DEVELOPING INVENTIVE SKILLS IN ENGINEERS IN A DIGITAL TRANSFORMATION ENVIRONMENT: QUALITY AND EFFECTIVENESS OF PEDAGOGICAL EXPERIMENTAL WORK

Turakulova Marjona Kiyom kizi

Bukhara state technical university, Uzbekistan

Abstract: This article discusses the issues of organizing engineering education in a digital transformation environment and developing students' inventive abilities in it. The advantages of using digital technologies (artificial intelligence, virtual and augmented reality, simulation systems) in the training of engineering personnel, as well as the effectiveness of innovative pedagogical methods, are analyzed. The possibilities of developing students' creative abilities are studied based on the stages of pedagogical experimental work - diagnostics, experimentation, monitoring and result stages. Students who receive education in a digital environment demonstrate a higher level of creative potential than those who receive traditional education. The article is of scientific and practical importance for developing effective pedagogical approaches to developing inventive abilities in engineering education and implementing them in educational practice.

Keywords: digital transformation, engineering education, inventiveness, pedagogical experimentation, innovative methods, digital environment.

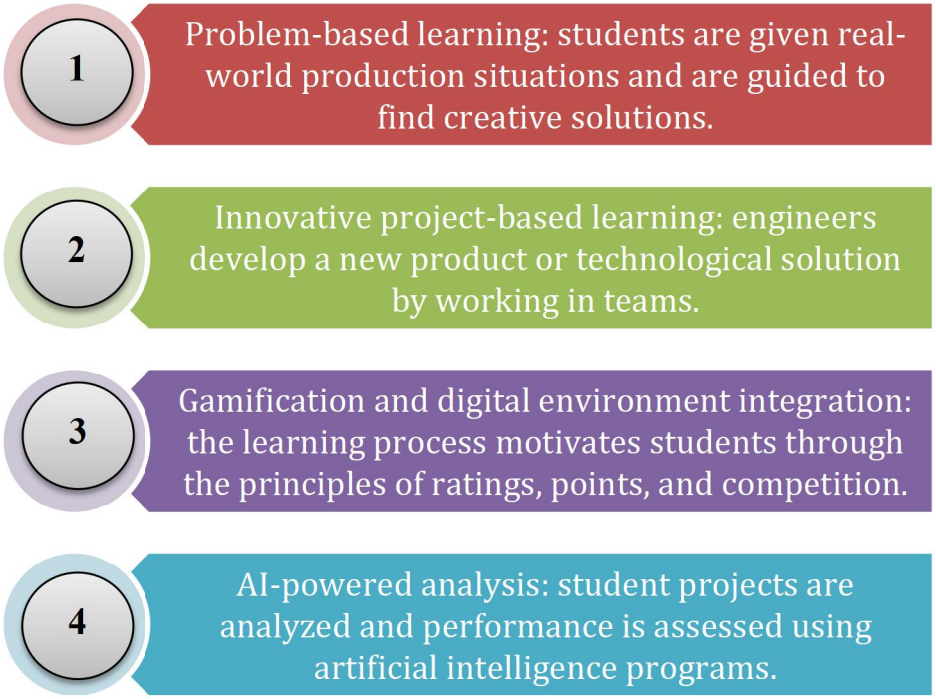
Today, technological development processes are based on the concept of digital transformation. For specialists working in the field of engineering, not only theoretical knowledge, but also inventiveness, innovative thinking and skills in solving problems through non-standard approaches are becoming increasingly important. Therefore, organizing engineering education in higher education institutions in a digital environment and effectively implementing pedagogical pilot work in this regard is an important factor.

1. Engineering education in the context of digital transformation

Digital technologies (artificial intelligence, virtual and augmented reality, simulation systems) require new pedagogical approaches in teaching engineering. Engineering students develop their inventive potential by solving problems in creative situations. The use of methods such as “virtual laboratories”, “digital prototyping” and “AI-assisted design” in the educational process stimulates inventiveness.

2. Pedagogical mechanisms for developing inventive abilities

A number of innovative methods are used in the educational process to develop inventive abilities:



3. Organization of experimental work

Pedagogical experimental work is carried out in stages:

1. Diagnostic stage: the initial level of students' creativity and inventiveness is determined.

2. Experimental stage: innovative methods (digital labs, AI simulations, startup approach in project work) are used.

3. Monitoring stage: students' activities, the quality of creative developments, and their indicators of developing innovative ideas are evaluated.

4. Results stage: The results of students who received traditional education and those who studied in a digital environment are compared.

4. Criteria for the effectiveness of pilot testing

The effectiveness of pedagogical experimental work is evaluated based on the following criteria:

- Increased inventiveness in students (number of new ideas, quality of creative developments).

- The effectiveness of using digital technologies in solving engineering problems.

- Student participation in startup projects and practical results.

- The level of teachers' use of innovative methods.

5. Methods for assessing inventiveness in the digital environment

Various assessment criteria are used to measure the effectiveness of developing students' inventive abilities. For example, the number and quality of project work, the implementation of startup ideas, the number of creative developments on digital platforms and their innovative level indicate the effectiveness of the educational process.

6. The role and methodological approaches of teachers

In the context of digital transformation, the methodological approaches of teachers are of particular importance. The teacher no longer plays the role of a teacher, but rather a mentor, advisor, and coordinator. Therefore, it is necessary to organize ongoing digital competency development courses for teachers.

7. Analysis of foreign experience

In developed countries of the world, there are different approaches to developing inventiveness in engineering education. For example, in the USA and European countries, problem-based learning is widely used. In the experience of Japan and Korea, students' creative abilities are developed by widely involving them in startup projects.

8. Practical results and analysis

The results of pedagogical experiments show that students trained on the basis of digital transformation demonstrate higher inventive potential than students educated in traditional ways. Their project work has more practical value, and their startup ideas have a faster chance of commercialization.

Organizing engineering education in the context of digital transformation and conducting pedagogical experiments in it significantly develops the inventive abilities of students. This process, on the one hand, increases the adaptability of engineers to modern technologies, and on the other hand, develops their innovative thinking. Thus, pedagogical experiments conducted in a digital environment bring educational effectiveness to a new level.

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