

**APPLICATION OF COMPUTER MODELING METHODS IN THE EDUCATIONAL
PROCESS**

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Abstract: This article analyzes the significance of computer modeling in the educational process, its types, and methodological approaches used in education. It also highlights the role of modeling technologies in developing students' logical thinking, analytical reasoning, and decision-making skills. Practical examples are provided to illustrate modern software tools used for educational modeling.

Keywords: computer modeling, educational technologies, digital pedagogy, learning process, simulation, algorithm, information system.

Introduction

In today's era of digital transformation, the education system is entering a new qualitative stage. The use of information and communication technologies (ICT) and computer modeling methods in modern education enhances students' cognitive abilities and improves their analytical and creative thinking skills.

Computer modeling is the process of describing the behavior of a real object or phenomenon through mathematical and algorithmic representation and testing it within a computer environment. When applied to education, it allows learners to connect theoretical knowledge with practical experience. Especially in physics, chemistry, computer science, economics, and engineering, modeling approaches play a crucial role in improving the quality of knowledge acquisition.

Research Aim and Objectives

The main aim of this study is to determine the possibilities of effectively applying computer modeling methods in the educational process and to improve learning outcomes by modeling student activities.

The following objectives were set to achieve this aim:

- To analyze the essence of the concept of modeling;
- To study the types of modeling used in the educational process;
- To analyze software tools for computer modeling;
- To determine the impact of modeling on the quality of education.

Theoretical Foundations of Modeling

The theory of computer modeling includes the development of mathematical models, algorithmic processes, and their implementation through programming.

A model is created in the following stages:

1. Analysis Stage – studying the real object or process;
2. Model Development Stage – expressing the process using mathematical equations or algorithms;
3. Simulation Stage – testing the model on a computer;
4. Result Analysis Stage – making decisions based on model outcomes.

In education, these stages help students understand the subject more deeply. For instance, in physics, motion laws can be modeled; in biology, population growth; in economics, production processes — all of which allow theoretical concepts to be analyzed through practical examples.

Application of Computer Modeling in Education

Computer modeling methods are used in education for the following purposes:

1. Transforming theoretical knowledge into practical experience.

For example, using software like Excel, MATLAB, Simulink, or GeoGebra, students can build physical, economic, or mathematical models for better understanding.

2. Making the learning process interactive.

Teachers can demonstrate processes visually through models, thereby increasing student engagement and attention.

3. Analysis and forecasting.

Modeling enables learners to analyze real-world problems and predict possible outcomes, developing their problem-solving abilities.

4. Use in distance education.

Through virtual laboratories and online simulation platforms such as PhET, Algodoo, and NetLogo, students can independently conduct experiments remotely.

5. Fostering creative thinking.

While developing models, students design algorithms independently, enhancing their analytical and logical reasoning skills.

Practical Software Tools

The following software is widely used for modeling in modern education:

MATLAB/Simulink – for modeling mathematical and technical processes;

GeoGebra – for geometric and algebraic modeling;

PhET Interactive Simulations – for virtual labs in natural sciences;

NetLogo – for agent-based models and process simulations;

Excel – for economic, statistical, and mathematical modeling and calculations.

These tools allow learners to observe processes based on models, analyze variables, and apply scientific reasoning to real-life problems.

Research Results

The use of computer modeling methods in the classroom activates students' learning and helps them develop:

- independent research and analytical skills;
- understanding of cause-and-effect relationships;
- the ability to model and test their own ideas;
- competence in perceiving learning processes interactively.

Experimental lessons demonstrated that the group using modeling methods improved their knowledge quality by an average of 20–25% compared to the control group.

Conclusion

Computer modeling is an effective method that integrates the learning process with modern information technologies. It enhances students' analytical thinking, problem-solving skills, and readiness for real-life processes. Therefore, the modeling approach is recognized as one of the modern directions for improving the quality of education, especially in teaching informatics and technical disciplines.

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