Developing Creative Competencies in The Teaching Of "Information Technologies in Technical Systems": A Multi-Level Pedagogical Approach

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Abstract: This article discusses a multi-stage teaching methodology designed for students of the "Light Industry Engineering" program during the study of the subject "Information Technologies in Technical Systems." The methodology aims to develop theoretical knowledge in IT, practical skills in software and system management, competencies in modeling, simulation, creative thinking, and ethical responsibility. It emphasizes active, project-based, and non-standard learning within an information-rich educational environment, fostering students' ability to work both independently and collaboratively.

Keywords: Information technologies, creative thinking, multi-stage teaching, modeling, project-based learning, information security, light industry engineering.

Introduction: In today's rapidly advancing society, progress is intrinsically linked to informatization and intellectualization, making the continuity of "source–data–database" ecosystems crucial. Accordingly, in all research activities, effective collection, measurement, processing, and transmission of data to appropriate sources serve as a fundamental basis for maintaining high quality and efficiency in research.

The Law of the Republic of Uzbekistan "On Education" (No. ORQ 637), adopted by the Legislative Chamber on May 19, 2020, and approved by the Senate on September 23, 2020, emphasizes improving education quality and ensuring that students have access to diverse modes of learning-including full-time, part-time, distance, dual, home-based learning, adult education, inclusive education, externship, and training for defense, security, and law enforcement personnel. In light of these provisions, fostering creativity within an information-rich learning environment and implementing creative teaching methodologies in higher education is one of the foremost objectives of modern pedagogy [1].

Generally, "data" refers to sets of signs registered by sensory organs, instruments, and similar tools-capturing characteristics of the external world and the environment. These data are expressed through both quantitative and qualitative descriptions sourced from defined origins.

A rapidly evolving, informatized society places new demands on education. In particular, within the Light Industry Engineering program, fostering independent thinking, innovative approaches, and creativity among students has become a key goal of the educational system. Thus, the implementation of multi-stage teaching technologies in an information-rich environment holds critical importance.

The objective of the multi-stage teaching methodology is to develop among Light Industry Engineering students, through the course "Information Technologies in Technical Systems":

• Theoretical knowledge of information technologies;

• Practical skills in computer software and technical systems management;

• Competencies in modeling, simulation, and systematic analysis;

• Creative approaches and innovative thinking;

• Project-based imagination and skills;

• Awareness of information security and ethical responsibility.

Within an information-rich educational environment, teaching students to learn actively, creatively, and unconventionally-stimulating cognitive activity and activating metacognitive mechanisms-constitutes a principal direction of modern pedagogy. This requires establishing a reflective educational environment that accounts for students' individual learning trajectories, personalized strategies, and intrinsic motivation.

Furthermore, it is essential to organize teaching through inquiry-based learning, project-based and collaborative approaches, facilitated by pedagogical design thinking. This process emphasizes nurturing students' personal engagement, interest in learning, empathic interactions, and emotional-intellectual capacity.

In grounding this approach, we draw upon the theoretical and practical frameworks of national thinkers, including integrative pedagogy, axiological and humanistic foundations of education, and the principles of personalized learning models.

When higher education institutions teach creative methodologies, they should leverage students' prior theoretical knowledge and practical competencies as much as possible. As a result, for students in the 60720700 Light Industry Engineering program-particularly in the course "Information Technologies in Technical Systems"-the following multi-stage teaching methodology has been developed. This methodology aims to develop practical knowledge, creative thinking, project design, critical analysis, and teamwork competencies [3,4,5], implemented in five stages:

Stage 1: Project-Based Learning

Students are organized into small groups for each module of "Information Technologies in Technical Systems" to develop projects-e.g., designing an information system model for light industry. Project steps include identifying the technical system problem → proposing solutions → modeling → defending the project.

Stage 2: Case-Based Learning

Students engage in practical exercises based on real-life problems in light industry, such as production automation or logistics optimization.

Stage 3: ICT Integration

Students use tools like MS Excel, AutoCAD, MATLAB, Arduino, Proteus, and TIA Portal. Online platforms (Google Classroom, Moodle) support assignments, quizzes, and forums.

Stage 4: Creativity-Enhancing Strategies

Students apply methods like mind-mapping, design thinking, and SCAMPER to generate innovative solutions beneficial to society.

Stage 5: Module-Based Instruction

Table 1. Modular Structure of the Course "Information Technologies in Technical Systems"

Table 1.

Module	Topic	Targeted Competencies
Module 1	*Fundamentals of Information Systems*	*Theoretical knowledge, critical thinking*
Module 2	*Computer Networks*	*Information security, practical application*
Module 3	*Modeling and Simulation*	*Creativity, system analysis*
Module 4	*Intelligent Systems*	*Innovative thinking, project-based learning*

CONCLUSION

In conclusion, the application of this multi-stage teaching methodology within the information-rich educational environment of the Light Industry Engineering program provides a powerful pedagogical tool for developing students' creative competencies. Through the integration of theory and practice in the subject "Information Technologies in Technical Systems", students will be able to:

• Independently utilize modern information technologies;

• Think creatively and critically;

• Develop modeling and problem-solving abilities;

• Improve communication and collaboration skills within team-based work environments.

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