

COMPETENCY-BASED APPROACH AND INTEGRATION OF PROFESSIONAL COMPETENCIES IN MODERN ENGINEERING EDUCATION

Siddiqov Bakhtiyor Maxammadjon ugli
Independent researcher
Namangan State Technical University

Abstract: *The article analyzes the theoretical and methodological foundations of the competency-based approach in engineering education and its significance in educational practice. The content and pedagogical potential of the competency-based approach are revealed in harmony with state decisions and strategic documents aimed at modernizing the content of education. Within the framework of the research, a pedagogical model based on the integration of universal and professional competencies in engineering education was developed. The results of the experimental research demonstrated that competency-oriented educational technologies are effective in improving the professional training and practical readiness of future engineers.*

Keywords: *competency-based approach, engineering education, professional competence, innovative education, dual education, pedagogical integration.*

INTRODUCTION

Modernization of the higher education system in the Republic of Uzbekistan has been defined as one of the priority directions of state policy. In particular, the Decree of the President of the Republic of Uzbekistan “On approval of the Concept for the Development of the Higher Education System of the Republic of Uzbekistan until 2030” and the Development Strategy of New Uzbekistan for 2022–2026 emphasize the modernization of educational content based on international standards, the wide implementation of a competency-based approach in the educational process, the development of dual education mechanisms, and the adaptation of engineering education to the requirements of an innovative economy as priority tasks [1].

These strategic tasks create the need to develop new pedagogical approaches, innovative educational technologies, and competency-based educational models in engineering education. Therefore, developing a pedagogical model based on the integration of universal and professional competencies in engineering education, scientifically analyzing its theoretical foundations, and effectively implementing it in practice is considered one of the urgent scientific and pedagogical problems.

LITERATURE REVIEW

Today, a modern engineer is not only a specialist with technical knowledge and skills but also a highly qualified professional capable of working in complex technological systems, making strategic decisions in problematic situations, thinking innovatively and critically, and collaborating effectively in teams. From this perspective, developing students' professional competence in engineering education, preparing them for practical activities, and developing their ability to work in innovative environments are becoming increasingly important.

UNESCO identifies the formation of educational outcomes based on universal competencies as one of the priority directions for modernizing the education system. According to the organization's conceptual approaches, the modern educational process should not be limited to mastering theoretical knowledge but should also focus on developing universal competencies that ensure individuals' readiness for social, communicative, and innovative activities. In this regard, UNESCO recognizes the development of 21-st-century skills such as critical thinking, creativity, communication, and collaboration as one of the main pedagogical tasks in the educational process.

The competency-based approach evaluates educational outcomes not by knowledge acquisition alone but by readiness for practical activity. OECD (Organisation for Economic Co-operation and Development) proposes assessing the quality of education through functional literacy and problem-solving ability [1;2].

Competency-oriented models in engineering education are widely applied in the European Higher Education Area. Within the framework of the Bologna Process, organizing educational content based on competencies, expressing learning outcomes through specific competencies, and ensuring students' readiness for practical activities are defined as priority tasks [5;6].

In European engineering education practice, innovative pedagogical technologies such as project-based learning, problem-based learning, and dual education are widely used as effective mechanisms for developing students' professional competencies. Such approaches involve students in solving problems related to real production tasks and contribute to the development of independent thinking, analytical approaches, and teamwork skills [3;4].

At the same time, the analysis of scientific studies shows that comprehensive pedagogical models ensuring the integration of universal competencies (critical thinking, communication, teamwork, creativity) and professional competencies (technical analysis, engineering calculations, technological decision-making) in engineering education have not been sufficiently developed.

This issue is particularly noticeable in local scientific research, where the interrelationship between these competencies, their formation stages, and pedagogical mechanisms have not been systematically analyzed.

Therefore, developing an integrative competency-based model in engineering education and implementing it in the educational process is considered an urgent scientific and pedagogical task.

RESEARCH METHODOLOGY

The research aimed to scientifically justify modern competency-based approaches in engineering education and determine the effectiveness of their implementation in practice. The study was conducted based on a comprehensive methodological approach.

The theoretical and methodological basis of the research consisted of systemic, competency-based, integrative, and activity-based approaches.

These approaches made it possible to analyze engineering education as a holistic pedagogical system, identify mechanisms for forming professional competence among mechanical engineers, and ensure the harmony between educational content, methods, and technologies.

Systemic Approach. The systemic approach considers the educational process as an integrated system consisting of interconnected elements. According to this approach, the content, goals, methods, forms, and outcomes of engineering education are analyzed in mutual relation.

Competency-Based. Approach The competency-based approach evaluates educational outcomes based on students' readiness to effectively perform practical activities rather than merely the level of knowledge acquisition.

Integrative Approach. The integrative approach ensures the interconnection between various fields of knowledge and competencies in the educational process. Modern engineering activities require interdisciplinary knowledge; therefore, integrating technical disciplines, information technologies, economic knowledge, and social competencies is essential.

Activity-Based. Approach The activity-based approach organizes the educational process based on students' practical activities. Knowledge is acquired and reinforced through project work, problem analysis, laboratory research, and industrial practice.

RESULTS AND CONCLUSION

The results of the research showed that implementing a competency-based approach in engineering education positively influences the professional training and practical readiness of future mechanical engineers.

In the experimental group, the educational process was organized based on project activities, engineering case studies, and solving practical problems. This approach ensured the development of analytical thinking, innovative approaches, and teamwork competencies among future mechanical engineers.

In addition, the integration of dual education and digital learning environments plays an important pedagogical role in developing professional competence among future engineers.

The use of innovative pedagogical technologies in the educational process contributes to the development of students' independent thinking and creative activity.

References

1. *Concept for the Development of Higher Education in the Republic of Uzbekistan – 2030.*
2. *Mirziyoyev Sh.M. Collection of decrees on the development of education.*
3. *OECD. Education 2030 Framework.*
4. *UNESCO. Education for Sustainable Development Report.*
5. *Dewey J. Democracy and Education.*
6. *Ennis R. Critical Thinking Theory and Practice.*
7. *European Commission. Engineering Education Standards.*