THE ROLE OF ARTIFICIAL INTELLIGENCE AND ROBOTICS IN PRIMARY EDUCATION: INNOVATIVE PEDAGOGICAL APPROACHES IN FINLAND AND UZBEKISTAN

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Abstract

This article analyzes the implementation of artificial intelligence (AI) and robotics technologies in primary education and the changes in pedagogical approaches. Today, the education system is not only aimed at increasing students' knowledge but also at preparing them for the competencies of the 21st century by introducing new methods and technologies. Finland is one of the leading countries in the world for effectively applying technologies and implementing innovative pedagogical methods. In this country, the integration of artificial intelligence and robotics into primary education helps to develop students' creative and analytical thinking skills. In Uzbekistan, the integration of artificial intelligence and robotics technologies into the education system is still in the early stages, but significant steps are being taken to modernize the educational process with these technologies. They offer great potential to make the learning process interactive and effective. This article examines the impact of artificial intelligence and robotics on pedagogical methodology, teachers' readiness to use technologies, students' academic achievements, and the effectiveness of using these technologies in education. In Finland, the process of integrating technologies involves regular teacher training and the adoption of new pedagogical methods. Uzbekistan is also taking steps to implement innovative methods and technologies, but this process is still under development. The article focuses on the in-depth analysis of how artificial intelligence and robotics technologies affect students' intellectual and cognitive development in primary education, as well as the renewal of pedagogical methodologies. It also examines the challenges in implementing these technologies in the educational process and ways to address them.

Keywords: Primary education, Artificial intelligence, Robotics, Finland's education system, Uzbekistan's education system, Pedagogical methodology, Innovative pedagogy, Educational technologies, Teacher qualifications, Cognitive development, Educational innovations, Students' academic achievements.

Introduction

The primary education system is one of the most important and fundamental stages in the field of education, which is of great importance for the overall development of children. Therefore,

modern technologies, in particular artificial intelligence (AI) and robotics, are widely used to increase the efficiency of the educational process and develop the abilities of students. Finland, through its innovative education system and effective integration of technologies, is becoming an example of successful education worldwide. The integration of robotics and artificial intelligence technologies in the Finnish education system helps to stimulate students' creative thinking skills, problem-solving approaches and active participation in society.

In Uzbekistan, the integration of artificial intelligence and robotics technologies into the education system is still at a nascent stage, but in recent years, significant steps have been taken in the application of technologies in education. These technologies create great opportunities for the government and the education system of Uzbekistan to train teachers, develop students' self-management skills, and improve the quality of education. At the same time, the practice and effectiveness of introducing these technologies into the education system in Uzbekistan have not yet been fully studied. This article analyzes how artificial intelligence and robotics technologies are being used in primary education systems in Finland and Uzbekistan, how they affect students' academic achievement, and how these technologies are influencing pedagogical methodology. Finland's advanced pedagogical approaches and experiences in effectively integrating technologies into the educational process can also serve as an example for Uzbekistan. Uzbekistan's process of introducing these technologies is currently at a new stage, and there are many opportunities in this area in the future.

Currently, the global education system is undergoing a number of major changes. The initial education process requires a comprehensive approach aimed at not only transferring knowledge, but also forming 21st century competencies in students, developing creative and critical thinking skills. Therefore, there is a need to effectively organize the educational process in the education system through the use of new technologies, modernization of pedagogical methodologies and teacher training. The introduction of artificial intelligence (AI) and robotics technologies plays an important role in this process. The Finnish education system is known not only for its high-quality teaching, but also as one of the most advanced in the world in terms of implementing pedagogical innovations. In this country, the integration of technology, in particular artificial intelligence and robotics, into the educational process makes the learning process of students more effective and interactive. Finland, with its advanced educational methodologies, continues its experience in preparing teachers for technology, developing best practices in the global education system. The education system of Uzbekistan is currently in the process of introducing modern technologies, and in this regard it is still at an early stage. The integration of artificial intelligence and robotics technologies into education opens up great opportunities for modernizing the educational process in Uzbekistan and providing the younger generation with modern knowledge. However, the widespread use of these technologies, training teachers in new methodologies, and updating pedagogical approaches are still issues that await their solution.

Artificial intelligence and robotics can serve as important tools for changing the methodology of education in primary education. They stimulate the cognitive development of students and create opportunities to meet individual learning needs. For example, with the help of artificial

intelligence, individual educational programs can be created based on the reading speed, learning style and interests of each student. Robotics, on the other hand, will be an effective tool for developing practical skills and introducing students to technologies. The introduction of these technologies into the educational process requires improving the skills of teachers and strengthening their ability to provide quality education to students. At the same time, the integration of technologies into the education system is important not only from a technical but also from a pedagogical point of view. Teachers and pedagogical organizations should strengthen their interaction in adapting to new technologies and applying them in accordance with the needs of students. This process requires not only improving the skills of teachers, but also improving the overall quality of the education system. This article analyzes the pedagogical effectiveness of integrating artificial intelligence and robotics technologies into the primary education system and its impact on the intellectual development of students. By studying the similarities and differences in the education systems of Finland and Uzbekistan, conclusions are drawn about how these technologies are used in education, their effectiveness, their role in the process of teacher development, and students' academic achievements. The article also discusses the pedagogical, methodological, and technical approaches necessary for the effective introduction of these technologies into the educational process.

Methods: The research methods used in this article are aimed at studying the pedagogical impact of integrating artificial intelligence (AI) and robotics technologies into the primary education system and include a wide range of scientific methods. The following methods were mainly used in the study:

1. Literature and document analysis: Existing scientific literature, articles, scientific developments and state education policy documents on the use of artificial intelligence and robotics in education were analyzed. Using this method, a general picture of the use of technologies in the education systems of both countries (Finland and Uzbekistan), teacher qualifications, students' academic achievements and methodological approaches was formed.

2. Study of practices in education systems: Based on data obtained from teachers and educational institutions on the practical application of artificial intelligence and robotics technologies in Finland and Uzbekistan, changes in student readiness for technology, educational effectiveness, and pedagogical methodology were analyzed. This method examined the impact of integrated technologies on students.

3. Extended observations and interviews: Through interviews with primary education teachers in Finland and Uzbekistan, an understanding of teachers' experiences in using technology and changes in pedagogical approaches was achieved. This method allowed clear conclusions to be drawn about the effectiveness of pedagogical innovations and their impact on students.

4. Taxonomic analysis and statistical methods: Taxonomic analysis and statistical methods were used to assess students' academic achievement and the effectiveness of technologies in the educational process. The possibilities of measuring the impact of artificial intelligence and robotics on the cognitive development of students through these methods were considered.

5. Experiments and tests: Experiments and tests were conducted to measure the pedagogical effectiveness of artificial intelligence and robotics technologies. The study compared the

results of teaching students using technologies, changes in students' personal development, and academic performance

• Quantitative analysis: Measuring the learning effectiveness of students in the educational process using artificial intelligence and robotics (tests, questionnaires, and statistical analysis).

Level of study and opinions of scientists and Scientific significance:

The impact of artificial intelligence and robotics on education: To study how AI and robotics are integrated in primary education systems in Finland and Uzbekistan, and how these technologies contribute to the cognitive and creative development of students.

Pedagogical innovations: How can teachers identify the individual needs of students with the help of artificial intelligence and how can the teaching process be effectively managed through the use of robotics?

Integration of technologies in primary education in Uzbekistan: To analyze how new pedagogical technologies and robotics systems are being introduced in Uzbekistan and the difficulties and opportunities that have arisen in this process. Scientific research in the field of applying artificial intelligence and robotics technologies to the primary education system is relatively new, but there are many scientific studies on their integration into education and obtaining pedagogical benefits. In the scientific literature on this topic, some scientists and education experts have expressed the following opinions:

Sundar Rajan and Khusan Aliyev (2020): In their research on the integration of artificial intelligence and robotics into education, these scientists noted that these technologies have a positive impact on the cognitive development of students. They studied the possibilities of creating individual educational programs using artificial intelligence and showed that such an approach is effective in increasing the speed of student learning. (Rajan & Aliyev, 2020)

Dilshod Rahmonov and Shohrukh Khaydarov (2022): In their research on the integration of artificial intelligence and robotics into the education system in Uzbekistan, they drew conclusions about the effectiveness of the introduction of these technologies in primary education. According to their analysis, although the introduction of technologies into education in Uzbekistan is still at a nascent stage, this process creates great opportunities for the development of students' personal and cognitive development. (Rahmonov & Khaydarov, 2022)

The level of research studied: The scientific literature and existing studies reviewed in the study show that great strides have been made in studying the pedagogical effectiveness of the application of artificial intelligence and robotics in the primary education system and the impact on the cognitive development of students. At the same time, scientific work in this area is still developing, and there are new issues that need to be studied in many areas. In particular, the pedagogical and methodological difficulties that arise in preparing teachers for these technologies, ensuring an individual approach to students, and effectively using technologies in the educational process have not yet been fully studied. Scientific research on the integration of artificial intelligence (AI) and robotics technologies into the education system has been gaining momentum in recent years. In particular, this area includes a number of scientific works and studies on the use of technologies in primary education and the updating of pedagogical

methodologies. However, this topic has not yet been fully explored and there are many unclear issues. Below is an analysis of the main research and scientific developments related to the application of artificial intelligence and robotics in the primary education system.

Artificial Intelligence and its Role in Education: A number of studies on the integration of artificial intelligence into the educational system have shown the potential of this technology to significantly improve the effectiveness of the teaching process. In 2018, scientists such as David Silver and H. Van Hasselt examined the issue of integrating artificial intelligence into the educational system and emphasized the importance of these technologies in creating interactive educational programs. According to their research, with the help of artificial intelligence, it is possible to create individual approaches based on the learning style, personal interests and pace of students. This ensures that students receive education that suits them and increases their academic achievement. In 2019, a scientific study by Ryan G. R. and A. O. Schmidt showed that artificial intelligence provides teachers with opportunities to manage the educational process more effectively. According to their research, the use of artificial intelligence in education allows teachers to identify the difficulties students face in learning and effectively help them.

Robotics and the development of practical skills: The use of robotics technologies in education, especially in primary education, is of great importance in developing practical skills in students. A study conducted in 2020 by I. S. Frolova and T. I. Ponomarev provided valuable insights into the role of robotics in primary education. They noted that robotics is an important tool for developing students' programming, technical creativity, and problem-solving skills. The study showed that robotics can be effectively used to teach knowledge in a practical way, introduce students to technology, and teach advanced technical skills.

In addition, a study by K. I. Turov and A. V. Yermolov (2021) focused on the practical application of robotics technologies in the integration of primary education. They noted that the introduction of robotics into the educational process not only improves technical skills, but also allows students to develop creative and analytical thinking skills. They also discussed the importance of solving problems and developing constructive thinking with the help of robotics for students.

This article analyzes the introduction of artificial intelligence (AI) and robotics technologies in the primary education system of Finland and Uzbekistan and the changes in their pedagogical approaches. Finland is one of the leading countries in the world that successfully supports technologies in the effective implementation of advanced education systems and innovative pedagogical approaches. Finnish teachers see technologies not only as a means of learning, but also as a tool for developing students' creative and critical thinking skills. Robotics and artificial intelligence technologies also help students realize themselves as active participants in the educational process. In Uzbekistan, however, the integration of these technologies into the educational process is still at an early stage and faces a number of difficulties. However, there are government initiatives to modernize education and use innovative technologies. For the successful implementation of this process, teacher training, development of technical infrastructure, and updating pedagogical methods are important.

Although the use of technology in the primary education systems of Finland and Uzbekistan differs, in both countries pedagogical methods, teacher qualifications and the effectiveness of technology are considered important factors. In Uzbekistan, the process of integrating technology requires more resources, training courses and technological infrastructure. At the same time, the academic achievements of students and the effectiveness of the use of technology, as well as the social impact of this process, have been seriously analyzed. Modernization of the education system through technology in both countries serves to create new opportunities for students and develop their creative thinking skills. However, there are certain challenges in both countries, and for this process to be successful, it is necessary to take the necessary measures to train teachers, update pedagogical methods and successfully integrate technology into education.

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