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APPLYING MOTIVATIONAL METHODS TO STUDENTS IN TEACHING THE SCIENCE OF AUTOMATION OF TECHNOLOGICAL PROCESSES

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Abstract. This research focuses on the application of motivational methods in teaching the science of automation of technological processes, a field that requires a combination of theoretical knowledge and practical skills. Motivation plays a crucial role in enhancing students' interest, engagement, and effectiveness in mastering complex concepts related to automation systems, control mechanisms, and technological integration. The study examines various motivational strategies, including goal-oriented learning, problem-based tasks, gamification techniques, and real-world project applications. By implementing these methods, students are encouraged to develop creative thinking, analytical problem-solving abilities, and professional competencies. The research emphasizes that motivational approaches not only increase academic achievement but also prepare students for their future careers in engineering and technology. The findings suggest that a well-structured motivational system contributes significantly to improving the quality of education in the field of automation of technological processes.

Keywords: Motivation in education; automation of technological processes; teaching methods; student engagement; problem-based learning; gamification; engineering education; technological integration; applied motivation; professional competencies.

Introduction. The rapid advancement of technology in the modern world has made the science of automation of technological processes one of the most important areas in engineering education. Automation, which involves the use of control systems, sensors, and computational technologies, plays a crucial role in improving efficiency, productivity, and safety in industrial and manufacturing sectors. Therefore, preparing highly qualified specialists in this field requires not only the delivery of theoretical knowledge but also the development of practical skills, creativity, and problem-solving abilities. One of the key challenges in teaching such a complex subject is maintaining student motivation. Many learners find the science of automation demanding due to its technical nature and the need for strong mathematical and analytical foundations. Without sufficient motivation, students may experience difficulties in understanding abstract concepts, applying theories to practice, and sustaining interest throughout the learning process. For this reason, the application of motivational methods in the educational process has become an essential component of effective teaching. Motivational strategies in teaching automation can include interactive learning activities, real-world case studies, collaborative projects, and the use of modern digital tools such as simulations and gamification. These approaches not only make lessons more engaging but also help students connect theoretical knowledge with practical applications. Furthermore, motivation fosters curiosity, encourages independent learning, and develops professional competencies that are crucial for future engineers. This research paper aims to explore how motivational methods can be effectively applied to students in teaching the science of automation of technological processes. It seeks to identify the most effective techniques, analyze their impact on student

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learning outcomes, and provide practical recommendations for educators. The study highlights the importance of motivation as a driving force behind successful teaching and learning, emphasizing its role in shaping competent and innovative specialists for the technological era.

Literature review. The role of motivation in education has been widely studied by scholars across various disciplines. Motivation is often defined as the internal and external factors that stimulate learners to initiate and sustain their efforts in the learning process. In the context of technical and engineering education, motivation is considered a critical factor influencing students' ability to grasp complex concepts and apply them effectively in practice. According to Deci and Ryan's Self-Determination Theory, intrinsic motivation—driven by curiosity, interest, and a desire for mastery—plays a significant role in academic success. Studies in engineering education have shown that when students are intrinsically motivated, they demonstrate higher levels of persistence, creativity, and problem-solving ability. Extrinsic motivators, such as grades, rewards, and recognition, also influence student behavior, but research emphasizes the importance of balancing both types of motivation to ensure long-term engagement. Several researchers highlight the effectiveness of active learning approaches in increasing student motivation. For instance, problem-based learning (PBL) has been found to enhance critical thinking and connect theoretical knowledge with real-world applications. In the field of automation, PBL tasks that simulate industrial processes allow students to experience authentic challenges, thereby increasing their interest and commitment. Similarly, collaborative learning methods, such as group projects and peer-to-peer teaching, encourage teamwork, communication, and responsibility, all of which are essential for motivating students in technical subjects. Gamification has emerged as another motivational strategy that is particularly relevant in engineering and automation education. By incorporating elements of competition, rewards, and interactive simulations, gamification helps sustain student interest and transforms complex topics into engaging activities. Research by Hamari et al. suggests that gamified learning environments improve both motivation and learning outcomes, particularly in technical disciplines where abstract theories can otherwise appear overwhelming. Moreover, the integration of digital technologies, such as automation software, virtual laboratories, and simulations, has been shown to significantly improve student engagement. Studies indicate that when students can visualize and test automation processes in a simulated environment, they develop a deeper understanding of theoretical concepts. This approach not only boosts motivation but also bridges the gap between academic learning and professional practice. Overall, the reviewed literature emphasizes that motivational methods are crucial for enhancing the teaching and learning process in the science of automation of technological processes. A combination of intrinsic and extrinsic motivators, problem-based learning, gamification, and digital integration are recognized as effective tools that help educators inspire students, foster creativity, and prepare them for future careers in engineering and technology.

Research Methodology. The research methodology of this study was designed to analyze the effectiveness of applying motivational methods in teaching the science of automation of technological processes. A mixed-method approach was employed, combining both qualitative and quantitative techniques to gain a comprehensive understanding of the impact of motivational strategies on students' learning outcomes. Firstly, a survey was conducted among undergraduate students specializing in automation and control systems. The questionnaire included both closed and open-ended questions to assess students' levels of motivation, interest

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in the subject, and perceptions of different teaching methods. A total of 120 students participated in the survey, providing a representative sample for the study. The data collected from the survey were analyzed statistically to identify patterns, trends, and correlations between motivation and academic performance. Secondly, classroom experiments were carried out in which motivational methods such as problem-based learning, gamification, and real-world project tasks were integrated into the teaching process. Students were divided into two groups: an experimental group exposed to motivational strategies and a control group taught through traditional methods. The performance of both groups was compared using academic assessments, project outcomes, and participation levels. This allowed for an objective evaluation of the effectiveness of motivational techniques in enhancing student engagement and knowledge acquisition. In addition, qualitative data were gathered through interviews and focus group discussions with both students and instructors. These discussions aimed to gain deeper insights into how motivational methods influenced students' attitudes, self-confidence, and willingness to engage in independent learning. Teachers' perspectives were also analyzed to understand the challenges and opportunities of implementing motivational strategies in technical education. The research design was supported by the use of descriptive and inferential statistical tools, as well as thematic analysis for qualitative data. Reliability and validity were ensured through triangulation, which combined survey results, experimental findings, and interview insights. This methodological approach provided a holistic view of the role of motivation in teaching automation of technological processes, ensuring that the conclusions drawn are both evidence-based and practical.

Research discussion. The findings of the study reveal that motivational methods significantly improve students' learning outcomes in the science of automation of technological processes. The comparison between the experimental and control groups demonstrated that students who were exposed to motivational strategies showed higher levels of engagement, better academic performance, and stronger problem-solving skills compared to those who were taught using traditional methods. The survey results indicated that more than 70% of students in the experimental group reported an increased interest in automation topics when problem-based tasks and real-world projects were integrated into the lessons. These students highlighted that connecting theoretical knowledge with practical applications helped them better understand abstract concepts, such as control systems and process integration. By contrast, students in the control group often found the subject challenging and less engaging, which negatively affected their motivation and participation. The use of gamification techniques, such as interactive quizzes, competitive tasks, and simulation-based exercises, was particularly effective in maintaining continuous motivation. Students reported that gamification not only made learning more enjoyable but also created a sense of achievement that encouraged them to actively participate in class activities. This finding is consistent with existing literature, which emphasizes that gamification increases both motivation and retention of knowledge. Interviews and focus group discussions further supported these outcomes. Students expressed that motivational approaches encouraged creativity and self-confidence, while also reducing fear of failure. Many students stated that they felt more prepared for real-world professional challenges due to the hands-on nature of the teaching methods applied. Teachers also noted that while implementing motivational methods required additional preparation and resources, the results justified the effort by enhancing the overall quality of the educational process. An important

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aspect of the discussion is the balance between intrinsic and extrinsic motivation. While extrinsic factors such as grades and recognition were effective in encouraging participation, intrinsic motivation—fueled by curiosity, problem-solving, and real-world relevance—proved to be more sustainable in the long term. This aligns with theoretical frameworks such as Deci and Ryan's Self-Determination Theory, which suggests that long-lasting motivation comes from internal drives rather than external rewards.

Table 1. Comparison of student performance in control and experimental groups

Criteria	**Control Group (Traditional Methods)**	**Experimental Group (Motivational Methods)**
Average Test Score (%)	68	82
Class Participation (%)	55	87
Project Completion Rate (%)	60	90
Student Satisfaction (1–5 scale)	3.1	4.5

The table demonstrates that students exposed to motivational methods performed better in tests, participated more actively in class, completed projects at higher rates, and reported greater overall satisfaction with the learning process.

Table 2. Student perceptions of different motivational methods

Motivational Method	**Percentage of Students Finding it Effective (%)**
Problem-Based Learning (PBL)	78
Gamification (quizzes, simulations)	72
Real-World Project Tasks	85
Collaborative Group Work	69
Use of Digital Tools/Simulations	81

According to the data, students rated real-world project tasks and the use of digital tools as the most effective motivational methods, while all other approaches were also perceived positively, indicating their overall usefulness in teaching automation of technological processes.

Conclusion. This study has shown that the application of motivational methods in teaching the science of automation of technological processes has a significant positive effect on student learning and engagement. The results from surveys, classroom experiments, and interviews confirm that students exposed to motivational strategies—such as problem-based learning, gamification, and real-world project tasks—demonstrated stronger academic performance, higher levels of participation, and greater enthusiasm for learning compared to those taught with traditional methods. The research highlights that motivation is not only a driving factor in academic success but also plays a vital role in preparing students for professional practice. Motivational approaches encourage creativity, critical thinking, teamwork, and problem-solving skills, all of which are essential for future engineers and specialists in automation. Furthermore, the balance between intrinsic motivation, driven by curiosity and interest, and extrinsic

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motivation, supported by rewards and recognition, was found to be crucial in sustaining long-term engagement.

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