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Summary

**HIGHER EDUCATION REFORMS
AND ACADEMIC COMMUNITY**

A.A. Dulzon
National Research Tomsk Polytechnic University

The paper aims at drawing academic community's and authority's attention to the systemic crisis of Russian higher education and the necessity for country-wide discussion to find rational crisis recovery. It studies the reasons and propagation of the crisis in the higher education and provides some solutions to overcome the problem. It underlines the necessity to involve wider academic community and Russian society in development of technologies to overcome crisis. The relevance of higher education institutions consolidation is put under reasonable doubt. The author highlights the necessity of balanced approach to the competition in the education system, with turning focus on comprehensive cooperation at all levels. The article suggests initial steps to ensure basic conditions for stability and further improvement of the university system efficiency. Therewith, it is crucial to ensure high standards of ethics and integrity of the academic community and management staff of the universities.

**ENGINEERING EDUCATION
AND TRAINING OF YOUNG ENGINEERS:
PRACTICE AND URGENT ISSUES**

L.N. Bannikova, L.N. Boronina,
Yu.R. Vishnevskiy
Ural Federal University named after the first President of Russia B.N. Yeltsin

The paper studies the role of education system in preparing engineering staff through developing new approaches to designing education programmes and new educational technologies. The conclusions are based on a survey conducted at big Ural industrial enterprises and multi-year engineering student monitoring.

**SOCIAL AND PROFESSIONAL
ADAPTATION OF UNIVERSITY
GRADUATES IN THE LABOUR MARKET**

E.V. Politsinskaya, A.V. Sushko
Yurga Institute of Technology (Branch) of the National Research Tomsk Polytechnic University

The article deals with the problem of adaptation of graduates of higher education institutions in the labor market in modern conditions. Based on the results of questionnaires and interviews with young specialists and employers, factors that influence the social and professional adaptation of graduates of higher education institutions are revealed. The viability of interaction of outcome-based, contextual, problem-based and personality-oriented approaches in the educational process to prepare a competitive specialist who is able to successfully adapt in the labor market is explored.

**PROFESSIONAL CULTURE
AS BASIS FOR ENGINEERING
MASTERS' PROFESSIONAL ACTIVITY**

Yu.V. Podpovetnaya, A.D. Podpovetny
South Ural State University
(National Research University)

Today, the enhancement of engineering master's competitiveness requires a cultural ground. The article justifies that the formation of a cultural ground is achieved through the development of a professional and project-oriented culture, as well as a scientific and methodological culture of master students within the process of engineering education. Both professional and project-oriented, and scientific and tutorial cultures are presented in the article as important qualities of engineering master students; their structural components are identified taking into account future masters' professional activities. The inability of the existing pedagogical models to solve the identified problem sets a task of developing two basic models:

a model providing focused development of a professional and project-oriented culture and a model for the development of a scientific and tutorial culture of engineering master students.

DEVELOPMENT OF INTEGRATED MANAGEMENT SYSTEM IN THE ENGINEERING SCHOOL

I.T. Zaika
Kuban State Technological University
A.P. Kovaleva
Ltd "InzhEkoProekt", Krasnodar

The article relates to integration of quality management systems of the university and the testing laboratory which is a part of the university according to the accreditation requirements to laboratories within the framework of the national accreditation system. It studies alternatives, areas, and degrees of the integration, and suggests a standard approach to IMS (Integrated Management System) based on ISO 9001 and ISO/IEC 17025, that eliminates possible risks in accreditation and allows achieving goals of the integrated management systems.

SOCIALLY ORIENTED APPROACH: PROFESSIONAL AND PERSONAL COMPETENCIES OF ENGINEERING GRADUATES

V.A. Pushnykh
Association for Engineering Education of Russia
I.B. Ardashkin, O.A. Belyankova
National Research Tomsk Polytechnic University

The paper addresses development of engineering graduates' competencies in terms of social position rather than economic, traditional, viewpoint. It emphasizes the importance to develop internal University culture that brings up engineers' responsible attitude to their professional activity. The authors provide some survey data related to TPU students' internal culture research.

SUMMARY

PROFESSIONAL-ORIENTED EDUCATIONAL ENVIRONMENT FOR SUPPORTING THE DEVELOPMENT OF CHILDREN'S TECHNICAL CREATIVITY ON THE BASIS OF NETWORK INTEGRATION OF INFRASTRUCTURE RESOURCES OF EDUCATIONAL ORGANIZATIONS

A.V. Isaev, L.A. Isaeva
Volgograd State Technical University

The article presents the concept of network interaction of regional educational organizations within the framework of the programmes supporting children's technical creativity. The urgency of the development of mechanisms for network interaction is considered. An example of realization of network interaction within the framework of the project "Medical measuring systems and robotics" is given. The project is aimed at popularization among schoolchildren and young people of research activities in the field of electronic and technical devices.

MODULAR TRAINING OF SPECIALISTS ON INNOVATIVE DESIGN IN MECHANICAL ENGINEERING

N.K. Krioni, M.B. Guzairov, S.G. Selivanov, S.N. Poezjalova
Ufa State Aviation Technical University

The basic concepts of modular training of specialists on innovative design in mechanical engineering are presented in the article. The concept of continuous innovative training of specialists on the example of the "Innovatics" module is illustrated. The description of educational and methodical teaching materials for "Innovatics" module is provided as an option for realization of electronic and distant teaching and learning methods.

SUMMARY

CONCEPT OF SUBJECT AREA "TECHNOLOGY" AS A WAY TO MODERNIZE LEARNING CONTENT AND METHODS AT MODERN SCHOOL

D.A. Makhotin
Moscow City Teacher Training University
A.K. Oreshkina, N.F. Rodichev
Russian Academy of Education
O.N. Logvinova
Academy of Social Management

The paper presents the main idea of "Technology" concept developed by the team in Russian Academy of Education. The concept distinguishes the basis and the main areas of learning content and methodical modernization in technology education at Russian schools.

INNOVATIVE TECHNOLOGY FOR MASS TRAINING: CASE STUDY OF E-COURSE "MECHANICAL ENGINEERING"

S.A. Berestova, N.E. Misyura, E.A. Mityushov
Ural Federal University named after the first President of Russia B.N. Yeltsin

The paper describes a course "Mechanical engineering" set up on the National Open Education platform. The course has a well-balanced system of authors' solutions, special practice-oriented tasks that encourage students to learn and develop engineering thinking. The disguising features of the course are weekly-based structure that allows controlling students' independent work, a practical-cognitive module, and an interactive programming module.

MONITORING MATH COMPETENCY OF IT STUDENTS

S.M. Dudakov, I.V. Zakharova
Tver State University

The paper studies a method to develop testing and assessment materials, which is based on splitting "classical" parts of mathematics into smaller disciplines. It reveals the opportunities of the method in terms of competency-based approach.

CONCURRENT ENGINEERING APPROACH TO TEACHING FUNDAMENTALS OF GEOMETRY AND GRAPHICS IN HIGHER ENGINEERING SCHOOL

E.V. Usanova
Kazan National Research Technical University named after A.N. Tupolev – KAI (KNRTU-KAI)

The paper proves the efficiency of teaching fundamentals of geometry and graphics in the context of concurrent engineering and provides the results of problem- and project based team work performed by students within the scope of blended learning programme. Educational resources of the course comprise materials for declarative learning (educational tools based on GDP – PPT animation, logical schemes with frames, videos) and procedural learning (CAD-systems, graphic tests, different level tasks).

TOWARDS GENERAL DEVELOPMENTAL CURRICULUM "FUNDAMENTALS OF MATHEMATICAL ENGINEERING MODELING"

I.S. Soldatenko, S.V. Sorokin, I.V. Zakharova, O.N. Medvedeva
Tver State University
O.A. Kuzenkov
Lobachevsky State University of Nizhny Novgorod

An innovative general developmental curriculum is suggested for extra school training. It has been developed within the framework of the Russian Education Ministry assignment aimed at establishing nation-wide practice-oriented science and technology clubs for engineering creativity. Distinctive features of the curriculum are project-based learning and an emphasis on mathematical modeling in design and engineering. The purpose of the programme is to promote the engineering profession and education in the country, develop the bases for engineering thinking of a new type in upper form pupils. This type of thinking is required to solve the problems of the new generation associated with intelligent control, artificial intelligence and other issues commonly known as "Future Engineering".

**PERSPECTIVES OF SMART SYSTEM
MATH-BRIDGE FOR LEARNING ARRAY
SORTING METHODS**

S.A. Fedosin, A.V. Savkina,
E.A. Nemchinova, N.V. Makarova
Ogarev Mordovia State University

The article proposes the use of Math-Bridge smart system as a tool to train and control knowledge of engineering students in the methods of sorting arrays.

**EDUCATIONAL TECHNOLOGIES
IN ENGINEERING EDUCATION:
MULTIDISCIPLINARY APPROACH**

A.A. Shehonin, V.A. Tarlykov,
A.Sh. Bagautdinova, O.V. Kharitonova
Saint Petersburg National Research
University of Information Technologies,
Mechanics and Optics

The article discusses the issue of implementation of multidisciplinary approach in engineering education through the construction of modular educational programmes, the implementation of network forms of education, as well as the use of interactive learning technologies. It is emphasized that the use of interactive technologies in the learning process is the first step in the implementation of interdisciplinarity on the level of educational programme's content aiming to foster competences of future engineer.

**INTERDISCIPLINARY PROJECT – BASIS
FOR DESIGNING STUDY PROGRAMMES**

A.A. Shehonin, V.A. Tarlykov,
A.Sh. Bagautdinova, O.V. Kharitonova
Saint Petersburg National Research
University of Information Technologies,
Mechanics and Optics

The specifics of engineering activity lie at the root of projects' implementation. An ability to independently develop and implement projects, as well as to assess their impact and significance is a necessary competence of each graduate. Thus, the core component of training competitive specialists is the introduction of interdisciplinary projects to the learning process. These projects are discussed in the article as a basis for designing of professional study programmes for higher education.

**VIRTUAL LABS IN ENGINEERING
EDUCATION**

S.V. Sorokin, I.V. Sorokina, I.S. Soldatenko
Tver State University

The article deals with the use of virtual labs in engineering education. The programmes which allow simulation of electronic circuits and robotic systems have been considered. The analysis is based on the use of virtual labs in the distant course "Practical engineering education" for pupils. The programme is designed by the authors.

**REWARDING LEARNING OF MATHS
IN ENGINEERING SCHOOLS:
LABORATORY WORKS**

V.A. Akimushkin, S.N. Pozdnyakov,
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Saint Petersburg State Electrotechnical
University "LETI"
S.V. Rybin
Saint Petersburg State Electrotechnical
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Research University Information Technolo-
gies, Mechanics and Optics

The approach to development and use of laboratory works in training discrete mathematics and mathematical logic is suggested in the article. It is based on the computer tools to develop and improve productive thinking. The works involved are based on modeling subject field, they include target setting which determines students experimental and constructive activities as well as resources for automatical evaluation of partial solutions submitted by students. Experiment results have shown a significant increase in efficiency as compared to the multiple choice tests.

**DESIGNING ICT EDUCATION
PROGRAMMES BASED
ON PROFESSIONAL STANDARDS**

I.V. Zakharova, S.M. Dudakov,
I.S. Soldatenko
Tver State University

The article describes experience of the Russian universities in designing education programmes in the field of information and communication technologies based on professional standards.

SUMMARY

SUMMARY

**TOWARDS THE ISSUE OF QUALITY
OF ENGINEERING EDUCATION**

S.B. Mogilnitskiy, E.E. Dementeva
National Research Tomsk
Polytechnic University

The article considers issues related to the quality assurance of higher engineering education, examines the global experience in this regard and ways to deal with the challenges. It is shown that one of the principal mechanisms to ensure and assess the quality of education is a professional and public accreditation (PPA) of education programmes (EP). The purposes and objectives of the professional and public accreditation, benefits for graduates of accredited programmes in the career development of a professional engineer are described. The practice and outcomes of the activities of the Association for Engineering Education of Russia (AEER) in the accreditation of education programmes in the field of engineering and technology are presented.

**ANALYSIS OF EVALUATION CRITERIA
FOR THESIS**

V.P. Kapustin, D.Yu. Muromtsev,
Yu.V. Rodionov
Tambov State Technical University

The article addresses the problem of raising thesis quality. The authors specify what scientific research is, determine its peculiarities, introduce the evaluation criteria for thesis and provide a list of reviewers.

**QUALITY OF FURTHER PROFESSIONAL
EDUCATION: NEW TRENDS
IN ASSESSMENT AND RECOGNITION**

V.G. Ivanov, M.F. Galikhanov
Kazan National Research
Technological University
N.N. Aniskina
Pastukhov State Academy
of Industrial Management

The article deals with the technology of independent assessment and recognition of quality of further professional education.

**VOCATIONAL EDUCATION
AND TRAINING SCHOOLS IN TERMS
OF STUDENT MIGRATION IN RUSSIA:
CHALLENGES AND PROSPECTS**

S.V. Dryga
National Research University
"Higher School of Economics"
D.V. Poletaev
Regional Public Organization "Migration
Research Center"

The paper considers social, economic, and demographic effects of attracting foreign students to vocational education and training schools in Russia. The authors investigate challenges and prospects of increasing national share in the export of educational services in this sector.

**CAREER GUIDANCE AND COUNSELLING
TO DEVELOP ENGINEERING EDUCATION
AT SCHOOL AND UNIVERSITY:
TECHNOLOGIES AND MODELS**

O.V. Shatunova, T.I. Anisimova
Elabuga Institute, Kazan Federal University

The paper deals with psychological and pedagogical aspects of engineering career guidance provided for pupils. It describes the experience of Elabuga Institute, Kazan Federal University, where they efficiently implement career guidance activities and develop engineering education based on interaction between school and university. One of the priorities is to involve pupils into research and technical activities through participating in innovation projects developed by the university.

**PRE-UNIVERSITY ENGINEERING
TRAINING FOR CHILDREN**

I.V. Vylegzhanina
Vyatka State University

The paper considers engineering training provided for children in terms of its objectives, content, methods, and ways of implementation.

FOREIGN LANGUAGE TRAINING FOR ENGINEERING STUDENTS (AIRCRAFT AND HELICOPTER INDUSTRY): SYSTEMIZING TRAINING CONTENT

S.E. Tsvetkova
Nizhny Novgorod State Technical University named after R.E. Alekseev
I.A. Malinina
National Research University "Higher School of Economics"

This paper deals with particularities of content of foreign language training provided to aircraft and helicopter engineering students. The educational information input is suggested to be systematized with regard to learning stages. The authors consider types of linguistic skills and relevant training methods aimed at effective acquisition of the input information.

QUALITY MANAGEMENT COMPETENCY AS AN ESSENTIAL COMPONENT OF PROFESSIONAL QUALIFICATION OF ENGINEERING GRADUATES

S.B. Venig, S.A. Vinokurova
Saratov State University named after N.G. Chernyshevsky

The authors focus on developing quality management competencies conducting the case study of education programme "Materials Science and Technology of Materials". The authors consider the skills of quality management to be crucial for today's engineering graduates and suggest enhancing Bachelor and Master of Engineering curricula with practice-oriented disciplines, modules, and practices, with relevant examples given.

CLUSTER APPROACH TO ENGINEERING TRAINING FOR MACHINE BUILDING INDUSTRY IN SINGLE-INDUSTRY TOWN

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Kh.R. Kadyrova
Zelenodolsk Institute of Engineering and Information Technologies (Branch) of Kazan National Research Technical University named after A.N. Tupolev - KAI

The article describes a cluster approach to engineering training for enterprises of a single-industry town; the case study is a branch of the oldest Kazan technical university. The cluster strategy is implemented via integration of educational institutions and industrial enterprises.

A PRACTICAL EXAMPLE OF PROFESSIONAL STANDARDS INTEGRATION INTO THE EDUCATIONAL PROCESS OF A NATIONAL RESEARCH UNIVERSITY

E.V. Omelyanchuk, O.P. Simonova, A.Yu. Semenova
National Research University of Electronic Technology "MIET"

The article focuses on the issue of aligning HEI study programmes with the present-day circumstances. A problem of major discrepancy between the higher education standards and the requirements of professional community has been indicated. The article justifies as the problem solution the implementation of additional competences which should guide graduates to carry out work functions introduced by professional standards.

MODERN MODELS OF TRAINING A PROFESSIONALLY-MOBILE SPECIALIST

T.A. Fugelova
Tyumen State University

The main reasons hindering the establishment and development of professional mobility of a future engineer in the socio-cultural educational space of a technical HEI are: the orientation of technical universities to the previously established model of training future engineers and the underdevelopment of the content of future engineers' training. A student has to learn the logic of the development of science, learn how to get knowledge, and get engaged in real professional activities within the learning process of a university.

GENERATION OF MACROREGIONAL NETWORK INNOVATION- AND EDUCATIONAL CLUSTER IN THE NORTH CAUCASIAN FEDERAL DISTRICT

M.Kh. Abidov, S.E. Savzikhanova, L.A. Borisova
Dagestan State University of National Economy

This article validates the generation practicality of the network innovation- and educational cluster, which would combine leading universities of the macroregion, research- and infrastructure entities and the business community. The main difference between the proposed model of the cluster generation and the existing ones is that originally the initiative of cluster establishment comes from entrepreneurs, who are interested in investments in the development of innovation- and educational activity of the macro-region, and the North Caucasian Federal District (NCD) in particular. This article also proposes patterns of networking cooperation of the cluster participants, in order to optimize expenses in the course of cluster creation and operation.

ENGINEERING MODELING: EDUCATIONAL PRACTICE ANALYSIS

O.N. Medvedeva, O.V. Zhdanova, I.S. Soldatenko
Tver State University

The paper studies a wide variety of additional education programmes and courses in engineering modeling ranging from radio technical simulation and robotics to mathematical modeling. It provides a detailed analysis of the courses according to some particular criteria. It proves that the programme implementation at different education levels depends on specific features of the institute and target student audience.

INTEGRATED LABORATORY SYSTEM

N.V. Anisimov
Kirovograd State Pedagogical University named after Vladimir Vinnichenko

This paper presents an integrated laboratory system, which enables to conduct laboratory work in "Electrical Engineering with the Basics of Industrial Electronics", "Electronics", "Electrical Work" and others in the course of teaching complex electrical and electronic professions. The design of the system enables to perform physical simulation of laboratory work by integrated plug-in units and also electronic simulation by a personal computer.