

**RESEARCH ARTICLE**

# Development Of A Methodology For The Development Of Technological Thinking In Students Based On Innovative Technologies

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## Abstract

This article covers the development of a methodology for developing students' technological thinking based on innovative educational technologies. The study developed a theoretical and methodological basis for the formation of students' technological thinking skills through the integration of pedagogical tools based on virtual and augmented reality, simulation modeling, interactive methods, problem-based learning, a project approach, and artificial intelligence into the educational process. The results of practical experiments showed that when using innovative technologies, students' analytical thinking, problem-solving competencies, creative approach, and skills in designing technical solutions have significantly increased. The proposed methodology is recommended as an effective model for the formation of technological thinking in the higher education system.

## KEYWORDS

Technological thinking, innovative technologies, methodology, digital education, project approach, virtual and augmented reality, simulation modeling, artificial intelligence, competence.

## INTRODUCTION

Providing students with technological thinking in the modern educational process is an important condition not only for increasing their competencies in the field of specialization, but also for forming the ability to develop innovative solutions in the future. Technological thinking includes the skills of analyzing complex problems, modeling processes, and creating effective solutions. Therefore, the issue of developing students' thinking in higher education is becoming increasingly relevant. [1-3]

Traditional teaching methods often do not sufficiently develop students' thinking. For example, providing only theoretical information in the classroom, conducting practical classes with

limited means, or insufficient use of interactive methods slows down the formation of skills in solving complex problems and designing technological solutions. Therefore, modern pedagogical research emphasizes the effective development of students' technological thinking through the introduction of innovative educational technologies. [4-6]

Today, the following innovative technologies are considered one of the most effective tools in the educational process:

Virtual and augmented reality - helps to visually model complex processes and gain experience in an interactive environment;

Simulation modeling - allows testing technological processes in real life in safe conditions;

Pedagogical tools based on artificial intelligence - allow personalized learning by creating individual educational directions and analyzing student activities;

Interactive and problem-based learning methods, a project-based approach - develop students' independent thinking, creative approach, and problem-solving skills [7].

The main goal of the methodological approaches outlined in this article is the effective formation of students' technological thinking, the development of their analytical thinking skills, creative approach, and skills in solving practical problems. The research results show that the application of innovative technologies significantly increases students' technological and creative thinking, which strengthens their professional training [9].

At the same time, the methodology developed in the article is recommended as an effective model for the development of technological thinking in higher educational institutions. The methodology is practically flexible and can be applied in various technological and engineering directions.

In the study of the development of technological thinking in students, the method of theoretical analysis is one of the main scientific means of research. This method is applied in the following areas:

Study and systematization of scientific literature.

- The latest scientific sources on technological thinking in students, innovative pedagogical approaches, digital and interactive educational technologies are analyzed;
- Empirical research on the formation of students' thinking based on virtual and augmented reality, simulation modeling, artificial intelligence, and interactive methods is studied.

Comparison and generalization of theoretical concepts:

- The approaches of various scientists and educators to the development of technological thinking are analyzed;
- Their advantages and limitations are identified, and the possibilities of practical implementation are assessed.

Integration of innovative technologies into research:

- The influence and effectiveness of virtual and augmented reality, simulation modeling, and artificial intelligence tools on the pedagogical process are theoretically studied;

-Through these approaches, students develop analytical thinking, problem-solving skills, and the ability to create creative solutions.

Identification of problems and formation of methodological solutions:

- Identification of pedagogical and methodological gaps in the development of technological thinking in students;
- Theoretically substantiated ways to eliminate these gaps based on innovative technologies.

Result: The application of the method of theoretical analysis provides a scientific basis for the research and allows for the consolidation of the developed methodology for the development of technological thinking in students. At the same time, this method ensures effective integration of research with other methods - practical experiment, observation, questionnaires, and assessment tools.

Research Methods In this study, the following methods were used to develop and test the methodology for the development of technological thinking of students:

Theoretical analysis method: [10]

- Scientific literature, research, and modern pedagogical technologies were analyzed;
- Various theoretical concepts were compared and summarized;
- With the help of innovative technologies, a theoretical basis for the development of students' technological thinking has been created.

Experimental method:

- A group of students was selected and the educational process was organized based on the methodology;
- Students' analytical, problem-based, and creative thinking skills were tested;

The results of the experiment made it possible to assess the effectiveness of innovative technologies.

Tracking and interactive evaluation:

- Student activity was observed in practical classes, project work;
- With the help of assessment tools, technological thinking, creative and problem-based thinking skills were analyzed.

Questionnaires and tests:

- Students expressed their experience, interest, and opinion on the methodology;
- Through tests, their level of knowledge and skills was assessed on a scientific basis.

Integrative method:

- The above methods were combined and created a scientific basis for the research;
- The combination of theoretical and practical approaches ensured the effectiveness of the methodology.

The harmonious application of research methods ensured high efficiency in the development of technological thinking, analytical and creative thinking skills in students and proved the practical significance of the developed methodology.

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