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IMPLEMENTATION OF CDIO AT THE EAST-KAZKAHSTAN TECHNICAL UNIVERSITY

Assiya Mashekenova[1], Anatoli Vakhguelt[2*], Oxana Denissova[3]

[1,3]Administration of Academic Affairs, D.Serikbayev East-Kazakhstan Technical University, Kazakhstan.
[2]School of Mechanical Engineering, D.Serikbayev East-Kazakhstan Technical University, Kazakhstan.

[*]Corresponding author

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The international initiative CDIO (Conceive-Design-Implement-Operate) is the main principle of an innovative educational environment for training a new generation of engineers.

The development of the CDIO concept began in the late 1990s in the United States as a response to employers' dissatisfaction with the fact that university engineering education was too far removed from practice. Officially, the CDIO community came into existence in 2000 through a collaboration between the Massachusetts Institute of Technology, Chalmers University of Technology, Linköping University, and the Royal Swedish Institute of Technology [1].

In accordance with the CDIO concept, educational programs and technologies for their implementation should be aimed at training engineers who are able to provide support for complex engineering products, processes and systems in a modern environment throughout the entire life cycle and be aware of the responsibility for the economic, environmental and technological consequences of their actions. In fact, the concept of CDIO is a comprehensive integrative approach to the organization of the educational process and the formation of an appropriate university environment to train a new generation of engineering elite.

To date, CDIO has covered more than 150 universities in 30 countries.

Members of the largest international project CDIO develop and implement a progressive and modern concept for improving engineering education at the undergraduate level in the universities participating in the project. This is an international project aimed at eliminating contradictions between theory and practice in engineering education. The new approach involves strengthening the practical orientation of training, as well as the introduction of a system of problem-based and project-based learning.

The general task of a modern engineering university is to prepare graduates who are able to plan, design, produce and apply complex engineering objects, processes and value-added systems in modern conditions with a team work. We see that this educational approach really promises good results and will help us educate a new generation of engineering personnel. Not a single university of Kazakhstan is represented in the CDIO initiative, EKTU named after D. Serikbaev became the first university.

The implementation of the CDIO approach in the training of engineering personnel at EKTU is an integral part of the large-scale modernization of the educational activities of the university, aimed at creating a student-oriented educational environment, developing educational programs of a new generation, developing academic independence and responsibility of students, and improving the skills of teachers and scientific and pedagogical staff. The main goal of joining the EKTU to the "Worldwide CDIO initiative" is to improve

the quality and effectiveness of engineering educational programs, bringing them into line with the requirements of modern production.

Over the past three years, at our university it has been implemented a number of initiatives:

1. In recent years, the University has carried out serious work on the development and implementation of the Practice-Oriented Learning Model. This system is implemented on the principles of continuity and accumulation of learning outcomes at the stages of "pre-university - university - post-university" Practice-oriented training is implemented in 14 industry-specific Competence and Technology Transfer Centers (CTTC) and in the Center of Excellence in the field of metallurgy and materials science.

2. In the 2021-2022 academic year, 21 best accepted to the university students have participated in the "Leaders of Engineering Education" (LEE) project. 5 of them, second-year students, of this LEE project were approved for the scholarship program from the enterprises of Kazzinc LLP. An agreement was signed with the condition of passing industrial practice with this subsequent employment.

3. To obtain initial skills and abilities in the future profession, 21 programs for the formation of basic engineering qualifications (BIQ) were developed as part of the educational programs (EP) through the implementation of the 1st year course "Introduction to engineering education" at our CTTCs.

4. In February 2022, the EKTU team visited two universities – Tomsk Polytechnic University and Tomsk State University of Control Systems and Padioelectronics, which are members of the Worldwide CDIO Initiative. We learned their experience of the CDIO standards introduction into the educational process in order to systematize and deeper implement project-oriented education. The problems of ensuring the quality of higher education, the modernization of engineering education based on Worldwide CDIO standards were discussed. Experience of implementation of the CDIO initiative at the universities were discussed.

5. We are using our project "Managing the effectiveness of educational programs" which was implemented in 2020 to for analyzing the quality and effectiveness of EPs and assessing their impact on the innovative development of the industry and the region. E-Monitoring was developed, which allows us to monitor the dynamics of the criteria base and the integral indicator of the effectiveness of the EP in real time.

6. The implementation of the student-centered approach and the relationship between the objectives of the EP, expected results and assessment methods are prescribed in the working curricula (syllabuses). Teaching staff presents types of assessment tools that allow to check effectively the availability of planned results and assess the level of mastering the discipline.

7. Specialized accreditation of 12 EPs of the university corresponding to 12 CDIO standards was carried out in the International Accreditation Agency - ASIIN.

As part of the additional program (Minor), a pool "Project design" was developed for all EPs at 2,3,4 years of study. Profile disciplines developed jointly with the leading enterprises of the region and the country. An obligatory part of the educational process are personal and group projects of students. At the end of the academic period, students present their work at the student conferences to staff, fellow students and employers.

Employers are actively involved in the educational process as teaching staff, EP developers, and leaders of final year projects. All our students participate in industrial practice at the enterprises at the end of each year of study.

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