Considering the issues of mathematics education informatization, we note that some experience with the use of electronic tool of learning purpose (ETLP) in teaching mathematics. However, we note the lack of implementation in the teaching of mathematics ETLP potential of ICT: providing immediate feedback between the student and teaching tool; operating on the basis of information technology (IT); the ability to handle large amounts of information over short periods of time; a visual representation on screen of the studied objects, processes, both as models and as a geometric interpretation (charts, graphs, tables, etc.); archiving large amounts of information in databases and data banks, their transmission and processing, automation of processes computing, information retrieval activities, data

processing educational experiment, process automation control results of assimilation. In this regard, the organization of teaching mathematics using appropriate ETLP integrated use, which is defined as an interconnected, the combined use of different components ETLP aimed at organizing and implementing training activities for the collection, storage, processing, transfer of educational information presented in the audio-visual, graphic, text form, automation control and self-learning outcomes for the solution of educational problems, including those adapted to different levels of training students. In this case the selection of components from different ETLP in mathematics for use in the learning process should be implemented to meet the requirements for their pedagogical and ergonomic quality.

To implement specific teaching objectives of teaching mathematics the specialized software (Mathcad, Matlab, Mapl, Mathematica, etc.) is used, it provides an opportunity to: run builds on the screen (including dynamics) of mathematical objects, function graphs, diagrams, describing the dynamics of studied the laws, create screen images of geometric objects and their dynamic presentation, automate processing information-search activities.

The potential of the Internet distributed information resources influences on the content, methods, organizational forms and the quality of mathematics teaching. In this context, it becomes advisable to use resources for learning mathematics.

In modern conditions the availability of a wide variety of applications and software tools math teacher is able to use them in the process of author's applications development for the solution of particular educational tasks.

However, the lack of elaboration of methodological approaches to the ICT didactic opportunities use in teaching mathematics should be noted.

The abovementioned defines the need for development of the methodical system of teaching mathematics using ETLP, specialized software, Internet distributed information resource, author's applications in mathematics, which is one of the direction to promote the mathematics education informatization.

Speaking about the feasibility of using ICT in teaching mathematics, we mention the need for pedagogical and ergonomic conditions for the effective and secure their applications [2]. The use of ICT in the mathematics teaching should be done in terms of a specialized classroom, equipped with a set of educational computer equipment that meets certain psychological, pedagogical, technical, ergonomic and physiological-hygienic requirements. In addition, this classroom must be equipped and certain types of training equipment, paired with the PC. For example, in the study of mathematics appropriate to the presence of: a document camera to project an enlarged image on the screen of mathematical objects, objects, figures, submitted to demonstrate, a digital camera to photograph the real world, which will be offered to the student as a reference for comparison with different mathematical objects (for example, to compare different architectural configurations with geometric shapes), a tablet that can be used in mathematics lessons a student to perform various tasks, drawing, drawings electronic pen and send them online teacher. One of the most popular tools for the organization of group and collective forms of learning is an interactive board, whose software allows you to enhance learning activities in mathematics lessons.

Thus, the next direction for the development of mathematics education informatization is creation of pedagogical and ergonomic conditions of safe use of information and communication technologies in mathematics teaching.

It should be noted that the implementation of ICTs for the development of meaningful lines of learning mathematics is appropriate for their systematic application. In this regard, a need to develop standards for student use of ICT in the process of learning mathematics, as well as the development of standards in the ownership of a mathematics teacher with ICT facilities for use in professional activities. The standard in the use of ICT must be defined the requirements for computer equipment, tools, information used in mathematics education, to

knowledge, abilities and skills using ICT tools in teaching mathematics. This determines the next direction of development of mathematics education informatization - the standardization of ICT use in learning mathematics.

The modern period of informatization of society and education determines the appropriate level of information security issues of the educational process based on the use of local resources and global information networks. In this context it becomes relevant training of mathematics teachers in pedagogically appropriate ICT use in teaching mathematics and information communication in the functioning of local and global computer networks, realize the potential of distributed information resources of the educational purpose. For the successful development of meaningful lines of mathematics there requires training of mathematics teachers in the organization of educational process in terms of informatization of education, including teaching practice using ICT tools in teaching mathematics. The electronic edition of the educational purpose, including realized in the networks, is now one of the most popular means of education and used in the practice of teaching and mathematics as a school subject. This determines the necessity of knowing the mathematics teacher guidelines development and use of electronic educational purposes, to assess their relevance in content and methodology. In connection with the possible negative consequences of using ICT tools required training of mathematics teachers in the pedagogical and ergonomic conditions of the safe use of information and communications (including the organizational, psychological, administrative, sanitary and other conditions of employment with the use of ICT).

So, an important direction of development of mathematics education informatization is the preparation of mathematics teachers in the use of ICT in professional activities.

In summary, we note that for the creation of training, software and technological developments in the implementation of the didactic possibilities of ICT in teaching mathematics to develop a theoretical framework of information mathematics education in today's information society of mass global communications.

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MODELS OF VIRTUAL LABORATORIES OF HIGHER EDUCATION INSTITUTION ON THE BASIS OF PRIVATE CLOUDS

Bilgaeva, L.P., Dambaeva, S.V.

Ulan-Ude, East Siberia State University of Technology and Management (ESSUTM)

In article questions of use of private clouds for creation of virtual laboratories of higher education institution are considered. Two models for realization of virtual laboratories and their development are offered: with peer virtual computers, with the dedicated server. Further development of the model is the SaaS level of private cloud.

Keywords: cloud computing, private clouds, models of virtual laboratories.

Introduction. Modern information technologies are an integral component of the educational process of any university. Achievement of good results in training of students possibly in the presence of reliable and safe work IT-infrastructure. It must meet the increasing demands performance and reliability at a constant increase in the volume of information being processed. At the same time put demands to reduce the cost of support and development of it infrastructure and improve its adaptability to the changing needs of the modern University in the IT-resources. The most effective way to meet these requirements is the development of information technology for learning through the introduction of cloud computing. Therefore, more and more educational institutions use the services of "clouds", providing educational services to students and teachers through the Internet. Basically educational organizations use public cloud services the largest IT-corporations such as Amazon, Google, Windows, etc.

The creation of educational services in the public cloud has a number of drawbacks. The university does not own and has no access to the internal cloud infrastructure; not all data can be trusted service provider in the Internet not only in storage but even for the data processing; there is a risk of losing data due to server crash; user loses control of their data, trusting their online service.

These shortcomings of public clouds, caused interest to deploy a private cloud in the university and with it the creation of services that provide educational services to students and staff of the university.

This paper presents some results of studies on the testing of technologies for deploying private clouds and create models of virtual laboratories and their implementation. It should be noted that the market for software products offered virtualization and cloud deployment, but they are not free and the price is quite high (3-10 million rubles). Therefore, studies are conducted on free software, namely: on the operating system, Ubuntu Linux and virtualization platform OpenStack.

Models of virtual laboratories. Currently used application packages are divided into autonomous and distributed. To work in autonomous application packages enough to install a software package on the computer. Distributed software packages mainly based on client-server technology. To work in a distributed program requires a dedicated server computer on which you install the server part of the program and a set of computers on which you install the client part of the program. Accordingly, developed two models of virtual laboratories: with peer virtual machines and laboratory with a dedicated virtual machine server. Virtual

laboratory model with peer machines shown in figure 1, is implemented as follows: create a single image of the virtual machine on which you install the necessary software, such as database MS SQL Server 2008 and Visual application development environment MS Visual Studio. It then creates the necessary number of virtual machines in accordance with the number of users. Each user runs their virtual machine using login and password, which run software installed on a virtual machine image. During the study of the subject the student performs work using the software available on the virtual machine. He has the ability to save the results of in its own virtual machine, making her the structure of folders and files. The teacher can start the virtual machine student at any time, including during the student's work. Users of clouds (students and teachers) can create snapshots - images of virtual machines in order to save your work, executed in a virtual machine.

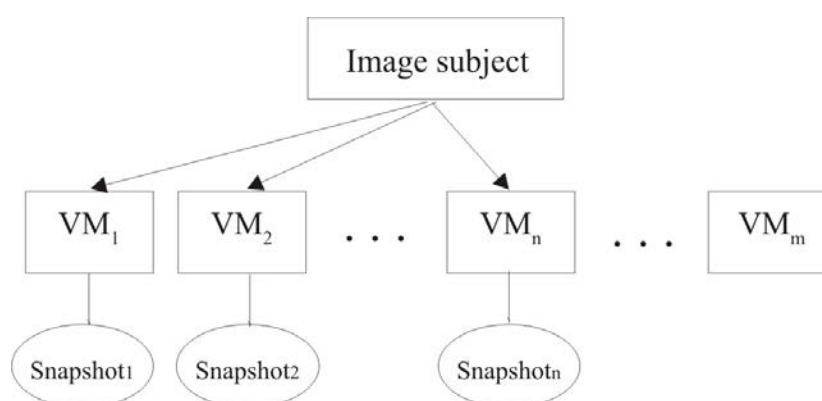


Figure 1 - Model of the virtual laboratory with peer virtual machines

Model of virtual laboratory with a dedicated virtual machine server, shown in figure 2, consists of two images of virtual machines, one of which is the server, and the other - the client.

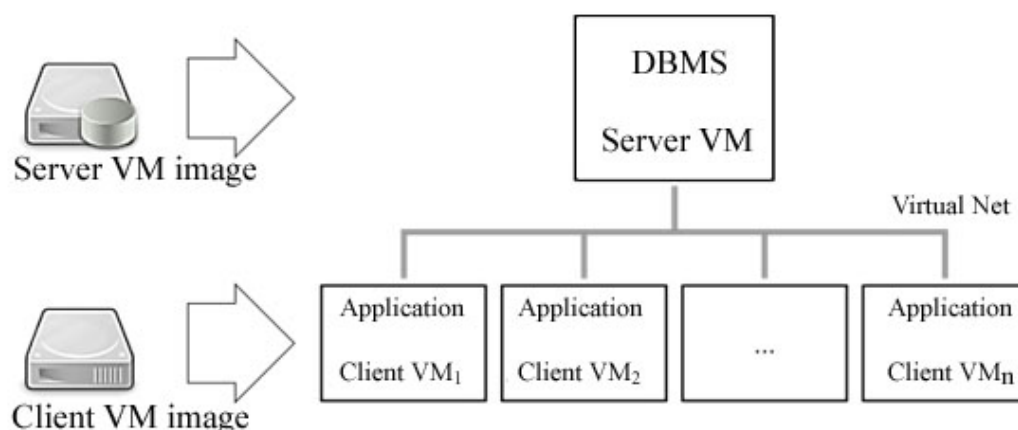


Figure 2 - Model of the virtual laboratory with a dedicated machine-server

For example, installed on the server database, and the client – application. Created virtual machine of users are clients and connected to the DBMS on a virtual network which is supported by network services OpenStack Networking (Quantum). After starting the virtual machine, the user connects application to the DBMS. Virtual machine with the DBMS must be running and available all the time, while the client VM is started by the user. Model development of virtual laboratories is the development and provision of services, provides an

efficient mechanism for storing and accessing personal and public information, input-output and transfer of information. These services represent a level of SaaS private clouds. In turn, SaaS can be divided into the following levels - file storage and web-application, as shown in Figure 3.

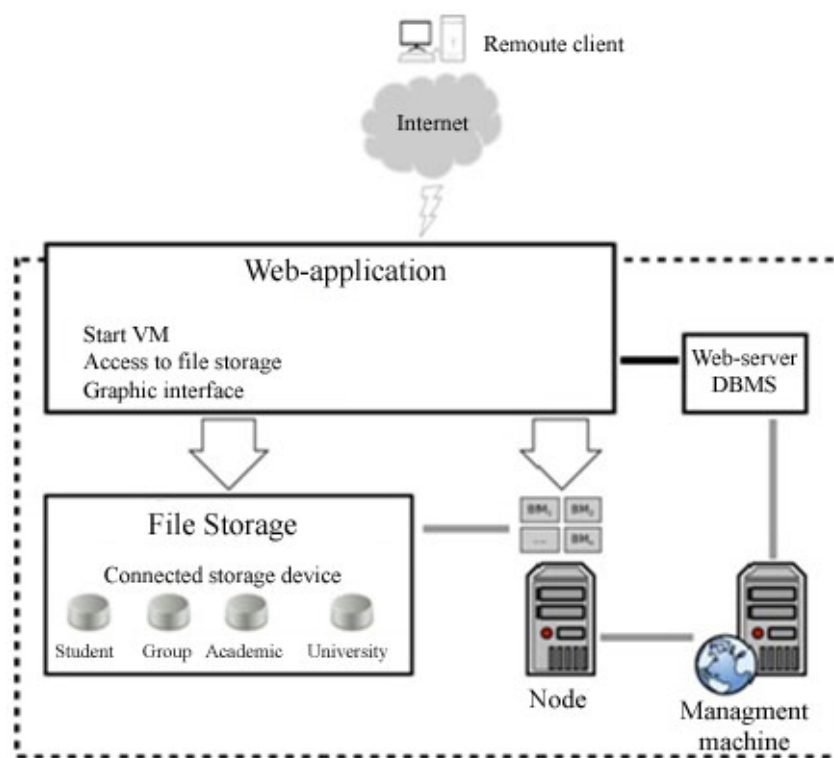


Figure 3 - Level SaaS private clouds

File storage allows distributed storage of a large amount of user data, providing a sufficiently high processing speed and reliability. Data is stored on a storage device called volume (volume), which can be connected, for example, when a user logs into the system. These volumes are supported component of OpenStack Block Storage Service (Cinder). It is possible, together with or separately Cinder use component OpenStack Object Storage Service (Swift) for storing objects - the single continuous vault. Each user has the right to connect multiple volumes - storage of students, teachers, educational groups, departments, the entire university. For each volume, you can set permissions.

Files are stored directly on the LVM-volumes that reside on computers IaaS private clouds. File operations are engaged in the service of components used storage OpenStack. The user can connect the volume, both directly and through the virtual machine.

Another level of SaaS is a private office. After successful login, a user gets a menu, from which it can perform various actions in a private cloud. For example, he can run the desired virtual machines (VMs), hiding unnecessary settings. The user gets access to the file storage and can perform file operations (upload, copy, move, delete, create, view attributes) on connected volumes. In addition, private office provides a graphical user interface for all operations, primarily Remote Desktop interface for the virtual machine.

Web-based application - this CGI-application that is available for use in your web browser and running on the Web server. Database (DB) user profiles, accessing the virtual machine through the web-application connected to the database users in OpenStack Identity Service (Keystone) on the Host. To interact with all services OpenStack has a special API, the

use of which conceals personal account for the user. Web server and database applications can be stored on the physical and the virtual machine.

Conclusion. Organization of training using virtual laboratories has several advantages.

Firstly, the advantages inherent in the concept of the cloud. These include easy scalability and dynamic reallocation of resources consolidated IT infrastructure of the university. This provides the ability to create a large number of virtual labs - for almost every student group in each subject.

Second, when the training is carried out using expensive licensed programs can access them from anywhere where there is Internet access.

Third, solves the problem of compatibility software versions when running on a virtual machine. So, on your home computer can be installed student version of the program is not compatible with that established in the University of display classes. Because of this, he is forced to take special measures to demonstrate the work performed teacher.

One of the main advantages of the organization of work in private clouds is the ease of maintenance programs that are installed on the virtual machine. To change the version of the program or its migration enough to make changes only on the image of the virtual machine and re-create clones of virtual machines.

Along with these advantages there are also risks. These include the need for a reliable and high-speed Internet.

In general, the model of the virtual laboratory at SaaS will increase the efficiency and reliability of the IT infrastructure of the university and thereby ensure the educational process necessary services.

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EDUCATIONAL STANDARDS AND DISCIPLINES COMPETENCY: SEARCH FOR A MATCH

Dyshenov, B.A., Naykhanova, L.V.

Ulan-Ude, East Siberia State University of Technology and Management

The paper is devoted to the problem of “Definition of the curriculum disciplines”. For solving the problem the research focuses on application of “Latent Semantic Analysis” method. This method is used to determine the match between competence and disciplines. Studies have shown that its application is possible. However, additional efforts are required in the preparation of the initial information.

Introduction

Educational standards of the last generation are based on competence approach. These standards do not contain a complete list of the basic disciplines. Thus, it requires a problem analysis “Definition of disciplines of the curriculum”. Of course, the basis for this determination are competencies. To solve the problem alone is not enough competencies. For that reason, one should find basic data. Higher professional education have long history of

learning. The result is a very large archive containing working curriculum disciplines. The best part of working curriculum disciplines - information resources. This fact helps to use them as the basic data.

Problem description

We need to find out a transformation $D: K \rightarrow D, D=(d_1, \dots, d_n)$.

The problem solution requires to present knowledges about competencies and disciplines teaching units; to explore the method “Latent semantic Analysis (LSA)” for solve the problem; to make a choice of the discipline.

Assumptions

Each discipline d has the minimum of discipline content, which is represented by teaching units set:

- 1) $d = \{u_i | u_i - \text{teaching unit}, i = 1 \div q, q = |\{u\}|\}$;
- 2) disciplines set D is complete;
- 3) at least one element $d \in D$ is matched by $\forall k \in K$;
- 4) $\forall k$ has terms set $T = \{t_i | t_i \text{ is term}, i = \overline{1, n}\}$, $\forall t_i$ is matched by *def* – definition.

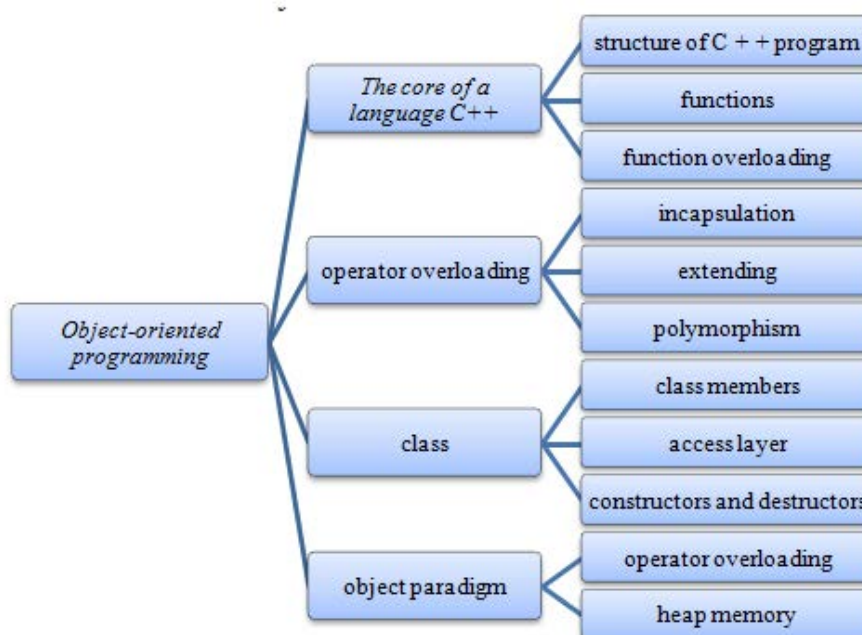
Knowledges about competencies and teaching units

Sets K and D are given by xml docs.

1. Then we need to establish compared texts base $B = K \cup D$, where K is the competence content, and D is discipline teaching units. Professional competence contents are given in tags `<pc>`, the titles and the disciplines teaching units are given in tags `<subject>`;

The example fragment of an analyzed text:

```
<pc name = "PC27"> One should know basic conceptual principles of functional,
logical and object-oriented programming approaches...</pc>
<subject id="1" name="Software engineering">
<du>The term of Programming technology... </du>
</subject>
<subject id="2" name="Object-oriented programming">
<du>The core of a language C++ Structure C++ programs. Functions... </du>
</subject>
<subject id="3" name="Functional programming">
<du>An introduction to programming with the help of functions and
procedures...</du></subject>
```



Picture 1 – The example fragment of a conceptual hierarchy

Data preparation

This stage include:

- 1) move stop-signs and mark a stem of each left word;
- 2) remove single words.

1. Then we need to move stop-signs (prepositions, conjunctions, pronouns) away from the resulting texts base B . Next step is to mark a stem of each left word with the help of Stemmer Porter. That let us reduce noises and double-check the results.

The example of data processing:

The term of programming technology...

The core of language C++ Structure C++ programs ...

The introduction to programming with the help of functions...

2. We should remove single words that appear in the text for once. That let us reduce noises and double-check the results.

Latent Semantic Analysis

This stage include:

- 1) construct indexed word frequency matrix;
- 2) compound singular decomposition indexed word frequency matrix (IWFMM) and as a result we get matrix $U2$ and matrix $VT2$;
- 3) we put $VT2$ matrix results on Cartesian reference system.

1. Then we need to construct indexed word frequency matrix, where lines are the word forms and columns are the array B (texts base). Word forms and texts bases are to be set at the intersection of the columns and lines. The results of matches are defined according to the word form's rank $Rang$. Each word's rank is determined according to the number of sources found in the searching system yandex.ru Num , which are classified under six main groups.

$$Rang = \begin{cases} 0 & | Num \geq 100000000 \\ 1 & | Num < 100000000, Num \geq 10000000 \\ 2 & | Num < 10000000, Num \geq 5000000 \\ 3 & | Num < 5000000, Num \geq 1000000 \\ 4 & | Num < 1000000, Num \geq 100000 \\ 5 & | Num < 100000 \end{cases}$$

Table 1 – The example fragment of indexed word matrix

	PC27	Se	OOP	FP	RLP	PF	TI	PTaMS	...
basic	0	0	0	0	0	0	0	0	...
conceptual	3	3	0	0	0	0	0	0	...
proposition	3	0	0	0	0	0	0	0	...
functional	3	3	3	3	0	0	0	3	...
logical	3	0	0	3	3	3	0	0	...
object	1	0	1	0	0	1	0	0	...
oriented	3	3	3	0	0	3	0	0	...
discipline	1	0	0	0	0	0	0	0	...
programming	2	2	2	2	2	2	2	0	...
approach	1	1	1	0	1	0	0	0	...
method	1	1	0	0	1	1	0	0	...
...

2. Next we exercise compound singular decomposition IWFM and as a result we get matrix $U2$ and matrix $VT2$ (table 3). The value of the matrix $U2$ reflects terms match value. The value of the matrix $VT2$ reflects value of competence and discipline match. In our problem, we have a goal to study the match of K competence set and D discipline set, so further we will analyze $VT2$ matrix.

3. We put $VT2$ matrix results on Cartesian reference system, where the columns are to correspond with values on X-Y axis, picture 2.



Picture 2 – Schedule of compliance

Choice of the discipline

Resulting values are to be classified according to centroid method, and then we can mark classes that are most designated for our competence. Obtained values set would correspond with curriculum disciplines under given competency.

The next stage is to find a distance set (from PC27 point to discipline point coordinates):

$$Dis = \{\sqrt{(x_1 - x_i)^2 + (y_1 - y_i)^2} \mid x_1 = VT2_{1,1}, x_i = VT2_{1,i}, y_1 = VT2_{2,1}, y_i = VT2_{2,i}, i = \overline{1, n}, n = |D|\}$$

Table 2 – The example fragment distances to competence

Discipline	Distance
Object-oriented programming	0,02
Recursive logical programming	0,03
Discrete mathematics	0,04
Functional programming	0,04
SADP	0,05
Theoretical informatics	0,06
Software testing	0,07
Software project management	0,07
Design technology of decision support system	0,08
Probability theory and mathematical statistics	0,08
Computer architecture	0,09
Programming fundamentals	0,29
Software engineering	0,33
Metrology of SW quality	0,39
Programming language theory	0,69
Formal language theory	0,73

These tables show the 11 most distances approximate disciplines that lie in the range from 0 to 0.1.

Table 3 – The example fragment of VT2 matrix

Competence and discipline	Abbreviations	X	Y
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
PC27	PC27	-0,08	0,1
Software engineering	SE	-0,25	0,38
Metrology of SW quality	MoSWQ	-0,26	0,45
Discrete mathematics	DM	-0,12	0,12
SADP	SADP	-0,12	0,13
Programming fundamentals	PF	-0,28	0,31
Object-oriented programming	OOP	-0,1	0,11
Recursive logical programming	RLP	-0,06	0,08

Continued Table 3

<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
Formal language theory	FLT	-0,58	-0,43
Design technology of decision support system	DToDSS	-0,15	0,14
Probability theory and mathematical statistics	PTaMC	-0,15	0,14
Software testing	SWT	-0,14	0,14
Computer architecture	CA	-0,13	0,17
Functional programming	FP	-0,06	0,06
Theoretical informatics	TI	-0,11	0,15
Programming language theory	PLT	-0,54	-0,42
Software project management	SWPM	-0,14	0,14

Conclusion

In this work, we have conducted the research applying latent semantic research. Experiment results prove that this method can be used. But term ranks were implemented in order to achieve acceptable results. We have used not only didactic units but their contents to improve the results. In the future, it is necessary to investigate the recognition algorithm of compound terms for solving the problem.

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BIONIC SELF –LEARNING SYSTEM

Anisimov, D.N.
ZATO Ozerny, m/u 52642

Problems of artificial intelligence and solutions of them. Create bionic principles of artificial intelligence.

Keywords: artificial intelligence, bionic.

Modern robots are becoming more complex. There are more and more modules for motion control and positioning, which put in robots. Developers are recording more and more features and commands that they can perform. They are even recording some algorithms, that a robot could learn individual commands and store data about a person. Maybe soon developers will have been describe the functions very exactly and the robot can becoming a doctor or engineer. But they never be able to describe the function so that the robot became a scientist and inventor, especially in the area, in which he wants. He will not to be sad, to love

or to hate. We will achieve such a result, if only we will build a robot as nature created us, with no additional restrictions. This system will be called bionic self-learning system.

Can identify the main reasons, which today do not allow robots to become the same as we:

- an incorrect way, which consist of descriptions of the new features and adding new modules, but a lot of intellectual and financial costs, that are invested in this way, give good results and surprise the consumer, this creates an encouraging cheating, that there are still a huge scope of human functions, which can be described for a long time improving robot;

- scary to shoot restrictions initially caused by the fact that the robot has a set of functions that it performs, where safety is achieved by the fact that the robot will not go beyond the functions, which recorded in it, otherwise, robot can be assessed as dangerous for society and all costs will not lead to results;

- creation and production of the perfect model less cost effective than a gradual improvement, where each new state can be sold for the maximum price, as the best new model

- development of modern psychology, state of knowledge of the brain and hormonal system still leaves many unresolved issues that can't create an accurate bionic model;;

- high requirements to the development team in the versatility and depth of knowledge, each member of the team must to have depth knowledge of anatomy, physics, hydraulics, electrical, electronics, higher mathematics and other subjects for the understanding common goal and mutual understanding, a number of leading countries in the development of robotics, have the deep but the narrow specialization of each professional.

There are following solutions to these problems:

- creating bionic model without prescription in advance management functions of motion and without perspective of add new modules, principle of creation should be such that the robot must himself or by help of other to take knowledge, how the human, the control system should confine by algorithm of memory formation and decision-making function of the significance of current parameters, the significance of which is formed based on the weights of the internal sensors (which including hormonal functions, which are dependent on the significance of the current settings) and other parameters, which synchronously arriving from various types of input information, and a block, which making random decisions, performing the role of system of adaptation, which should form high-level control system;

- the removal of restrictions of the robot, which implies complete freedom of learning;

- use of alternative concepts of psychology, based on the estimated model of the brain and hormonal system that accurately describes the majority of the laws of human behavior.

For the formulation of the problem is necessary to consider the basic principles of biological and bionic nervous and hormonal systems, to meet the views of alternative psychology, then consider implementing solutions to the problem of constructing a bionic self-learning system.

Consider the concept of the nervous and hormonal system, work of human brain and learning with a comprehensive perspective of anatomy and alternative psychology with the projection on the bionic implementation of key mechanical components.

Man has eight kinds of feelings, five of which can be called the main types. Taste and smell will not be considered. These feelings have not high significance in human learning. But some parts of them can be implemented using modern technical devices. Vestibular apparatus is quite simple and clear and consist of gyroscope and three angle sensors, three torque sensors and three command sensors in bionic realization. The remaining five types of feelings, their realization in nature, hardware implementation, the formula for creating the algorithm shown in Figure 1. Pronunciation of sounds also refers to the sensation of the proper motions.








kind of feeling	human's Implementation	Method of implementing in the robot	The physical nature and the basic quantities	mathematical form
VISION	EYE - MATRIX photoreceptor 	MATRIX photodiode 	WAVE λ - COLOR A - BRIGHT	$\infty 2M[1..n, 1..m, 2]$
HEARING	ear (tympanic membrane) 	SPEAKER (SEAL) 	WAVE λ - TONE SOUND A - VOLUME	$M[1..n, 2]$
TOUCH	SKIN 	MATERIAL with temperature and pressure sensors 	IMPACT ON THE SQUARE A_{Lj} - COORDINATE F_{Lj} - IMPACT	$\infty \begin{cases} M1[1..n, 1..m] \\ M2[1..n, 1..m] \end{cases}$
INNER FEELINGS	Nerve endings on ORGANS	Sensors on the device (the status and temperature)	IMPACT ON Coordinates A_i - COORDINATE F_i - IMPACT	$\infty \begin{cases} M1[1..n] \\ M2[1..n] \end{cases}$
IMPRESSION of own movement	NERVOUS SYSTEM	Sensor of yaw and MOMENTS 	IMPACT ON Coordinates A_i - COORDINATE F_i - IMPACT	$\infty M[1..n]$

Figure 1. Table bionic matching of basic senses

Consider the principle of construction of the nervous system. Elementary unit of nervous system is the neuron. It consists of dendrites - inputs, catfish - the cell body and axon - exit. Weight substance produced by cells - the mediator, proportional to the input exposure. When the cells are combined according to the type of information that is recorded to the brain, picture (Figure 2 right, the green part), a set of sounds, proper motion (Figure 2, right red area), etc. The Persistence of Memory is achieved by maintaining a constant content of mediator in the cell. There are also neurons of recording the relationship between neurons of kinds of information on their synchrony arrival in the brain (Figure 2 right - the white area). It creates an associative memory with a function of identification, where repetition on identified neurons increases their boost factor, by increasing the weight of substance - a mediator.

Decision-making are doing by weight functions primarily proper motions and internal sensations (including hormonal), which already played earlier actions with lowers the negative and increased the positive inner feelings.

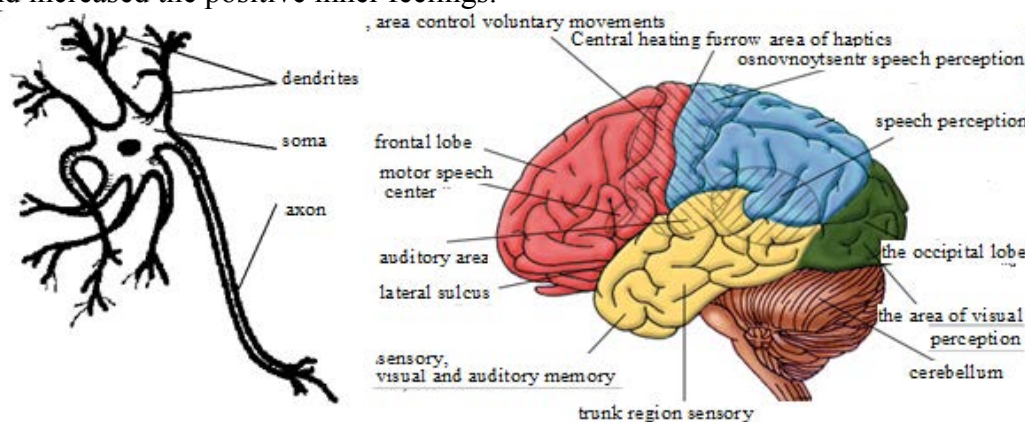


Figure 2. (left - neuron right functional areas of the brain)

Mathematically, a neuron performs the following functions:

$$f = \sum_1^i (a_i l_i) + a_a l_a \tag{1}$$

where: a - weight coefficient, l - parameter input, $a_a l_a$ - address portion of the neuron[1].

Accordingly, the decision of function is implemented by the following formula:

$$F_{k1} + F_{k2} + \dots + F_{kn} = a_1 f_1 + a_2 f_2 + \dots + a_n f_n + a_{kontr} f_{kontr} \tag{2}$$

where: F - final output function of types of information, f - final function of the input types of information, a_i - coefficients of used memory including f_{kontr} - control memory allocation function, while for each type of information is a function of:

$$f_i = a_{i1} f'_{i1} + a_{i2} f'_{i2} + \dots + a_{im} f'_{im} + a_{ikontr} f'_{ikontr} \tag{3}$$

where: a_{ij} - associative significance of pieces of information, f'_{ij} .

Further proposed structural model.

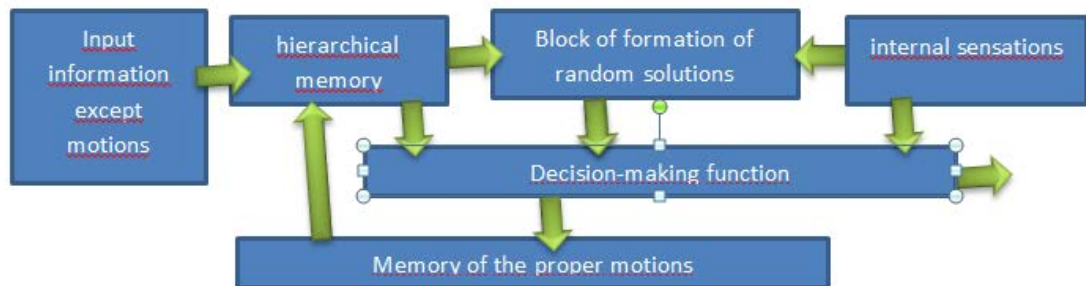


Figure 3. Structural model of the nervous system of bionic self-learning system

For the implementation of the structural model (Figure 3) proposed a functional diagram of the memory organization with a block of random decision making (system adaptation) and the final weight function (Figure 4).

Consider the principle of functional circuits. All incoming information is stored in separate files, in this case, depending on the species for which it is appropriate will be its shifts occur, stretching, cutting and averaging. Memory hierarchy is organized by the creation of simplified models, not only coming but also treated, depending on the ways of formatting information.

Next, the system is recording data identifying coincidentally with existing hierarchy. The system is recording files of certain types of information and information difference between the input objects synchronized with the arrival of the identified objects too.

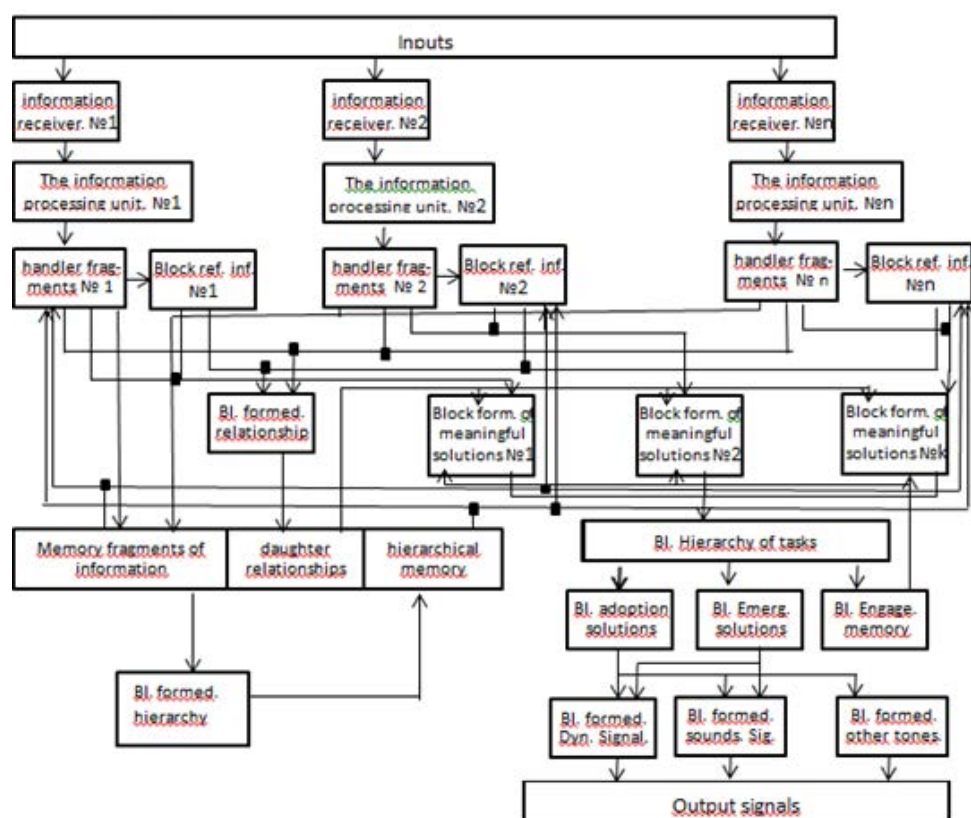


Figure 4. Functional diagram of the organization of memory, decision making and random decisions.

Over time, the database storage system needs to learn a very movements and concepts. The statistical differences become adjectives, dynamic - verbs, static subject matter of the second order. Information about good and bad forms weights internal sensors according to other types of information. Ability to create new kinds of information gives limitless prospects of development of mental activity. Implementation of hormonal functions under alternative descriptions psychology must make real sense.

We can conclude that the main direction of work on artificial intelligence -based system is a learning bionic functional description of the main functions of hormones as internal sensors, memory organization to develop an algorithm including its two main sub-parts is an algorithm for processing pieces of information fragments. The identification algorithm the formation of the memory hierarchy, creating based on the random number generator block making random decisions, and description for the possibility of the microprocessor firmware weight ultimate decision-making functions, with the construction of the chassis is less important and challenging task, here are some bionic compliance, circulatory and muscular systems - hydraulics and electrical power, skeleton - of metal structures, digestion - not less massive battery.

With all need to remember that only a practical experiment can confirm the theory. Only in this case we can speak about the prospects and completion of the proposed method for constructing a humanoid robot.

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INFORMATIZATION OF EDUCATION AS COMPLICATED SOCIAL PROCESS AND NEW TENDENCY OF PEDAGOGICAL SCIENCE

Kozlov, O. A.

University of education informatization of Russian education academy

The article contains theoretical problems of pedagogical science development in conditions of education informatization development.

Keywords: Informational and communication technologies, informatization of education, content of education, mixed media, telecommunications, web-technologies, informational and communication subject sphere.

Impetuous development of informational technologies and telecommunications let discuss actively developing process of modern society's informatization.

Informatization, **overall global communication of the modern society** means global social, cultural, technological process which peculiarity is in the fact that dominant type of activity in social sphere, science, culture, social life, business are collection, accumulation, processing, storage, transmission, usage, producing of information realizing on the basis of **informational and communication technologies (ICT)** for intensification of any labor including intellectual one.

Analysis of contemporary state of surveys in the sphere of **informatization, mass global communication of modern society** shows that it:

- Active usage of constantly perfecting and expanding intellectual potential of society concentrated in scientific, educational, production, social, cultural, and other types of life activity of its members reflected in digital and published funds;

- Integration of informational and communication technologies with constantly developing scientific and production technologies, business technologies, technologies of different types of arts, educational technologies initiating development of all spheres of life activity of modern society by intellectualization of labor activity of its members for increase of total cultural and professional level;

- High level of information service by means of accessibility for any member of society to all sources of commercial authentic information, visualization, and legality of issued information, essentiality of used data and knowledge;

- Need in realization of operative, differentiated by requests of users, communication or informational cooperation between separate individuals, groups of persons, different communities.

- Above mentioned tendencies change social order for quality of collected knowledge and skills for both school graduate and future specialist of any professional sphere and require improvement of education in the following spheres:

- Independence in the education process using potential of informational resource of local and global computer networks;

- Responsibility for selection of regime of educational activity and informational cooperation with interaction sources of teaching information;

- Realization of possibilities of informational and communication technologies in teaching and future professional activity.

It lets tell about the fact that today **informatization of education** actively develops itself – purposively organized process of assuring of education sphere by theory, technology, and practice of forming and optimal usage of scientific and pedagogical, pedagogical and

methodic, program and technological developments oriented to realization of ICT possibilities applied in comfort and health saving conditions.

This complicated social process requires corresponding resource provision. We emphasize the following **types of resources provision of informatization of education**:

- Scientific resource;
- Technical and technological resource (apparatus, software, design-ergonomics, communicational etc.);
- Economical resource;
- Legal resource;
- Informational resource (including digital publications of educational purpose so-called content);
- Social resource (including preparation and retraining of personnel, organization of constant preparation of pedagogical personnel in the sphere of informatization of education).

As first position is taken by scientific resource it lets tell that ***informatization of education is developed as new sphere of pedagogical science*** including subsystems of teaching, upbringing, education, and integrating psychological and pedagogical, social, physiological and hygienic, technical and technological, scientific and practice surveys which have some interactions between each other and forming a definite integrity assuring educational sphere by methodic, theory, and practice of development and optimal means of ICT applied in comfort and health saving conditions.

It determines necessity to orient education process not on receipt of some knowledge, skills, but on development of intellectual potential, development of skills to obtain knowledge independently in conditions of ICT didactical possibilities realization [4] with active usage of modern technologies of informational interaction and first of all as mixed media, telecommunications. Besides, realization of possibilities of these technologies lets include new themes lets include new reflecting modern scientific achievements studying of which was not possible till recently because of difficulties of conceptual character or difficulties connected with necessity to process large volumes of information for its educational interpretation. It changes ***content of education expanding it not only by volume but substantially***.

Realization of contemporary approaches in sphere of formalization of knowledge, structuring of educating material let remove main limitation which is stipulated by overload of educated person. In contrast to traditionally presented educating material (mainly in form of linear structures) modern hyper text and/or ***hypermedia forms of educational information presentation lets increase volume of material expanding thematic and spectrum of its presentation making easier search, interpretation, selection of necessary aspect***. Herewith designing of pedagogical technologies shall be oriented on such ***education results*** as: ***forming of skills to obtain knowledge independently, to realize different types of independent activity concerning collection, processing, transmission, producing of educational information***.

Modern approaches to usage of web-technologies suppose realization of informational interaction of participants of educational process in different working modes on base of Internet. Internet-technology provides of modern users with informational resources of global telecommunications, and Intranet-technology lets organize educational activity with usage of applied and instrumental software and systems accessible to modern user. Herewith ***taught persons can be oriented on usage of informational sphere of science*** (information and knowledge which fill base of data; distributed information processing; spread of scientific information) ***and culture*** (digital libraries, virtual museums, and art presentations, exhibitions).

Paradigmly new means appear; to them the following can be referred:

- Improving digital encyclopedias thanks to activity of users which provide taught

persons with technologies of collection and producing of information and knowledge;

- Social informational systems which function as social networks.

Application of such means in education can increase motivation of education, assure independency in time of solution of educational tasks, develop skills to use means of informational and communication technologies.

Development of pedagogical technologies on the basis of above mentioned means and technologies (mixed media, hyper media, web, Intranet) lets modify modern educational approaches to teaching of result achievement methods of educational tasks solution (teaching to method of solution of the whole class of tasks), based on realization of educational models using not axiomatic approach to teaching (familiarization of taught with typical solutions of educational tasks), and *methods or achievement ways of solutions of educational tasks*. In case of such approach **teaching to solution method of whole class of tasks** is supposed. That is teaching who to find answer on question with taught person didn't face using that knowledge which he obtained in the education process. Herewith emphasis is laid on ability to form creative solutions. It causes *modification of education purposes*.

Important aspect in time of elaboration of pedagogical technologies realizing didactic possibilities of information and communication technologies is *educational theory in conditions of information interaction between teaching, taught, and interactive educational mean functioning on base of ICT; theory of forming and functioning of information and communication subject sphere* in conditions of realization of different types of education activity realized on base of technologies of mixed media, telecommunications, which are the components of contemporary didactic.

In course of realization of education theory the following facts have significant mean: *prevention of potential negative consequences of usage of information and communication technologies in education and development of methods of informational protection of individuality in time of work with these technologies*. A very important fact is studying of possible negative influence on taught persons of usage of informational and communication technologies in physiological and hygienic, psychological, and pedagogical aspects.

So we can tell that didactic of education informatization is developed – it is a theory of education which purpose reflect requests for preparation of member of modern informational society of mass global communication, content – reflects significant changes in science, technics, and manufacturing, and methods – realize possibilities of informational and are adequate to contemporary perception methods of scientific and social regularities.

Herewith **didactic of informatization** of education is formed and developed in the following conditions:

- realization of didactic possibilities of informational and communication technologies;
- Realization of informational activity concerning collection, search, processing, formalization, producing of educational information;
- changes of paradigm of educational informational interaction between taught, teaching, and interactive source of educational information or informational resource;
- Changes of structure of educational material presentation in particular not linear, hypertext;
- Expansion of spectrum of types of education activity in conditions of realization of didactic possibilities of informational and communication technologies;
- Changes of purposes, results, organizational forms, and methods of education adequately to social order of informational society of mass global communication.

In aspect of above mentioned information, in conditions of changing of main ideas about educational information interaction, about structure of educational material

presentation, about new types of educational and informational activity realized in informational and communication sphere, special detection of changes of main provisions of pedagogical science has special meaning appearing in connection with informatization of education.

Comparative characteristics of main components of traditional pedagogical science in conditions of education informatization let correct content of education of any subject; reveal new purposes of subject teaching process, change teaching style and results of pedagogical influence adequately to modern technological possibilities and peculiarities of innovation pedagogical products including digital educational resources.

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DIDACTICS DEVELOPMENT IN EDUCATION INFORMATIZATION

Robert, I. V.

Director of the institute of informatization of education of the russian academy of education

Didactics in the modern pedagogical science is a learning theory, which describes the laws of learning, its basic principles, goals, content, forms, methods, tools, and the achieved results. At the present stage of scientific and educational research there are three stages of the didactics development.

Stage I - traditional didactics (XVII-XIX cc.). During this period, while teaching for the primary source of knowledge were, firstly, *the learner's perception results of the objects properties, their relationships or interactions between them, and the results of perceptual characteristics of the studied processes, events or situations*, and, secondly, *the dogma, encouraged by authoritarian leadership education*. Here, the learning process is an interaction between a teacher and learners (students), where learners are getting new knowledge and skills and, in addition, there is their upbringing and development.

Stage II - modern didactics (end of XIX - first half of XX century). In this period in the process of teaching and learning a basis was, firstly, **personal approach to the learner**, and secondly, *psychological management of the learner (learners) by teacher through a variety of teaching methods* (ways to achieve or realization of goals and tasks of education) and *the various means of training* (subject training support in the form of textbooks, teaching and visual aids, classroom equipment, including teacher's skills).

Stage III - post-modern didactics (second half of the XX century). The experts often call this period the «curriculum». In this period in the process of teaching and learning-

assessment of knowledge a basis was, first of all, psycho-social activities and, secondly, pedagogy of cooperation, but with the requirements of time and personal development of a student, as well as a creative approach to teaching. This period is characterized by particular attention to the formation of educational standards of general and professional education.

Stage IV - didactics of education informatization, basic characteristics we associate with characteristic features of Informatization, global mass communications of modern society of the XXI century (process, feature which is that the dominant activity in the social sphere, science, education, culture, public industry, and business are the collection, accumulation, processing, storage, transfer, use, production information, undertaken on the basis of modern information and communication technologies (ICT) for intensification of any work, including intellectual).

Analysis of the current status of research in the field of informatization, mass global communication in modern society shows that it provides:

- active use of the constantly advancing and expanding the company's intellectual potential concentrated in the scientific, educational, industrial, social, cultural, and other activities of life of its members, reflected in electronic and printed collections;
- integration of information and communication technologies are constantly developing scientific and production technology, technology business, technology different kinds of arts, educational technology, and initiating the development of all spheres of the modern society life at the expense of labour activity intellectualization of its members to increase their cultural and professional level;
- high quality of the information services through the availability of any member of the society to all sources of reliable information for civil purpose, visibility and legitimacy of the information provided, the materiality of the used data and knowledge;
- need for operational, differentiated on the needs of the users of communication or information interaction between individuals, groups of people, different communities.

These tendencies change the social order on the quality of the acquired knowledge and skills both for graduate school and for the future of specialist professional spheres and, as a consequence, improvement of education in the following areas:

- independence in the process of receiving education through the potential use of distributed information resource of local and global computer networks;
- responsible for selecting the mode of training activities and information interaction with interactive sources of educational information;
- realization of opportunities information and communication technologies in education and future professional activity.

Arising need for a majority of the modern society members intensively explore and pursue opportunities for information and communication technologies to increase their cultural and professional level is determined by constantly developing scientific and production technologies, business technologies, technologies of different kinds of arts, educational technologies, which are created and improved on the basis of ICT. Psychological acceptance of the individual and development of their capabilities in various spheres of the modern human to get education «virtually», promptly and on personal choice communicate with the right addressee, to cultivate and express themselves in a positive field of human aspirations.

These peculiarities of the contemporary society is determined by the need to orient the learning process not for the trainees to sum knowledge, skills, but for intellectual capacity development, skills development to extract knowledge in conditions of teaching ICT opportunities realization [4], with the active use of modern technologies of informational interaction and, first and foremost, such as multimedia, telecommunications. In addition, the

implementation capacity of these technologies allows you to include a new subject that reflects the modern scientific achievements, study the essence of which until recently was not possible due to the difficulties of a conceptual nature, or the difficulties associated with the need to process large volumes of information for the academic interpretation. All these changes in the education content, expanding not only in volume but also in terms of content.

Modern approaches use in the field of knowledge formalization, structuring of educational material allows you to remove the most important constraint, which is due to the learner saturation. Unlike traditionally represented educational material (mainly in the form of linear structures) modern hypertext and/or *hypermedia forms of presentation of educational information allows to increase considerably the volume of the material, expanding as a theme, and the range of its presentation, making it easier to search, interpret, selects the desired aspect*. Thus engineering pedagogical technologies is to focus on such *learning outcomes* as: *development of skills independently to acquire knowledge, to manage various types of independent activity on collection, processing, transmission, production of educational information*.

Modern approaches to the use of web-technologies presuppose implementation of information interaction of educational process participants in different modes in the Internet. Internet technology provides modern users the information resources of global telecommunications and Intranet technology allows you to organize educational activities with the use of application and software tools and systems available to the user. *The trainees can be oriented on the use of the information environment of science* (information and knowledge that are filling databases; distributed information processing; scientific information sharing) *and culture* (electronic libraries, virtual museums and art presentations, exhibitions).

There appear new means, which include:

- improved, because of the activity of electronic encyclopedias users, providing the learner technologies of information and knowledge collection and production;
- social information systems that are similar to social networks.

The use of such devices in education can significantly increase the motivation training, ensure the autonomy in solving training tasks, developing skills necessary to use information and communication technologies means.

Development of educational technologies on the basis of the above mentioned means and technologies (Multimedia, Hypermedia, web, Intranet) allows you to modify the modern educational approaches to teaching methods to achieve the solution of educational tasks (training method of solving problems), based on the educational models implementation, using not axiomatic approach to learning by providing trainees with standard solutions of educational problems), and the *methods or ways to achieve educational problems solutions*. In this approach assumes *training methods for solving a class of problems*. That is, learning how to find the answer to the question is that the former student has never encountered while using the knowledge he acquired during the training. Especially when this is done on the ability to do creative solutions. This leads to the *modification of the learning objectives*.

An important aspect of the pedagogical technologies development realizing the didactic potential of information and communication technologies, is *a theory of learning in conditions of informational interaction between training, the trainees (trainee) and interactive learning tool, functioning on the basis of ICT* [4]; *the theory of formation and functioning of information and communication subject environment* [4] in the context of the implementation of the various types of learning activities, implemented in it on the basis of Multimedia technologies, telecommunications, are components of modern didactics.

During the learning theories implementation it is essential *to prevent possible negative impacts of the information and communication technologies means use in education and*

methods development of information protection of the personality when working with these technologies. Particularly it is important to study the possible negative impact on trainees use of information and communication technologies means in physiological-hygienic medical, psychological and pedagogical aspects.

So, the possible negative consequences of a medical character may be revealed at the violation of the educational activity regime with the computer technology means, in violation of the right fit for the working place equipped with a computer with the respective peripheral equipment.

The negative ***psychological*** effects of ICT in the educational process can be caused by emotional stress when dealing with information full and emotionally rich educational material, with the incorrect distribution of information on the screen, oversaturated information intended for mastering.

Pedagogical negative effects can occur if the wrong organization of training activities on the computer, and the incorrect organization of the group, the collective activity of ICT - enabled.

However, modern traditional pedagogical science, their traditions originating from times of authoritarian teaching and the class-lesson system introduction as the main form of the educational process organization, is characterized by strong educational process organization, not allowing the arbitrary choice of the mode of training activities; categorically and encyclopaedic learning teaching; pillar when you gain knowledge to the learning advantage, and not on the student creative aspirations and not on the cultivation of intellectual freedom and democratization of the ways choice and means of educational information mastering. The students mainly require knowledge models of conduct, training activities and even thinking.

This situation constitutes both domestic and foreign researchers in the field of pedagogy, in particular didactics and psychology, which concurred on the need for updating the theoretical education foundations in the direction of ***adaptation purposes, organizational forms and training methods to the requirements of scientific and technological and social development, adequate to modern scientific cognition methods of natural patterns and socio-cultural processes.***

All this entails the necessity of a theoretical rethinking many of the didactics provisions, developing in the period of education informatization, disclosure of the peculiarities of the General theory of education in the terms of ICT tools use.

Thus, ***didactics of education informatization*** is a learning theory, the purposes of which reflect the requests for the preparation of a member of the modern information society mass of global communication, the content reflects the dramatic changes taking place in science, engineering, and manufacturing methods to realize opportunities of information and communication technologies and are adequate to the modern methods of scientific knowledge and social patterns.

The didactics of education informatization is formed and developed in conditions:

- implementation of didactic opportunities of information and communication technologies,
- informational activities of search, collection, processing, formalization, production of educational information,
- change the paradigm of educational information interaction between trainees (i.e. students), educational and interactive source of educational information or information resource
- changes in the structure of educational material presentation, in particular, nonlinear, hypertext,

- expansion of the range of species educational activity in conditions of didactic opportunities realization of information and communication technologies,

- change goals, results, organizational forms and methods of training adequately social order of the information society global mass communication.

In respect to the abovementioned, in the conditions of the fundamental concepts transformation of academic information interaction, on the structure of educational material presentation, on new types of educational and informational activities in the information and communication objective environment, the changes identification in the basic provisions of pedagogical science, arising out of education informatization is of special importance.

Let us present a table of the comparative characteristics of the main component of the traditional pedagogical science and pedagogical science in the conditions of education informatization: (contents of the pedagogical science, object of didactics, subject didactics, goal of the teaching process, didactics tasks, characteristic style of teaching, results of the pedagogical impact).

Traditional pedagogical science	Pedagogical science in the conditions of the education informatization
<i>The content of the traditional pedagogical science</i> - theory of education, including education, which has been studying the learning process as a managed process, the purpose of which - the message body of knowledge, development of skills training activities, learner's cognitive development.	<i>The content of teaching science in the education informatization</i> - theory of education as a system of knowledge about the processes of training and education in the ICT use in teaching and ensuring socio-psychological, pedagogical, technological and health-conditions of their use in the life of the individual, is adequate to requirements of modern information society mass communication and globalization
<i>Didactics object in traditional pedagogical science</i> is a process of learning as the correlation between the objective and subjective, social experience and possibilities of the trainee, turning it into knowledge, skills, and mental development, and general culture	<i>Didactics object in pedagogical science in the conditions of education informatization</i> - the educational process as interaction of subjective possibilities of student and results of pedagogical interventions that ensure disclosure, development and realization of the intellectual potential of a student on the basis of the ICT didactic potential implementation, and is aimed at achieving the educational objectives consistent with the modern level of development of the information society global mass communication
<i>Didactics subject in traditional pedagogical science</i> - <i>education process, taken as a whole:</i> <ul style="list-style-type: none"> • educational content, which is implemented in the curricula, programmes, textbooks; • means of teaching; • organizational forms and methods of training; • educational role of the 	<i>Subject didactics in pedagogical science in the conditions of Informatization of education - a process of formation, taken as a whole:</i> <ul style="list-style-type: none"> • educational content, implemented in the educational-methodical support of educational process, the contents of ICT resources corresponding to the modern level of society development and concrete level of students intellectual development, established with the help of automation of pedagogical and (or) psycho diagnostic testing; • educational products, functioning ICT provides the intensified process of training in accordance with the level of

<p>educational process;</p> <ul style="list-style-type: none"> • conditions which are favourable to active school creative work and intellectual development of a student 	<p>the learner (student) intellectual skills;</p> <ul style="list-style-type: none"> • organizational forms and methods of training, implementing the ICT didactic potential
<p><i>The purpose of the learning process in the traditional pedagogical science</i> - establishment of the most favourable interaction of the basic training component for maximum effectiveness, learning and student mental development</p>	<p><i>The purpose of the learning process in pedagogical science in the conditions of education informatization</i> - creation of conditions for the functioning of information and communication subject environment (in particular, on inline elements learning technologies), providing development and self-development of the learner, realization of its intellectual potential consistent with the education objectives</p>
<p><i>Didactics tasks in traditional pedagogical science:</i></p> <ul style="list-style-type: none"> • definition of the structure, volume and content of education; • determining effective ways of weapons of trainees' knowledge and skills; • revealing, disclosing those regularities of the process of learning, contributing to effective learning 	<p><i>Didactics tasks in pedagogical science in the conditions of education informatization:</i></p> <ul style="list-style-type: none"> • definition of the structure, volume, education content, relevant socio-cultural and scientific-technical level of development of modern society and identified the learner (student) level of intellectual development; • identification of the learner (student) individual capabilities to the knowledge of the regularities of the objective reality of the ICT use in the health-saving conditions; • development of methods and organizational forms of education adequately identified opportunities, abilities of students (student) and corresponding to the modern level of submission and retrieval of knowledge on the basis of ICT; • revealing, disclosing, development, implementation regularities of the educational process, ensure the effectiveness and safety education in terms of ICT tools
<p><i>Characteristics of the teaching style of traditional pedagogical science</i></p>	<p><i>Characteristics of the teaching style in pedagogical science in the conditions of education informatization</i></p>
<p>authoritarian-coaching teaching style:</p> <ul style="list-style-type: none"> - teacher concentration of the overwhelming majority of educational and methodical information; - almost complete elimination of trainees from the choice of methods and organizational forms of education, mode of training activities; - impact on student (as a rule), persuasion methods or coercion to the doctrine 	<p>development, self-realization of the learner (student) intellectual potential providing him tools (implemented ICT) research design, measurement, simulation, formalization of knowledge about the objective world in order to:</p> <ul style="list-style-type: none"> - self-extracting and knowledge representation; - self-selection mode of educational activity in conditions of information and communication subject environment functioning; - independent choice of organizational forms and teaching methods
<p><i>Results of the pedagogical influence during the</i></p>	<p><i>Results of the pedagogical impact in pedagogical science in the conditions of education informatization</i></p>

<i>traditional science</i>	<i>pedagogical</i>
<ul style="list-style-type: none"> • knowledge and skills acquisition as a reflection of the planned teaching, the level of which (both qualitatively and quantitatively) in the vast majority of lower than planned, in the best case - equivalent; • education of the individual in accordance with the objectives and tasks 	<ul style="list-style-type: none"> • activation of the learner (student) intellectual activities, development of his capabilities and abilities realization for knowledge and creative initiative and its constant improvement; • forming the ability to submit and retrieve knowledge through ICTs; • development of ability to perform virtual «micro-discovery» study patterns; • mastering of the common methods of cognition (adequately to modern achievements of scientific and technological progress) and the strategy for mastering educational material conditions for the ICT didactic potential implementation • development of learning activity culture (adequate to modern level of education informatization) and information culture of the learner (student) and training

The revealed comparative characteristics of the traditional pedagogical science and pedagogical science main component in the conditions of education informatization allow to:

- adjust the contents of education in any subject area,
- identify new goals of a specific subject teaching process,
- change the teaching style and the pedagogical impact results,
- intensify the independent intellectual activities of the student,
- ensure the intensification of the teaching process adequately to modern achievements of scientific and technical progress and social features of information society of mass global communication.

COMPUTER MODELLING OF INDIVIDUAL RHYTHMS

Volkova, L.V.,
Moscow, MEI SS №2

The designed computer Express-method for determination of individual rhythms significantly speeds up the diagnostic and consultative process.

The present stage of community development puts a number of essentially new problems, caused by vision, political, socio-economic and other factors, before the Russian educational system, also aims the pedagogical community at personality-centered and developing education (V.D. Shadrikov, A.G. Asmolov, I.S. Yakimanskaya).

Neuropedagogical technologies of personality-centered education provide division of pupils on types of the psychophysiological organization (V. N. Druzhinin, V. L. Bianki). In these cases, careful psychological examination of pupils, the taking into account of these given in construction educational and noneducational events (professional selection, work with difficult teenagers) are required. However, it demands additional time expenditure from the teacher, the psychologist and the social worker.

Computer modeling is one of efficient methods of studying of difficult systems, when execution of real experiment is complicated because of financial, physical obstacles or unpredictability of result. Logicality and formalizability of computer models allow to reveal the main factors, defining the properties of studied original object.

Purpose of this information: development and approbation of computer rhythmic diagnostics, according to the wave theory of personality (G. A. Aminev). The basis for similar approach are periodic (cyclic) changes of the psychological phenomena (Perna N. A. Chizhevsky A.L. Aminev G. A. Temuryants N. A. Makeev A.M. Yefimov M. L. Druzhinin V.N and B'day), established by many psychologists and biologists. Therefore, application of express methods of definition of individual rhythms opens new perspectives for diagnostics, correction and forecasting of a condition of pupils, in practice of psychological consultation.

It was developed in two directions: study of the year, seasonal rhythms, determined by birthdays and caused by rippling of the content of hormones in plasma (Yu.Ashoff), and also the long-term rhythms, connected with solar activity (A.L. Chizhevsky). Fluctuation parameters were defined by methods of conduction of biologically active points (R. Zints, J. Shtebel, I.P. Yemelyanov). The received results were compared with date on conduction of biologically active points. Correlations with date on R. Ketell's tests, Ya.Strelyau, with the test of career guidance of E.A. Klimov were carried out.

The main period of life of the examinee, so-called life chronoquantum (G. A. Aminev), which is ranging from 9 till 15 years, within 12.2 years, is established. This period correlated with biological indicators (the menarche, a biological maturity, etc.) on significance level $P < 0.05$. It is constructed spectral psychodiagnostic rhythmoscop, defining seasonal rhythms of characterologic and temperament properties of identity.

Approbation of this technique showed its efficiency. Wave records of mental properties on temporary life rules are revealed, some of them are given below. In figure 1 are the schedules of dependence of force coefficient of braking nervous processes (Strelyau's test) from a month of the birth (an experimental curve) and its approximate function $\cos(3-0)$ (a theoretical curve), where 3- period, 0-acre-stage are represented. Similarly, in figure 2 - schedules of dependence of indicators of tendency to professions like "People and Technician" (the E.A test. Klimova) from a month of the birth (an experimental curve) and its approximate function $\cos(6-0)$ (a theoretical curve), where 6 -period, 0- acre-stage . In figure 3 - schedules of dependence of suggestibility degree (the I.E test. Schwartz) from a month of the birth (an experimental curve) and its approximate function $\cos(3-1)$ (a theoretical curve), where 3- period, 1- acre-stage. Zodiacal months of the birth are defered on abscissa, values of indicators of personality trait, which were scaled for convenience, - on ordinate.

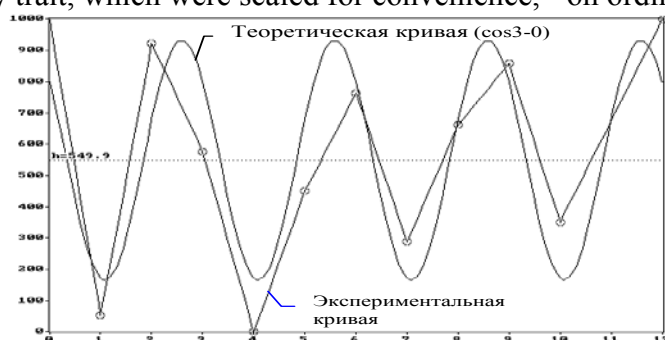


Fig. 1. Indicators of braking force of nervous processes (Ya. Strelyau's test) at born in different months.

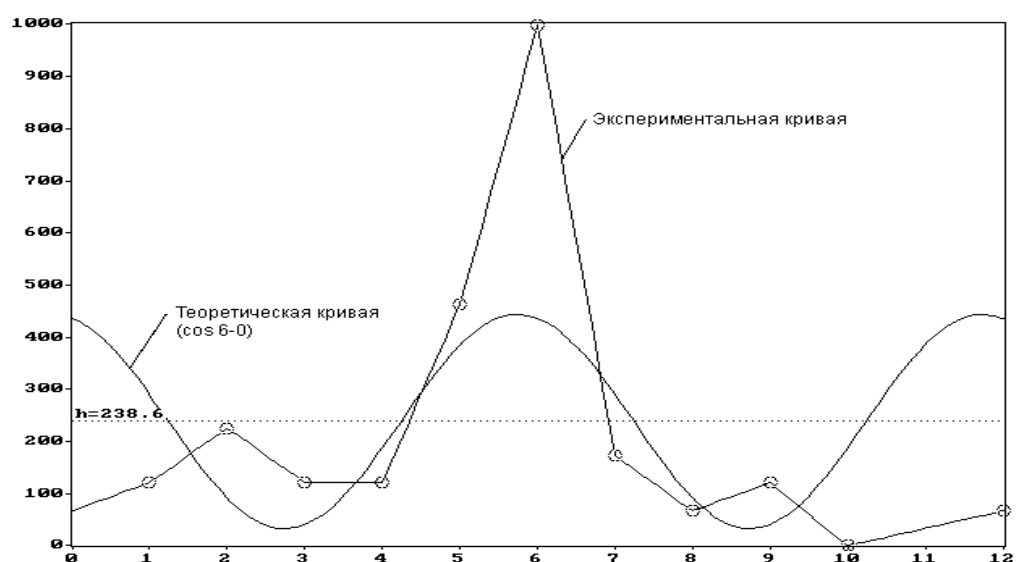


Fig. 2. Indicators of tendency to professions like "People and Technician" (the E.A test. Klimova) at born in different months.

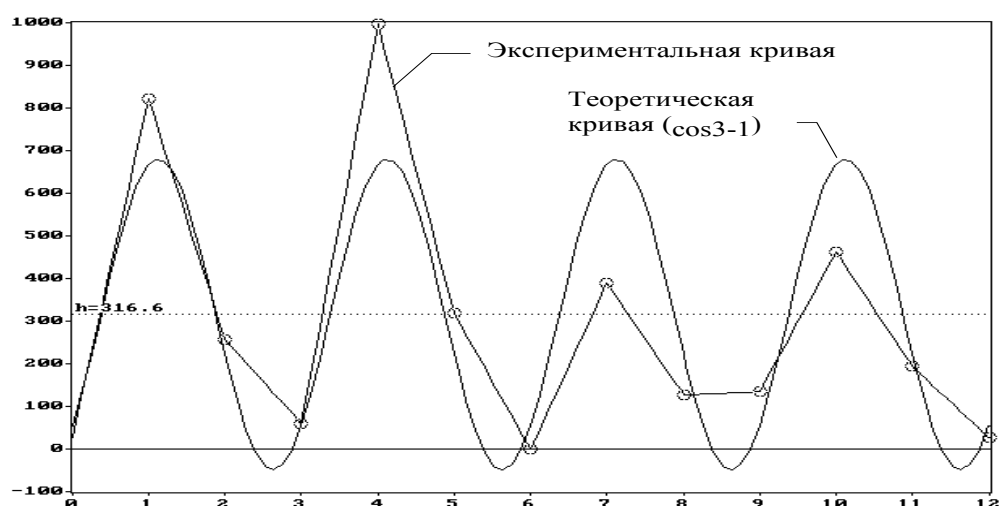


Fig. 3. Suggestibility exponents (I.E test. Schwartz) at born in different months.

The developed express techniques of rhythm are simple in application and can be used in work of psychological service, considerably accelerate diagnostic and consulting process.

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FEATURES OF INTERNET CONSUMPTION IN RUSSIAN RURAL SETTLEMENTS

Davydov, S., Logunova, O.

National Research University – Higher School of Economics

Authors of the proposed article are aiming to answer the question what are the features of Internet development and consumption in rural Russia. The research is based on the results of several quantitative surveys, covering all Russian population including rural residents, as well as two ethnographic research expeditions to Kostroma and Rostov regions.

Keywords: Internet consumption, rural audiences, Runet, social networks

The Internet is gaining popularity in Russia for the last two decades. The research made by various research institutes shows that more than a half of Russian adults are using online services. In accordance with the data of the Public Opinion Foundation (Fond «Obshestvennoe Mnenie» [8]), monthly reach of the Internet among Russians at the age of 18+ in autumn 2013 was 57%, daily reach – 46%. Russia is the 6th country in the world by the number of WWW users, and one third is made by mobile Internet consumers.

From the very moment the Internet became widespread in Russia it is under scrutiny of social researches. For instance, several research institutes (Public Opinion Foundation, WCIOM, TNS Russia, GfK-Rus, etc. [1, 2, 8, 14]) are regularly providing quantitative Internet audience data. A quite detailed overview of such sources is contained in the article by Frolov [9]. Galitskiy [10], propose segmentations of Russian Internet users based on Public Opinion Foundation and MASMI surveys. Delitsyn [5, 6, 16] is forecasting parameters of Internet development in the country. Doktorov [7] has been analyzing the interaction between the Internet and the society since 1999, taking into consideration the prospects of the Internet from its very inception.

In the presented scientific and – even more – industrial research context the rural part of Russian Internet audience remains practically unexplored. Historically we can see inhabitants of big cities at the forefront of Internet consumption. However, recently we are facing a trend of involving rural inhabitants into Internet usage. It is the fastest growing segment of the audience. Taking into account that rural residents make up about one fifth of the total population of Russia, and that according to cited above Public Opinion Foundation survey penetration of Internet in rural areas is about 44%, this group of users should be considered as quite important.

Academic studies in this area started outside Russia much earlier. There is a term ‘rural Internet’ meaning ‘the access to the Internet from rural areas’ (also referred to as “the country” or “countryside”) which are settled places outside towns and cities. Inhabitants live in villages, hamlets, on farms and in other isolated houses. Mountains and other terrain can impede rural Internet access. The studies of Internet consumption in rural areas can boast a long history, particularly in the USA they are dated back to the early 1990s. It is mostly caused by the earlier and faster development of the Internet and its even spreading among the cities populated differently. As a rule a city and a village differ mostly in terms of lifestyle but communications are basically the same, the villages are not so much behind.

Another area for inclusion of the Internet is American farming. One study reviewed data from 2003 and found that “56 percent of farm operators used the Internet while 31 percent of rural workers used it at their place of work”[12]. In later years challenges to

economical rural telecommunications remain. People in inner city areas are closer together, so the access network to connect them is shorter and cheaper to build and maintain, while rural areas require more equipment per customer. However, even with this challenge the demand for services continues to grow.

One of Contemporary research in this field is Stern, Collins and Wellman, ed. [13]. The papers address substantive and methodological issues regarding the place of the Internet in daily life, in general, with a specific focus on rural places and their unique qualities. Much attention is paid on such topics as geographic isolation, community cohesion, social networks, technological diffusion, and challenges for survey research.

The present article is based on the results of the qualitative survey of rural Internet audiences consistently performed by the Media Studies Laboratory of the National Research University 'Higher School of Economics' in Kostroma and Rostov regions in 2012 and 2013 respectively. In Rostov region the research was conducted in cooperation with the Don State Technical University. The basic method of research was based on detailed interviews with Internet users at the age of 14+. In the next section regions and methodology of the survey are discussed in more detail.

Methods and Regions of the Research

The survey is based on the complex qualitative and quantitative research methodology. Main method is in-depth interviewing of new media users. Also such methods were used as observation and questionnaire interviewing.

During the first expedition to Kostroma region usage of Internet was one of the topics in the guide. However in that case only some of the respondents were online users. In Rostov region Internet usage was a subject of a separate guide. Sample size at the first expedition was 43 interviews and 30 interviews at the second one. Dates of field work: 25-28 June 2012 (Kostroma region) and 25-30 June 2013 (Rostov region).

he following topics concerning Internet usage were included into the guide:

- Equipment for Internet access;
- E-mail and messaging services;
- Searching systems, use of Internet for educational purposes, online news;
- Blogs and social networks;
- Piracy;
- E-commerce and advertising;
- Online games.

In Kostroma region, North of Russia, field work was organized in Manturovskiy region. 5 villages were selected (Ugory, Leontievo, Davydovo, Afanasievo and Medvedevo), all of them are rather far from urban settlements. Nearest of them is Manturovo – 16699 persons, and rural population of the district in total is 4586 persons. Level of income of the majority of respondents is comparatively low. Main occupation is private farming.

During the second expedition to the Southern part of the country interviews were collected in the rural settlement Koksovskoe (with an urban settlement status till 2004), its population is 8050 people. The nearest town, Belaya Kalitva is 15 kilometers away, and Rostov-on-Don, the regional center is 160 kilometers away. Many of the villagers are employed in industrial production, so they are not considering private farming as their main source of income.

Two mentioned above rural areas are very different, but they do not represent all the variety of rural settlements in the surveyed country. However, as we shall see, Internet consumers in both sampling point have much in common. Thus, some features of online usage found can be treated as typical at least for the substantial part of Russian rural audience.

Results

Mode of access to the Internet

Characteristics of the technical means used for getting access to online resources are crucial for understanding of the Internet audience behavior. Indeed, such factors as speed of the Internet connection, type of device or devices (desktop or mobile? and for desktop – where it is located?), screen size, availability of keyboard, etc. are essentially determining ways people communicate and access information online.

A resident of a large Russian city have many available alternative ways of getting Internet access, and costs of corresponding services are comparatively low. It is normal for such people to use various online connections in different situations of life. However such opportunities are usually limited in small settlements. Costs of services are higher there and incomes are lower, that is why rural consumers have to be more attentive to the choice of a method of connection.

For instance, users in the villages of Kostroma region have only one way of connecting to the Internet. It is mobile Internet that can be used via mobile telephones and smartphones. Furthermore this type of connection can be used on other devices with a USB modem. People in Koksovskoe have an opportunity to connect to the Internet via telephone line. In this case price is higher but speed of access is faster. Stationary phone lines are not widespread in the rural settlements, and in the context of mobile telephony development people tend to reject the older technology. However several cases from the research show that people ordered stationary telephone line connection specially for getting wired Internet access.

Delytsin [5] argue that “for quite a long time in regions and rural areas mobile connection will be of higher convenience for using the Internet”. This statement is fully approved by our survey. There is at least one mobile phone in the vast majority of households, which means that a user does not need any extra devices. The obvious benefits are saving money, mobility and ease of use. At the same time such connection is not so fast, the screen of the device is small, and text input is inconvenient.

The age of respondents using mobile phone for Internet access is commonly less than 35 years. First, mobile phone is a good device for communications via social networks, and many young rural residents are active users of them. Second, representatives of the senior age groups of the audience are worse mastering work with a small screen. Some people use mobile gadget as an additional device for Internet connection in cases when main hardware is unavailable. One of the respondents remarked in the interview taken in his garage: «*Now I don't have a computer with me, so I go out to the Internet via mobile. At home through <I use> a computer*» (Rostov region, male, 25 years, electrician). This example shows that for some rural users it is valuable to stay online regardless of their location.

A USB modem connected to a desktop computer or a laptop is a more expensive option. Among the drawbacks there is also a low quality and instability of connection; this problem persists for all operators and tariff plans. It can also impose some restrictions on the content the users access as they have to take into account the fixed traffic limits and so avoid videos and some games.

Setting up a wired Internet connection using a telephone landline is one of the most expensive and unaffordable solutions. However subscribers of this service note that they have the best available speed of connection, and an opportunity to save on their monthly subscription payments. Those “advanced” users sometimes enjoy up-to-date modems with a built-in Wi-Fi router. Despite the fact that mobility is not a core value for this audience group, respondents do find it comfortable to use at home a laptop or tablet with wireless connection.

Thus, the means of Internet access used are diverse, but limited with the existing market offer. And people do move to new access technologies when they become available. However the device used to access the Internet and the quality of connection are practically

not connected with the informational interests of consumers. The latter are discussed in the subsequent parts of our article.

Search of Information. News. Usage of E-Mail

Researchers of Russian Internet audience do agree in opinion that interests and preferences of urban and rural users are different. As it noted in the report by Yandex [15], «while Internet search and social networks are used in all settlements by 90% of the population, news websites in small towns and villages are of any interest for only 50% of Internet users compared to 80% in Moscow».

Search of information is one of the basic features for Internet users. This topic sounded in all the interviews with the Internet users. The following features of information search by the respondents were revealed.

- Search settings are defined spontaneously. Respondents do not realize while connecting the Internet how long will the session last, what topics and resources will become objects of attention, etc.

- Search of information is usually not a regular task for the majority of users.

- Respondents tend to use Internet as an additional source of information, while getting data from some other sources.

While searching in the Internet respondents demonstrate lack of critical attitude and frequently even attention to sources of information. They do not try to verify obtained data and don't recognize different sorts of manipulation. As we'll show later, the same behavior is observed in cases of online advertising and e-Commerce services. For Russian rural residents the level of trust to the Internet is still high. More deep analysis show however that people do understand their feebleness as online users and re afraid of Internet as a source of potential threads and dangers.

A typical starting point for all sorts of information requests is Web search engine. Yandex is the leading search engine among Russian “villagers”, followed by Google, Mail.ru and Rambler.

One of the obvious and unique advantages of the Internet as a medium is that it is capable to provide news in real time benefiting the audience with an opportunity to be among the first to know. However, this feature is not in use by the villagers participated in the survey. They do not enjoy the variety of views available either and don't often use the Web for making their own judgments or for their personal analysis. The majority of respondents do not suffer from “informational hunger”. They are fine with quite similar news reports on traditional media (mainly top 3 Russian TV channels – First Channel, Rossia-1 and NTV).

Approximately half of the respondents have their own e-mail address. The main reason for opening an e-mail account is its necessity for registration in different electronic devices (for example, such as tablets), and online games. The initial function of e-mail, that is interpersonal exchange of letters, files, etc., is used quite rarely. Indeed, in small settlements face-to-face contacts are still of high importance. And for contacting relatives and friends in other regions of the country rural residents prefer to use phone. A narrow layer of e-mail users consists of specialist exchanging messages on professional topics with colleagues from other locations.

Mail.ru is the most popular free e-mail service in the rural settlements. According to various surveys, it has much more registered users than Yandex, but in the cities the situation is opposite [15]. It is largely because of the fact that Mail.ru proposes a social network “Moi Mir”, that is actively used by rural audiences and practically not popular among Russian urban users.

Social Media and Online Games

In general, social media are popular among Russian users in rural as well as urban settlements, and their popularity is growing steadily. According to WCIOM [14], 82% of

Internet users had at least one account in social networks in 2012 compared with 53% in 2010. Interest in social media is not going down, and their influence is growing in Russian regions. This trend is confirmed by our study. The observed activity of the respondents in social networks is quite high. About 70% of the survey participants are registered there and visit social media Web-sites regularly. However some of the survey participants never had their social media account, and some stopped to use it due to some reason. The basic argument not to use social networks is that such activity is associated with idleness, indulgence and vain pastime. Some informants told that they deleted their Web-pages, because they *“played with that for a long time”*. Most often people are registered in one social network, and that is enough for them. Only 1/3 of the sample are registered in two social networks or more.

The difference of the social network consumption between urban and rural population is quite noticeable. “In the 100 thsd. settlements Russian products “VKontakte”, “Odnoklassniki” and “Moi Mir” are rather popular. Those sites are used by 43% of Internet users in small cities and villages, compared with 23% in Moscow. They are in Top-5 of the most used sites”[15]. The survey affirms that the most popular online resource is “Odnoklassniki”, it is an undoubted leader. The next positions belong to “VKontakte”, “Facebook” and “Moi Mir”.

The reasons of selection of the particular social network are diverse. “Odnoklassniki” is popular because its interface is friendly and easy. Also many villagers and relatives use it as well. Great importance is given to the stylistic design of the Web-site, color solutions, various additional and available functions, such as gifts sending, on-line music listening, forming communities, the presence of “black list”. As for “VKontakte” interface, some respondents do not like it, and others are attracted by it. It is mostly popular among the younger users. “Facebook” is used mainly by the older people whose work is not connected with the country. They are realized professionally in the urban way of life. And this social network provides them an opportunity to communicate with a habitual circle of people. They are representing urban professional groups: doctors, photographers, businessmen, etc.

The average number of “friends” is about 50-70. However there is a group of active users who managed to collect 500-600 “friends”. Structures of “friends” groups are very diverse. Basically they are villagers, relatives, classmates, fellow students from colleges and universities, work colleagues, sometimes - online games friends. Interviewees pointed out often that they are connected with people that they know in person and offline.

Main purpose of social networks usage is communication. One of the respondents, 14 years old schoolgirl, formulated that quite well: *“...yeah, to sit, talk, chat, discuss somebody”*. The most popular pastime in the Net is exchange of messages in the selected group of friends, relatives and new acquaintances. The older generation is using social networks for communication with their children and other relatives, sometimes very numerous, that are studying in the city, serving in the army or moved to other regions of the country. Social networks are frequently used to find lost childhood friends and countrymen, classmates, former co-workers and colleagues. All new users pass this stage of forming his or her circle of online acquaintances, including new and/or regenerated contacts.

The other popular ways of social networks usage is playing online games and communication in groups on hobbies and interests. Respondents do use the last feature rather effectively. In this case users are getting the possibility to discuss problems connected with fishing, crafts, farming, gardening, sewing, etc.

It seems quite obvious that Internet consumption by rural audiences is changing from season to season. The main factor is the pressure of work in the garden. In summer social networks are more actively consumed during the “divine holidays” and days of bad weather, when it is not possible to work outdoors. Time of consumption is growing in the late fall and

winter. In general, we can conclude, that the level of activity of using social networks in the areas of the survey is high. Social networks is a part of the everyday practices of the villagers, they are gaining popularity among people of different age, professional and educational groups.

Conclusions

Taking into account the insufficient development of the Internet access infrastructure, we need to conclude based on two case studies, that Russian rural population is actively assimilating Internet, especially in the younger age groups. At the same time the level of media literacy and the ability of critical perception of information are very low among this part of the audience. The last thesis is proved, in particular, by a weak understanding of the problem of audiovisual piracy, which is actively discussed by Russian media. The Internet is perceived primarily as a source of entertainment, the main directions of its use are social networking and search of information for different casual purposes. The attitude towards e-Commerce and online advertising is cautious, and the experience of using Internet for financial operations is very limited.

«Rural Internet users reported using books and other printed materials at a higher level than their urban and suburban counterparts. At the same time, they reported using the Internet at a lower rate than their urban and suburban counterparts»[11]. This conclusion based on the survey of the US audiences by Pew Research Center's American Life Project in conjunction with the California Healthcare Foundation. In his article «Community Cohesion and Canadian Rural E-Mail Behavior»[13] Derek Wilkinson argues that in rural Canada e-mail use could be increased by developing greater computer skills. Both statements can be totally applied to Russia. The results of the survey corroborate that rural Internet consumption in Russia is developed in the framework of global trends having some features that are observed above.

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