

Summary

FORMATION OF COMPETENCES AND INNOVATIVE TRENDS IN THE E-LEARNING ENGINEERING EDUCATION INDUSTRY

A.V. Putilov, I.A. Baranova
National Research Nuclear University
"MEPHI"

This article is about the trends of innovation in e-learning of students. The authors describe some examples of using microknowledge, animation, simulation, gamification and chatbots.

MOTIVATIONAL TYPES OF PARTICIPANTS OF PROFESSIONAL RETRAINING PROGRAMS

S.M. Kazantseva
University of Tyumen

The demand for educational services in the Russian society is consistently high. In addition to the higher education services, additional education services and various types of retraining programs hold a large share of services structure. The main objective of the Training programs for management staff for the economic entities of the Russian Federation (Presidential programs) is training of specialists, primarily with engineering and technical educational background, in management of a modern organization. The article analyzes the main motivational types of participants of such programs. Identification of types is necessary for the proper design of training programs. According to the authors, there is a lack of attention to this problem, leading to the decline in the quality of training.

POPULARITY OF ENGINEERING PROFESSIONS: THE RESULTS OF OPINION POLLS

I.A. Kaplunov, E.V. Klyushnikova
Tver State University

The authors analyzed the current state of student's interest in scientific and technical direction, made a comparative analysis of the popularity of engineering professions and areas of training of higher education among the youth on the basis of the results of opinion polls, information and analytical materials on the results of monitoring the effectiveness of the educational institutions of higher education.

BALANCED SCORECARD AS A TOOL FOR FORMING A BLOCK OF BUSINESS EDUCATION IN A LEADING UNIVERSITY

A.A. Kozlova, A.V. Putilov
National Research Nuclear University
"MEPHI"

The article deals with topical issues related to the innovative development of the educational system. The article analyzes the role and place of education in the innovative development of economy and the place of the balanced scorecard in the part of business education formation. An experimental estimation of the parameters of the SSP for the leading university was carried out.

"THE FUTURE BEGINS TODAY": VIEW OF FIRST-YEAR STUDENTS

E.V. Kondrashova
National Research University Higher
School of Economics

Connection of professions of the future with engineering is considered in the given work. The paper is devoted to the questions as future work is seen by first-year students of engineering specialties and what requirements are formed at future engineers in the present

SUMMARY

SUMMARY

for successful realization of a profession in the future. In the paper the main requirements of future experts to the profession are revealed, and also major factors of choice of profession are reflected.

INTELLECTUAL GUIDANCE OF ENGINEERS IN THE UPDATES OF MODERN INDUSTRIES

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(National Research University)

The lack of reliable reference points of engineers, which determine the levels of changes in designs and technologies, created problems in planning and organizing the updates of modern industries. The article discusses the procedures for phased detection of level of changes in technologies and designs based on the cycle of interconversions of object and process systems.

ENGINEERING EDUCATION IN INNOVATION ECONOMICS

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Today's rapidly evolving market necessitates a close link between the decisions made in numerous academic fields such as physics, industrial engineering, and economics. This connection should find its reflection in modern engineering education. Underlying methodological basis for this work is the theory of technological modes, which rapidly gains popularity in Russia today. It is shown that engineering and economic environment is formed as a set of technological modes, which resolve the issues of coordinated development of technologies, integration of formal and systems methods, at alia. In the course of research, there have been developed models of dynamic technological modes which define the solution conditions for the stated issues. As a result, the article presents a number of models which form modern engineering knowledge along with an example of an academic course, its structure and analysis. It further illustrates the solution to the coordination issues and offers proper recommendations.

DEVELOPMENT OF TECHNICAL CREATIVITY IN SYSTEM OF TRAINING OF THE EXPERT

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Novosibirsk Industrial and Energy College

The article consider a problem of development of technical creativity as element of system of training of the qualified specialist. Forms and methods of the organization of technical creativity in Russia in the comparative analysis with the direction of this activity in other countries are investigated. The author imparts experience of the organization of occupations of the creative abilities aimed at the development, students and the achieved results. The offered conclusions give an experience transfer opportunity, in practical activities of other educational institutions.

THE PROBLEM OF FORMATION OF VALUE-SEMANTIC BENCHMARKS FOR FUTURE PROFESSIONAL ACTIVITIES

T.A. Fugelova
University of Tyumen

Modern education aims at the training of engineer, capable of performing the transformative activity. The formation of values and responsible attitude of future engineers to the world as the basis for "occurrence" in the culture taking into account the personal characteristics and specific conditions of their activity, the inclusion in innovative activity is the condition and prerequisite for the formation and development of their professional mobility.

IMPLEMENTING CDIO PROJECT-BASED LEARNING IN TRAINING OF HEAT AND POWER ENGINEERS

E.A. Boiko, P.V. Shishmarev,
D.I. Karabarin, A.A. Pikalova
Siberian Federal University

This paper presents the experience and current results of CDIO standards implementation in training of bachelors in Heat and Power Engineering at Thermal Power Stations academic department in Siberian Federal University. It provides information on methodology of modernization of educational programs, curricula and programs

of disciplines in transition to CDIO project-based learning technology. Preliminary assessment and analysis of lessons learned and scaling perspectives are given.

INTERIM RESULTS AND DIRECTIONS FOR FURTHER USE THE CDIO CONCEPT IN RUSSIA UNIVERSITIES

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Non-state Higher Educational Establishment "UMMC Technical University"

The interim results of CDIO implementation in domestic universities, as well as the directions for further use in the Russian Federation are presented. The paper analyzes the dynamics of academic publications on CDIO. The article also highlighted a list of factors that hamper the development of CDIO in Russian pedagogical practice. The set of recommendations is proposed, and an algorithm for introducing this approach into the practice of the university is described.

ABOUT THE BOLOGNA PROCESS AS IT INFLUENCED THE HIGHER EDUCATION IN RUSSIA

I.N. Kim
Far Eastern State Technical Fisheries University

Among a large part of the educational public there is a perception of the negative impact on national higher education caused by Bologna process. In the context of FESTFU we can say that the transition to tiered system of education has substantially changed educational and scientific activities of university. Regulatory framework was developed for ensuring educational and research activities in the format of Bologna process. It refreshed the activity of teachers, formed their educational and methodological culture, prepared them to make effective use of modern technologies in training and allowed to bring educational process to a qualitatively new level.

TECHNICALLY-ORIENTED EDUCATION PRACTICES FOR FUTURE ENGINEERS IN THE USA

I.A. Monakhov
Tver State University

The study examined technically-oriented education practices and the US Government's measures taken to support education engineering programmes. It concludes with the strengths and weaknesses of the support system that encourage youth to study engineering and choose engineering careers.

FEATURES OF IMPLEMENTATION OF CROSS-DISCIPLINARY LINKS IN THE SYSTEM OF TRAINING SPECIALISTS IN HIGHER EDUCATION IN THE FIELD OF 15.04.01 «MECHANICAL ENGINEERING» AND THE INCREASING ROLE OF A TECHNICAL SPECIALIST IN MODERN SOCIETY

I.N. Romanova, A.Yu. Krasnopevtsev
Togliatti State University

The paper considers the basic requirements for the development of model for implementation of cross-disciplinary links in training specialists in the field of mechanical engineering in order to increase their role in a modern society.

FEATURES OF THE FORMS OF REALIZATION OF TRAINING SPECIALISTS FOR DEFENSE INDUSTRIES

T.Yu. Dorohova
Tambov State Technical University

The paper describes the learning environment, accumulating resources of educational, scientific and industrial structures and enabling the involvement of students and masters in educational, scientific and research activities. Create a practice-oriented environment in the context of integrated scientific, educational and industrial structures allows to realize educational technology of practice-based learning, based on the activity approach, extending the application of the problem and project-based learning, aimed at generating innovative ideas.

SUMMARY

SUMMARY

DEVELOPING MASTERS-BUILDERS'S MANAGEMENT COMPETENCES USING MODERN EDUCATIONAL TECHNOLOGIES

M.S. Gusarova
Tyumen Industrial University

The article presents design of a unique course "Project HR-engineering" for Masters-builders aimed at developing managerial competencies. Within its framework, it is proposed that leadership skills are developed by using active learning methods: gaming, project teams, case studies, training. All this contributes to the development of leadership skills in a format of approaches to education known by engineers of the future (engineering and project).

MODELING IN VOCATIONAL EDUCATION

O.V. Ezhova
Kirovohrad Volodymyr Vynnychenko State Pedagogical University

The article is devoted to the problem of modeling as a method of research in vocational education. Classification of pedagogical models by the most essential signs: scope of application, form, structure, research object, development over time, extent of display of the main lines of system, extent of specification, the breadth of the scope of problems is developed. Each class of models is briefly characterized. The definitions of the concepts "specialist model", "specialist training model" are offered.

PROJECT-BASED TRAINING OF STUDENTS AND SCIENTIFIC RESEARCH ACTIVITIES OF HIGHER EDUCATION INSTITUTION

S.S. Kugaevskiy
Ural Federal University

The article analyzes the changes related to the issues of practice-oriented training of university students, gives an example of creating conditions for motivating students to conduct scientific research during the implementation of the project under the Resolution of the Government of the Russian Federation N218.

ANALYSIS OF THE TEXTS OF THE FEDERAL STATE STANDARDS OF THE LATEST GENERATIONS BY TECHNICAL PROFILES (UNDER THE DIRECTION "NUCLEAR PHYSICS AND TECHNOLOGY" (DEGREE "BACHELOR") ON THE SUBJECT OF "FOREIGN LANGUAGE"

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The article is given a comparative analysis of the federal state educational standards (GEF) of recent generations by the example of the field "Nuclear Physics and Technology" under the bachelor's program in the subject "Foreign Language". The main changes of the components, the standards of FSES 3 and FSES 3+ in the system of higher education are presented.

PEDAGOGICAL CONDITIONS OF SCIENTIFIC AND TECHNICAL CREATIVITY IN THE SYSTEM OF TECHNOLOGICAL PREPARATION

M.K. Romanchenko
Novosibirsk Industrial and Energy College

The article is devoted to problems of development of creative potential possibilities of pedagogical workers in the system of technological preparation of pupils. Analyzing the practice of scientific and technical creativity, the author shows the dynamics of the level of development of students from fifth to eleventh grade, traces the changes from the level of General introduction to the technology of production processes, to understand the essence of these processes and understanding of promising improvement. Defines the pedagogical conditions of scientific and technical creativity in the system of technological preparation of pupils, namely the idea of the development of the student social relationships to work, developing relevant skills such traits as: civic responsibility, patriotism, the need for employment. The main aim of this development is the recruitment of students to work, relying on their innate personal data, and training in the

application of modern science. Exploring the dynamic changes of cognitive interest of the student, the results of scientific research in the field of pedagogy, in order to ensure effective building technology training, the author proves a number of fundamental positions stated in the work.

EXPERIENCE IN THE DEVELOPMENT AND USE OF TSUAB EDUCATIONAL COMPUTER PROGRAMS FOR TEACHING SUBJECTS "STRENGTH OF MATERIALS" AND "STRUCTURAL MECHANICS"

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F.A. Krasina
Tomsk State University of Control System and Radio Electronics

The article presents the results of the work on the introduction into the educational process of the department «Structural Mechanics» of TSUAB of computer programs designed to solve problems in the disciplines «Strength of materials» and «Structural Mechanics». Programs allow to check the correctness of the results of the manual calculation, to quickly find and correct mistakes, to avoid a large volume of similar calculations. The developed computer programs have advanced interface, input data and results of calculation are presented in the usual form for the student; program distribution is free.

IMPLEMENTATION OF COMPUTER-BASED LEARNING PROGRAMS IN PROFESSIONAL FOREIGN LANGUAGE TRAINING OF FUTURE ENGINEERS

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I.A. Malinina
National Research University Higher School of Economics

The article touches upon the question of pedagogical rationale for implementing computer-based learning programs and offers the procedure of their usage in professional foreign language training of future engineers. The article considers peculiari-

ties of using multimedia on the first stage of foreign language training as well as computer-based checking programs during professional development of future engineers.

ORGANIZATION OF EDUCATIONAL ACTIVITY OF STUDENTS ON PREPARATION AND IMPLEMENTATION OF LABORATORY WORK IN PHYSICS

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Based on the analysis of advantages and disadvantages of techniques for carrying out laboratory works on physics, his own experience, described and justified method of activation of educational activity of students of a technical college in the laboratory of physics-based task approach. The expediency of using the system of specially selected and designed jobs and tasks in the allocated stages, interactive models, thereby increasing the learning outcomes.

ANALYSIS OF GRADUATES' EMPLOYMENT IN ENLARGED GROUPS OF PROFESSIONS

D.Yu. Baskakova, O.Yu. Belash
Saint Petersburg State Electrotechnical University "LETI"

The article analyzes employment indications of graduates of St. Petersburg universities in enlarged groups of professions. The research allows to identify groups of occupations with the most successful employment of graduates, and also distribution of universities in each of the enlarged group of professions according to successful graduate's employment.

TO THE QUESTION OF DIDACTIC CONDITIONS REDUCTION OF RISKS INDUSTRIALIZATION OF ENGINEERING EDUCATION

M.A. Dubik
Tyumen Industrial University

The paper describes the questions succession of the industrialization of engineering education, risks of the industrialization of engineering education, of didactic con-

SUMMARY

SUMMARY

ditions of reduce risks, importance of the problem of independent work of students with the textbook physics.

THE 50TH ANNIVERSARY VAZA: HIGHER EDUCATION IN TOGLIATTI, AS INDICATOR OF INNOVATIVE DEVELOPMENT OF "AVTOVAZ"

V.V. Yeltsov, E.M. Chertakova
Togliatti State University

The formation of the Volga automobile plant and Togliatti state University was carried out almost simultaneously, and developed these structures, interacting with each other in many areas, including research and innovation activities. Science largely contributed to solving production problems and create a theoretical background for the solution of some practical problems in the development of new technologies, equipment and materials. Staffing of the corps of PJSC "AVTOVAZ" also deserves great credit for TSU. The modern state system of higher education at TSU as a mirror reflects the state of development of PJSC "AVTOVAZ", representing a systemic crisis in science and production. For both structures characterized by the same problems, both objective and subjective: the lack of financial resources for conducting research, the reduction of engineering structures on the Vase and reducing the volume of University research, the subjectivity of decision making by top managers and the personnel "hunger" in the research field.

EXPERIENCE OF TRAINING STUDENTS IN PRODUCT QUALITY CONTROL USING CAD SYSTEMS FOR AUTOMATIVE INDUSTRY

E.N. Pochekuev, V.V. Yeltsov,
A.V. Skripachev
Togliatti State University

Training of competent specialists in the field of design of high-quality automotive products is impossible without using the modern systems for computer-aided design of processes and objects in the educational process. Siemens PLM Software NX environment is used within the training of bachelors in the field of 15.03.01 "Mechanical Engineering" in Togliatti State University.

Training is a comprehensive one and aims at improving the quality of products even in developing models. In the training of students, much attention is also paid to the quality control of products obtained by metal forming using CAE programs, such as Autiform, Deform and LS-DYNA.

MODERNIZATION OF PERSONNEL TRAINING FOR ECONOMIC DEVELOPMENT ANNOTATION

V.P. Soloviev, T.A. Pereskokova
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The article is devoted to the problem of necessity to modernize the staff training to ensure the growth of industrial production and a significant increase in the output of innovative product. The task of universities is to improve the pedagogical qualification of teachers for the effective use of modern teaching technologies, forming the students, fundamental competence – the commitment to quality.

It is proposed to discuss new principled approaches in the system of education and upbringing. The view was expressed that the preparation of graduates of technical direction of training at the bachelor level in the nearest future will become a brake on the development of modern innovative economy.

MISSION OF COMPETENCES IN THE FIELD OF QUALITY MANAGEMENT IN THE SYSTEM OF TRAINING MASTERS DIRECTIONS "BUILDING"

N.N. Aleksandrova
Tyumen Industrial University

The article reveals the role of competencies in the field of quality management when mastering master programs in the direction of "Building" in accordance with GEF 3+ and outlines the organizational and methodological foundations for its development within the discipline of "Quality Management".

**HUMANITARIAN VALUES
OF ENGINEERING AND THEIR ACTUAL-
IZATION BY STUDENTS IN EDUCATIONAL
PROCESS OF THE UNIVERSITY**

E.G. Belyakova
University of Tyumen
A.A. Melikhova
Tyumen Industrial University

The problem to develop axiological foundation of Engineering in modern education is still solved in terms of "knowledge"-based approach. The possibility to integrate humanitarian and technical components of educational content by activation psychological and pedagogical mechanisms of meaning-making is proved. All that lets to form sensible value and mean position, to embed humanitarian senses to vocational activity.

INTERACTIVE SIMULATORS EXAM

I.B. Docenko, V.V. Burkov, D.V. Burkov
Southern Federal University

The article presents the experience of using modern interactive tools for the creation and practical application in educational practice of electronic simulator of the exam. The structure of the simulator and highlights of the individual structural elements. A concrete implementation of the training complex of the exam in a separate discipline is examined on the example of Russian history.

**DEVELOPMENT OF CREATIVE GRAPHICAL
ACTIVITY**

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The article contains the actual problems of teaching descriptive geometry within the engineering specialties in the country's universities. The main tasks of the course of descriptive geometry are revealed. The current state of teaching the course in connection with Russia's entry into the Bologna process is given.

SUMMARY

**MANAGEMENT OF THE PROCESS
FINAL QUALIFICATION WORK IMPLEMEN-
TATION OF BACHELORS-BUILDERS BASED
ON THE END-TO-END COURSE PROJECT
TECHNOLOGY**

L.A. Kulgina, L.V. Peretolchina
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A.N. Rostovtsev
Novokuznetsk Institute (branch) "Kemerovo
State University"

In order to solve the problem of quality training of graduates of Bachelor's Degree programs in civil construction for complex engineering activities, it is necessary to shift to the new educational technologies and organizational forms of training. The article provides a model of the process of final qualification work implementation of bachelors-builders (methodology IDEF0) based on the end-to-end course project (EECP) technology. The positive results of the implementation of model in the educational process are presented.

**FOREIGN LANGUAGE TEACHING
SYSTEM IN TRAINING PROGRAM
"AIRCRAFT ENGINEERING"**

O.N. Martynova
Samara University

In the article it is discussed the problem of language teaching quality improving in non-linguistic higher education institutions. For students of the training program "Aircraft engineering" it is very important because of the current situation in this sector of the national economy. The article gives an analysis of some problems in foreign language teaching, describes and theoretically justifies the system of foreign language training developed in Samara University.

SUMMARY

**CREATING A GRAPHICAL CULTURE
OF STUDENTS IN VIRTUAL EDUCATIONAL
SPACE OF TECHNICAL UNIVERSITY**

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Siberian State Transport University

The purpose of article is the analysis of problems of developing graphical culture of student in modern virtual space of technical university. The graphical culture is determined in article as expression of a maturity and qualities, developed in virtual pedagogical space and efficiently realized in professional environment, which include the broad graphical worldview and the thesaurus formed by the system of graphical knowledge.

**CONTINUITY OF COMPUTER TECHNOLO-
GIES' MASTERING IS THE ESSENTIAL CON-
DITION TO TRAINING OF HIGH-QUALITY
OPTOTECHNICAL AND ELECTRO-OPTICIAN
INSTRUMENTATION ENGINEERS**

I.P. Torshina, Yu.G. Yakushenkov
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and Cartography

Training of optician-engineers and electro-optical specialists may be divided with informatics and computer technologies point of view at three stages: 1. studying of general principals of informatics and computer technologies, 2. training to computer methods with reference to typical blocks of optical and electro-optical systems typical blocks for optical and electro-optical systems designing, 3. training to computer modeling methodology for the system approach to electro-optical device designing as a whole.