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Summary

CDIO: OBJECTIVES AND MEANS OF ACHIEVEMENT

S.A. Podlesny, A.V. Kozlov
Siberian Federal University

The system of CDIO standards in terms of implementation in Russian engineering education is analyzed. Particular attention is paid to the scientific and methodological elaboration of «Conceive» stage. To increase the efficiency of this stage, domestic TRIZ methodology is considered. Relevant didactics, CAI programs and virtual environments of professional activity are proposed. It is indicated that international standards are more effective when they are implemented in educational-scientific-industrial (innovation) complexes.

MODERNIZATION OF ENGINEERING EDUCATION BASED ON INTERNATIONAL CDIO STANDARDS

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The concept of engineering education modernization based on CDIO (Conceive, Design, Implement, Operate) Standards is considered. Comparative analysis of the CDIO Syllabus and the Association for Engineering Education of Russia accreditation Criterion 5 is given. The experience of the CDIO Standards implementation at Tomsk Polytechnic University is discussed. The CDIO Academy programme for Russian universities faculty professional development is described.

INTEGRATED CURRICULUM DEVELOPMENT IN INDUSTRIAL ENGINEERING PROGRAM USING CDIO FRAMEWORK

N. Kuptasthien, S. Triwanapong, R. Kanchana
Rajamangala University of Technology Thanyaburi, RMUTT, Thailand

This paper shares Thai industrial requirements on new graduates entering real-life workplace and the development of an integrated curriculum using CDIO framework. The result from a questionnaire survey showed high needs for personal and interpersonal skills with strong industrial engineering background. These skills were integrated into courses in 4-year program.

EXPERIENCE AND PRACTICE OF MANAGEMENT PROBLEM SOLUTION AT CDIO IMPLEMENTATION IN UNVERSITY EDUCATION

P.M. Vcherashniy, N.A. Kozel'
Siberian Federal University

There have appeared a great number of management problems at universities first introduced CDIO ideology. Taking into account the fact that the ideology itself leads to critical technologies development in the current education system, solution of management problems is to result in significant changes in a university. The article lists and describes the problems solved in a definite university and the results.

CDIO WITHIN THE SYSTEM OF CONTINUOUS EDUCATION "FROM SCHOOL TO HEI": STAGE "CONCEIVE" AT SCHOOL

O.V. Sidorkina, T.V. Pogrebnaya
Siberian Federal University

The article describes the system of methods to reveal potential intellectual giftedness of pupils. The system is designed by the authors and based on TRIZ-pedagogy. Within this system the pupils, who are regarded as future university applicants, are related to innovative HEI (high education institution) through innovative project activity. The authors have analyzed how appropriate the system is to introduce stage "Conceive" at school preparation for HEIs implementing CDIO system.

CONTENT AND AIM OF THE DISCIPLINE "INTRODUCTION TO ENGINEERING" WITHIN THE WORLDWIDE CDIO INITIATIVE

S.I. Osipova
Siberian Federal University

The comparative analysis of FSES of the higher professional education and CDIO standards has revealed that design-innovation competency as the ability and willingness to implement the entire cycle of product or system development is learning outcome of engineering education. The article considers the value and role of the discipline "Introduction to Engineering" and its significance in the process of design-innovation competency development.

STUDENTS AS AGENTS – CONNECTING FACULTY WITH INDUSTRY AND CREATING COLLABORATIVE PROJECTS

L.B. Jensen
Technical University of Denmark, Lyngby, Denmark

Collaborative projects between partners in the building industry and students constitute important means for addressing more advanced parts of the CDIO Syllabus 4. In this paper an existing internship program is revised in order to enhance collaboration between industry and faculty/students and perform as vehicle for addressing challenging parts of the CDIO syllabus.

PROJECT ACTIVITIES IN THE DEVELOPMENT OF ENGINEERING THINKING

T.V. Dontsova, A.D. Arnautov
Siberian Federal University

The article discusses the problem of educating a next generation engineer, who is able to think in terms of process. The particularities of engineering thinking being analyzed, the project activities are considered relevant to develop engineering thinking. The discipline «Introduction to Engineering Design» is proposed as an element within the system of project-based education provided at Siberian Federal University in accordance with CDIO international initiative.

IT PROFESSIONAL STANDARDS AS A FACTOR INFLUENCING THE SYLLABUS OF IT TRAINING COURSES. IMPLEMENTATION OF PRACTICE-ORIENTED LEARNING AT NARFU

N.V. Chicherina, O.D. Bugaenko,
E.E. Ivanova, E.V. Rodionova
Northern (Arctic) Federal University
named after M.V. Lomonosov

The paper covers education program development according to Russian and international professional standard requirements, development of IT specialist competency model, choice of training paths and learning outcomes with regard to international recommendations.

PRACTICE-ORIENTED EDUCATION AT NORTHERN (ARCTIC) FEDERAL UNIVERSITY

O.D. Bugaenko, E.E. Ivanova,
E.V. Rodionova
Northern (Arctic) Federal University
named after M.V. Lomonosov

The article examines implementation of team design projects embracing the principles of interdisciplinary and practice-oriented training into education programmes. The urgency of launching the project aimed at developing not only engineering design skills but also personal and interpersonal skills is outlined.

MATHEMATICS IN ENGINEERING EDUCATION WITHIN THE FRAMEWORK OF CDIO STANDARDS: METHODOLOGICAL ASPECT

V.M. Fedoseev
Penza State Technological University

The article describes the CDIO standard effect on the teaching methods of mathematics in technical institutions and focuses on the integration tools in

mathematical and engineering training. Teaching tools in designing learning activities to implement the integration objectives and recommendation of their application during the teaching process have been examined based on a specific example.

COMPETENCES AND ENGINEERING STAFF IN THE SPHERE OF ENERGY CONSERVATION AS A BASE FOR RETRAINING PROGRAM DESIGN

S.D. Vaulin, I.A. Voloshina,
I.O. Kotlyarova
South Ural State University
(National Research University)

Demand for the personnel capable of taking innovative decisions and designing innovative facilities conditions the necessity for training managerial and engineering staff. The offered programs of three types based on the energy conservation competence models of managerial and engineering staff contribute to the solution of professional problems and development of competences in planning, design, production, implementation in the conditions simulating professional activity.

APPLICATION AND DEVELOPMENT OF CDIO ENGINEERING EDUCATION MODE IN UNDERGRADUATE SCIENCE PROGRAM

J. Zhou
Chengdu University of Information
Technology, Chengdu, P.R. China

Enlightened by successful implementation CDIO (Conceive, Design, Implement, and Operate) in Engineering Program, CDIO is applied to undergraduate science program in Chengdu University of Information Technology. In this work, CDIO is adapted into science program as a systematic framework including setting explicit professional training standards, reconstructing curriculum system, optimizing theoretical and experimental teaching mode, and intensifying process assessment. The results show that the adaptation of CDIO can inspire the interests of study as well as the practical ability of students in undergraduate science program.

ACTIVE TEACHING METHODS IN PROFESSIONAL CONTENT-BASED ENGLISH LANGUAGE LEARNING AS AN IMPORTANT COMPONENT OF CDIO CONCEPTS (PROFILE/SPECIALIZATION 12.03.01 "INSTRUMENT ENGINEERING")

V.S. Ivanova, K.V. Mertins
National Research Tomsk Polytechnic
University

The article describes the possible quality provision of engineering training in profile (specialization) 12.03.01 "Instrument Engineering" via developing a creative environment. Examples of applying active teaching methods in compliance with CDIO Initiatives are discussed.

APPLICATION OF INTERNATIONAL CDIO STANDARD AND INNOVATIVE APPROACH IN THE METHODOLOGY OF SCIENTIFIC CREATIVITY

M.N. Prosekova
Tyumen State Oil and Gas University

Innovative methods of scientific work combined with the international CDIO initiative criteria are new approach to engineering education. The article presents the assessment tools and evaluation techniques which can be applied during various master's thesis project stages, with main focus being paid to "production" in parts "testing" and "validation". The present article is the continuation of the work done previously.

CDIO INITIATIVE AND PROBLEMS OF ACTIVE LEARNING IMPLEMENTATION IN ENGINEERING EDUCATION

Yu.P. Pokholkov, K.K. Tolkacheva
National Research Tomsk Polytechnic
University

The article considers recommendations of CDIO Standards on active learning methods and their application to the problems in the system of engineering education. Contradictions between the

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organization of educational process and conditions for active and effective learning (interactive, practice-oriented, problem-based and project-based learning) are discussed as the main reason of the above stated problems. To overcome the contradictions it is importnat to make significant changes in the planning and organization of training, as well as in the requirements for qualifications of teachers, that are critical for teachers' ability to use modern methods and techniques to ensure students' involvement in the learning process.

ACTIVITY OF THE ENGINEERING TEACHERS ASSOCIATION TO IMPLEMENT CDIO CONCEPTS

Yu.V. Podpovetnay
South Ural State University
(National Research University)

The article examines a new approach to higher engineering education based on the introduction of the CDIO concept. The possibilities to implement the world CDIO initiative standards which enable university faculty to design educational process in the modern way so that students' motivation to learn is constantly motivated are outlined. The experience of the Ural Engineering Teachers Association in implementing CDIO concepts to improve educational process is presented.

TEAM-BUILDING FOR IMPLEMENTING INNOVATIVE EDUCATION PROGRAM WITHIN CDIO IDEOLOGY

S.I. Osipova, E.A. Rudnitsky
Siberian Federal University

It have been revealed that to improve the quality of engineering education it is required to build a creative team of teachers for developing innovative framework which guarantees adaptation and implementation of CDIO ideas. The article presents the experience in team-building including selection criteria. The task to create the unified team of teachers, students, employers and University authorities is set.

HUMAN RESOURCE MANAGEMENT FOR DEVELOPING BASIC EDUCATION PROGRAM IN CDIO IDEOLOGY

N.V. Gafurova, O.A. Osipenko
Siberian Federal University

The article highlights the issue of human resource training for CDIO ideology implementation. The authors suggest improving CDIO program by paying special attention to human resource management that involves all the stakeholders of the program: teaching staff, university managers, university applicants, students and employers representatives.

CDIO STANDARDS IMPLEMENTAION. TUSUR UNIVERSITY CASE STUDY

M.E. Antipin, M.A. Afanasyeva,
E.S. Shandarov
Tomsk State University of Control Systems and Radioelectronics

The paper presents the TUSUR University case study in implementing CDIO standards. The authors describe how TUSUR University manages to apply CDIO principles at different levels, from one discipline to the whole educational program.

MOBILE SOFTWARE ENGINEERING FIELD: INNOVATION IN EDUCATION TO SHAPE THE ENGINEER PROFILE

Z.C. Chagra
The Private High School of Engineering and Technologies

During 2011, the Private High School of Engineering and Technologies (ESPRIT) came to decide that modifications ought to take place in the study plan within the school. The mobile section is one of the main fields that were born after a global analysis of several profiles and engineering technologies. This paper addresses a model of mobile software engineering taught through the mobile section curriculum.

SUPER COURSES, A BRIDGE BETWEEN UNIVERSITY AND INCUBATOR

I. Shimi
The Private High School of Engineering and Technologies

Engineering studies are based mainly on projects and Implementing solutions and are the most required selection criteria in the industrial market, particularly during economic crisis where finding jobs isn't guaranteed anymore and only Operational engineers can become job creators. To help engineers become future entrepreneurs, super courses or accelerated undergraduate studies are becoming necessary to provide extracurricular experience in a short period of time. Here comes the important role of CDIO standards, which helps alot engineering students from designing patterns to integrate the professional world.

INTRODUCING CDIO AS A TOOL FOR NARFU EDUCATIONAL PROGRAMS

N.V. Chicherina, E.E. Ivanova,
M.A. Korelskaya
Northern (Arctic) Federal University named after M.V. Lomonosov

This article describes the enhancement of upgraded engineering education programs based on international CDIO standards within the framework of Northern (Arctic) Federal University n.a. M. Lomonosov.

EXPERIENCE AND FURTHER REFLECTIONS ON PRACTICE-BASED LEARNING DEVELOPMENT AT OMSK STATE TECHNICAL UNIVERSITY

V.V. Shalay, L.O. Shtripling, N.A.
Prokudina
Omsk State Technical University

The article discusses experience and prospects of practice-based learning development at Omsk State Technical University through the establishment of resource centers and basic academic departments in corresponding enterprises, as well as implementation of CDIO standards.

COLLABORATIVE PROJECTS WITHIN «STUDENT – FACULTY – ENTERPRISE» SYSTEM AS MEANS OF PROFESSIONAL COMPETENCY DEVELOPMENT

M.Yu. Chervach, Yu. B. Chervach
National Research Tomsk Polytechnic University

The article reviews student involvement in professional business project development at HEI engineering department from the CDIO model perspective. The extent of student engagement in stages of conceiving, designing, implementing, and operating is analyzed. Possible roots for project activity development within the CDIO framework are proposed.

WORLDWIDE CDIO INITIATIVE, SINGAPORE IMPLEMENTATION EXPERIENCE

E.O. Akchelov
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This article is dedicated to analysis of CDIO standards implementation in Singapore Polytechnic curricula. This paper presents evidence of compliance of Singapore Polytechnic curricula with CDIO standards. It is considered that experience of CDIO implementation in Singapore Polytechnic is successful.