ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE

ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 11,2025

Journal: https://www.academicpublishers.org/journals/index.php/ijai

IMPROVING THE TEACHING OF DISCRETE MATHEMATICS AND MATHEMATICAL LOGIC COURSES BASED ON INNOVATIVE TECHNOLOGIES

Rofiyev Farrux Mamatkulovich,
Master's Student, Samarkand State Pedagogical Institute

Abstract: This article discusses the improvement of teaching the courses "Discrete Mathematics" and "Mathematical Logic" based on innovative technologies. In the context of digital education, the importance of effectively using modern information and communication technologies, interactive methods, e-learning platforms, and digital educational resources is analyzed. The role of innovative approaches such as blended learning, gamification, and virtual laboratories in developing students' logical thinking, algorithmic reasoning, and analytical skills is substantiated. The study results show that the integration of innovative technologies into the educational process enhances the quality of education and promotes the development of students' independent thinking abilities.

Keywords: innovative technologies, discrete mathematics, mathematical logic, information and communication technologies, logical thinking, education quality, digital learning.

Introduction

In today's era of globalization and digital technologies, organizing the education system based on innovative approaches is becoming an urgent issue. In particular, the effective use of modern pedagogical and information technologies is required in teaching technical and natural sciences, including discrete mathematics and mathematical logic. These subjects play a crucial role in developing students' algorithmic thinking, logical analysis, systematic reasoning, and independent decision-making skills in problem-solving. The integration of innovative technologies into the educational process not only enhances learning effectiveness but also increases students' interest in the subject, teaches them to think creatively, and enables them to find correct solutions in challenging situations. Interactive methods such as "e-learning," "blended learning," "gamification," and "virtual laboratories" make the learning process more effective and engaging.[1]

Current Issues in Teaching Discrete Mathematics and Mathematical Logic

Today, discrete mathematics and mathematical logic form the theoretical foundation for fields such as information technology, programming, cryptography, algorithm theory, and artificial intelligence. Therefore, in teaching these subjects, it is important to guide students not only through theoretical knowledge but also toward practical analysis and logical thinking. In higher education, these subjects are often based on formal concepts and mathematical proofs, which can create difficulties for students in deeply understanding the topics.

Traditional teaching methods, being largely teacher-centered, tend to reduce student engagement and limit their involvement in independent exploration. This hinders the full comprehension of the subject matter and the development of practical application skills. In particular, the explanation of topics related to logical expressions, algorithmic analysis, and

1. [1] Rasulov, B. R., & Qoziyev, A. A. Discrete Mathematics: Textbook. Tashkent: Fan va Texnologiya, 2020.

ORIGINAL ARTICLE
INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE
ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 11,2025
Journal: https://www.academicpublishers.org/journals/index.php/ijai

graph theory often suffers from a lack of visual aids. Hence, in modern education, teachers need to utilize innovative approaches, interactive methods, and digital technologies to effectively organize lessons.[2]

The Necessity of Integrating Innovative Technologies into the Educational Process

In the context of digital transformation, every stage of the educational process must be organized in harmony with modern technologies. The "blended learning" model is one of the most effective approaches in this regard. In this system, traditional classroom sessions are combined with online instruction. As a result, students have the opportunity to work independently outside of class through video lectures, online tests, and electronic learning materials.

Another innovative approach is the "flipped classroom" model, in which students study new topics independently at home, while class time is devoted to solving problem-based tasks. This method enhances student engagement, logical thinking, and teamwork skills. It is particularly effective for studying proofs in mathematical logic, combinatorial problems, or algorithmic analysis tasks. Additionally, the "gamification" technology serves as an important tool to increase motivation in the learning process. Assigning tasks through points, rankings, levels, or game elements makes learning more engaging. In this way, students actively participate in the lesson, which significantly improves learning effectiveness.[3]

Opportunities for Using Information and Communication Technologies and Electronic Platforms

The rapid development of information and communication technologies (ICT) provides extensive opportunities for the digitalization of the education system. For example, platforms such as "Moodle," "Google Classroom," and "Edmodo" enable the organization of distance learning, conducting lessons in electronic format, and continuous monitoring of students' progress. Through these platforms, teachers can upload materials, create tests, and analyze student activity.

In addition, software such as "GeoGebra," "Desmos," "WolframAlpha," and "Logicly" allows for the visualization of discrete mathematics and logic concepts. For instance, logical expressions or graph networks can be represented in real-time within these programs, helping students better understand complex topics. These tools also guide students toward practical activities and prepare them to work effectively in a modern digital environment. Furthermore, AI-based software tools are expanding opportunities for individualized instruction. Automated assessment systems, interactive tests, and virtual communication tools are being developed to support students' learning.

Conclusion

The application of innovative technologies in teaching discrete mathematics and mathematical logic is an essential requirement of modern education. These subjects help develop students' logical thinking, algorithmic approach, and analytical reasoning. Therefore, integrating digital

2. [2] Qodirov, A., & Jorayev, S. The Role of Information and Communication Technologies in Education. Tashkent: Innovatsiya, 2022.

3. [3] Zaytseva, N. A. Innovative Technologies in Modern Education. Moscow: Prosveshchenie, 2020.

ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 11,2025
Journal: https://www.academicpublishers.org/journals/index.php/ijai

tools, interactive platforms, and visual modeling software into the teaching process increases student engagement and facilitates the understanding of complex concepts.

Lessons based on innovative technologies not only make the learning process more effective but also foster students' independent thinking, problem-solving abilities, and creative skills. Thus, the widespread implementation of new teaching methods, information and communication technologies, and digital learning environments in these subjects will further enhance the quality and effectiveness of education in the future.

References:

1. Rasulov, B. R., & Qoziyev, A. A. Discrete Mathematics: Textbook. Tashkent: Fan va Texnologiya, 2020.
2. Kholmatova, M. M. Mathematical Logic and Its Practical Applications. Samarkand: SamDU Publishing, 2019.
3. Tokhtayeva, D. S. Innovative Pedagogical Technologies in Higher Education. Tashkent: TDPU Publishing, 2021.
4. Qodirov, A., & Jorayev, S. The Role of Information and Communication Technologies in Education. Tashkent: Innovatsiya, 2022.
5. Lerman, C. Discrete Mathematics and Its Applications. New York: McGraw-Hill Education, 2019.
6. Halmos, P. R. Naive Set Theory. New York: Springer, 2017.
7. UNESCO. ICT Competency Framework for Teachers. Paris: UNESCO Publishing, 2018.
8. Zaytseva, N. A. Innovative Technologies in Modern Education. Moscow: Prosveshchenie, 2020.
9. Vedeneeva, T. E. Discrete Mathematics in Engineering Education. Saint Petersburg: Lan, 2021.