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| Research Article

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Methodology for Developing Students' Engineering Competence Based on a Creative Approach

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Annotation
This study is devoted to the development of a methodology for enhancing students' engineering competence based on a creative approach. The application of innovative and creative methods in engineering education contributes to the development of students' independent thinking, problem-solving skills, and ability to design technical solutions. The research analyzes the theoretical foundations of the creative approach, its role in engineering education, and methods of applying modern pedagogical technologies. The results help improve the quality of engineering education and enhance students' practical competencies.

Keywords: creative approach, engineering competence development, innovative pedagogy, problem-solving, technical solutions, engineering education, creative thinking, pedagogical technologies.

Introduction. In today's technological advancement context, engineering education requires new approaches. Developing students' engineering competencies necessitates fostering creative thinking and skills for solving innovative problems. Traditional teaching methods often fail to meet contemporary demands; therefore, enhancing the effectiveness of engineering education through a creative approach is an urgent issue [1].

In modern education, pedagogical technologies and methods of the creative approach are currently essential for the quality and effectiveness in developing students' professional and personal characteristics, demonstrating numerous advantages[2].

1. ***Creative Approach and Its Role in the Educational Process.*** The creative approach occupies an important place in modern pedagogy and engineering education. Contemporary scientific literature views the development of creativity as one of the main factors in shaping students' engineering competencies. [4].
2. ***Theories on the Formation of Engineering Competencies.*** Additionally, the cultural-historical theory proposed by Vygotsky (1978) and the constructivist educational approach contribute to engineering education by enhancing students' independent knowledge acquisition and problem-solving abilities.

3. ***The Role of Innovative and Creative Methods in Engineering Education.*** Methods aimed at developing students' engineering competencies based on a creative approach include: Project-Based Learning (PjBL) – developed by Thomas (2000), focusing on enhancing students' abilities to solve real-world problems. STEAM Education (Science, Technology, Engineering, Arts, Mathematics) – researched by Yakubov (2018), considered as a means of strengthening the creative approach in engineering fields.
4. ***The Importance of Information Technologies in Developing Engineering Competencies.*** Information technologies are currently key factors in the development of engineering competencies. Research conducted by Larkin (2015) identifies simulations and virtual laboratories as innovative tools for teaching engineering subjects. Programs such as Autodesk, MATLAB, and SolidWorks play crucial roles in forming students' practical skills [5].

An engineering game is a professionally oriented game type that imitates engineering activities, replicates methods for solving engineering problems, models the system of production relationships, and serves as a pedagogical tool for developing the innovative potential of future specialists[6].

Research Methodology. The engineering game is a complex concept that encompasses didactic, role-playing, and operational games. Pedagogical conditions influencing the enhancement of students' professional competencies and the importance of involving students in project activities for developing communication culture have been substantiated [6].

Engineering games possess certain characteristics, the main ones of which are depicted in Figure 1.

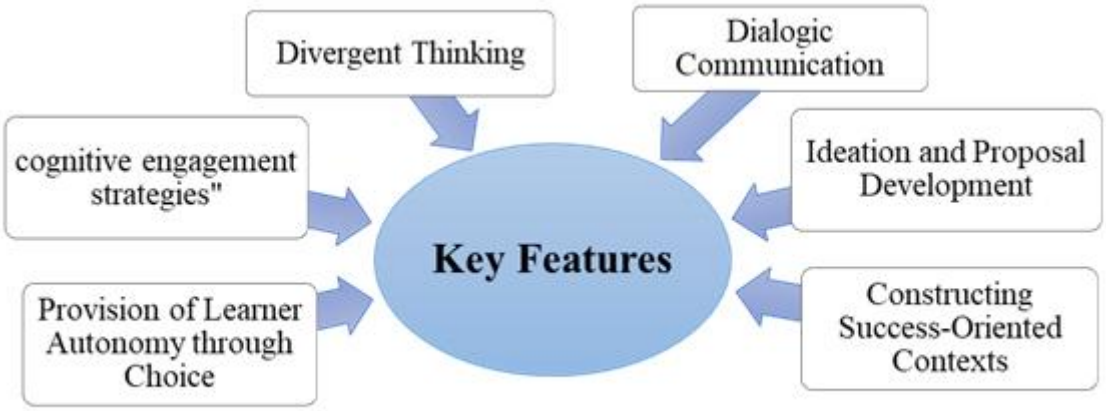

Figure 1. Main Features of Engineering Game Methodology

The following factors determine the quality of education in connection with the learning process: delivering lectures at a high scientific and pedagogical level; conducting problem-based lectures; organizing lessons in an engaging, question-and-answer format; utilizing advanced pedagogical technologies and multimedia tools; presenting learners with thought-provoking and motivational problems; maintaining high academic expectations; providing individual support to learners; encouraging open communication; and involving students in scientific research activities [7].

Analysis and Results. The application of engineering games for the development of students' engineering competencies is considered purposeful and effective. Below, we will highlight several engineering game methods aimed at fostering the growth of students' engineering competence.

Analogy-Based Modeling Method. In technical higher education institutions, it is often difficult to represent complex production situations, and conducting experiments under real conditions usually requires significant material costs and time.

A model is a simplified form of representing (describing or characterizing) the real production or market processes and their interrelationships within a system. It allows for the study, assessment, and prediction of the influence of various factors and constituent elements on the state of the entire system, i.e., on the change of the target indicator. Models can be physical, mathematical, logical, simulation-based, and so on [8].

Conclusion and Recommendations

The methodology for developing students' engineering competencies based on a creative approach plays a significant role in the modern educational process. Analysis of scientific literature shows that the use of innovative methods in engineering education contributes to enhancing students' knowledge levels, developing their independent thinking abilities, and forming skills to solve real-world problems.

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