CREATION OF AN INCLUSIVE VIRTUAL EDUCATIONAL ENVIRONMENT UTILIZING ARTIFICIAL INTELLIGENCE TECHNOLOGIES

Liudmyla Peretyaha
Doctor of Pedagogical Sciences, Professor,
Professor at the Department of Preschool Education,
Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Ukraine
e-mail: LEPeretyagaVVMakarov@gmail.com, orcid.org/0000-0002-3686-2601

Romana Sirenko
Doctor of Science in Public Administration, Professor,
Professor at the Department of physical Therapy, Occupational Therapy,
Sports Medicine and Physical Education,
Private Higher Educational Institution "Lviv Medical University", Ukraine
e-mail: romanaua@gmail.com, orcid.org/0000-0001-9100-4709

Summary

The article provides a comprehensive analysis of the role of artificial intelligence (AI) in modern education. The authors explore how AI can be used to automate routine tasks of teachers, create personalized curricula for each student, create an adaptive learning environment, and provide effective feedback. It has been established that inclusion is an integral part of the educational policy of many countries, including Ukraine. However, despite significant achievements, inclusive education still faces a number of challenges related to insufficient funding, lack of proper training of teaching staff, and stereotypes about people with disabilities. Nevertheless, inclusive education remains one of the priority areas of development of modern education, as it contributes to the creation of a more just and inclusive society.

It is noted that the introduction of AI in education requires addressing a number of challenges related to cybersecurity, personal data protection, development of appropriate pedagogical models, and consideration of potential social consequences, such as increased inequality of access to quality education.

The study found that the cooperation of educational institutions with the artificial intelligence industry opens up new opportunities for modernizing curricula and preparing students with special educational needs to meet the rapidly changing requirements of the labor market.

Key words: educational process, inclusion, special educational needs of students, higher education institutions, artificial intelligence.

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1. Introduction

Inclusion, as a principle of equal opportunities for all, is one of the fundamental principles of a modern democratic society. Its importance has especially increased in the context of globalization and integration. In education, inclusion involves creating an educational environment that would allow every student, regardless of their special educational needs, to develop and succeed. This principle is enshrined in many international documents and is reflected in national education development strategies, including in Ukraine.

The principle of inclusion in education is one of the fundamental principles of a modern democratic state; it is enshrined in a number of international documents, including the UN Convention on the Rights of Persons with Disabilities, and is reflected in the national legislation of Ukraine. Article 24 of the Constitution of Ukraine guarantees equality of all citizens under the law, and the Law of Ukraine "On Education" defines inclusive education as a priority area of state policy. Strategic documents, such as the Strategy of National Policy for the Development of Education in Ukraine, also emphasize the importance of creating an inclusive educational environment for all students, regardless of their special educational needs.

The analysis of scientific papers leads to the conclusion that artificial intelligence opens up new horizons for the development of inclusive education. The use of technologies such as adaptive learning systems, voice assistants, and facial recognition technologies allows for the creation of an individualized educational environment that takes into account the diverse needs of students at all levels of education *(Sadovyj, 2023).* This contributes to improving the quality of education and provides equal opportunities for all. However, it is worth noting that the introduction of AI in education requires addressing a number of ethical issues related to the protection of personal data and ensuring the safety of students. Therefore, further research in this area is necessary to develop effective and safe solutions.

2. Analysis of publications and the purpose of the study

The problem of inclusive education in higher education institutions is becoming increasingly relevant. Research in this area is conducted by such scholars as K. Bortun, A. Kolupaieva, A. Polichronidi, L. Yatseniuk, R. Kozak, and others. At the same time, the rapid development of artificial intelligence technologies, which is being studied by Michurin M., Kviatkovska A., Kotenko N., Kibenko L., Spirin O., Osadcha K. and others, opens up new prospects for improving inclusive practices. Although inclusive education is recognized as an important goal *(UNICEF, 2014; UNESCO, 2023),* its implementation is associated with a number of challenges. As noted by Jury A. et al. (2023), educators need to constantly work to overcome their own prejudices and stereotypes in order to ensure inclusive education. At the same time, Poluchtovych T., Tsurik M., Linnik B. (2023) emphasize that the involvement of all stakeholders – teachers, parents, professionals – is a key factor in the success of inclusive initiatives.

Despite the significant potential of artificial intelligence in the context of inclusive education, the issue of its application in higher education institutions remains insufficiently researched. Inclusion and artificial intelligence are relatively new areas of research that require further development, and today there is a tendency to integrate these two areas of research, which contributes to the development of innovative solutions to create a more accessible and high-quality educational environment.

3. Synthesis of inclusion and AI: new opportunities for learning

The idea of inclusive education, which emerged in the 1990s, has gradually transformed from an experimental approach to one of the key paradigms of modern education. Today, inclusion is an integral part of the educational policy of many countries, including Ukraine. However, despite significant achievements, inclusive education still faces a number of challenges related to insufficient funding, lack of proper training of teaching staff, and stereotypes about children with special needs. Nevertheless, inclusive education remains one of the priorities for the development of modern education, as it contributes to a more just and inclusive society.

As noted in the study *(Peven, 2023):* "Inclusive education, based on the principles of equality, justice and respect for diversity, is a key element of a democratic society. It involves creating learning environments that allow every child to develop their abilities and achieve success, regardless of their individual characteristics". Inclusion is especially relevant in the context of children and youth education, as it is during this period that a personality is formed and the foundations for successful adaptation in society are laid. However, the implementation of the inclusion principle requires significant efforts from the state, educational institutions and the public.

Every year, virtual assistants, automated systems, and other technological innovations are integrating into the educational process, transforming traditional teaching methods. In this context, there is a need to carefully study and evaluate the impact of artificial intelligence on the educational sphere, as well as to consider the opportunities and challenges it brings with it *(Kotenko, 2023).* It is worth noting that creating an electronic inclusive educational environment is a complex and multifaceted task that requires a comprehensive approach. It is necessary not only to develop new technological solutions but also to ensure their integration into the existing education system. In addition, it is important to take into account the diverse needs of people with disabilities and ensure that these technologies are accessible to everyone. The implementation of such projects requires significant financial resources, as well as close cooperation of specialists from different fields: teachers, psychologists, engineers, and others *(Marchenko, 2023).*

The analysis of scientific research and pedagogical observations leads to the conclusion that artificial intelligence has great potential for creating a more inclusive educational environment. Adaptive learning systems can provide an individualized approach to each student, regardless of their special needs. Voice assistants and text translation programs can help students with visual or hearing impairments, and speech recognition systems can help students with writing difficulties, Augmented reality applications can increase accessibility by providing virtual support and additional information. For example, augmented reality can offer sign language interpretation or display additional information related to classroom activities; artificial intelligence can be a valuable assistant for educators, especially when working with students with emotional difficulties. Emotion recognition tools allow educators to better understand what their students are feeling and adjust their working methods accordingly, creating a more empathetic and inclusive educational environment.

Summarizing the above, we can say that artificial intelligence is transforming education, making it more accessible and effective for all students, regardless of their special needs. Technologies such as adaptive learning platforms, speech recognition systems, and augmented reality open up new opportunities for personalizing learning, creating an inclusive educational environment, and increasing motivation to learn.

4. Disadvantages of using AI

Based on the analysis of a wide range of sources and scientific works on the problem under study, we will highlight the main disadvantages of introducing artificial intelligence into an inclusive educational environment:

1. The use of artificial intelligence in inclusive education carries certain risks associated with algorithmic bias. There is a threat that machine learning models may perpetuate existing inequalities and discrimination in the educational process.

2. The digital divide is a serious obstacle to realizing the potential of artificial intelligence in inclusive education, as not all students have equal access to the digital technologies needed to use innovative educational tools.

3. Security and privacy. Developers and implementers of artificial intelligence systems in education are responsible for ensuring the security and confidentiality of students' personal data. Collecting and analyzing large amounts of data requires the development of effective information security measures and transparent mechanisms for its processing.

4. Training and digital skills of teachers Successful implementation of artificial intelligence in inclusive education is impossible without proper training of teachers. Teachers must not only master new technologies, but also understand how to use them effectively to meet the needs of students with special educational needs. However, in practice, it often turns out that teachers need additional training to effectively use new technologies in their work. In addition, it is important that technologies are used to achieve pedagogical goals and not replace traditional teaching methods.

To summarize, the integration of artificial intelligence into inclusive education opens up new opportunities, but at the same time poses complex ethical dilemmas. To ensure the fair and effective use of AI in education, it is necessary to develop clear ethical principles that would regulate the collection, storage, and use of student data, as well as ensure the transparency of algorithms. In addition, it is important to create mechanisms for monitoring and evaluating the impact of AI on the educational process, as well as to develop appropriate training programs to prepare teachers to work with new technologies. Only with a comprehensive approach will we be able to realize the full potential of artificial intelligence to create a more inclusive and effective educational environment.

5. AI tools and technologies for inclusive education

The introduction of artificial intelligence tools, such as *ChatGPT and Poe* chatbot, into the educational process opens up new perspectives for the development of inclusive education. A study published in the Journal of University Teaching and Learning Practice (2024) confirms that the use of chatbots can significantly improve student learning outcomes.

To ensure an inclusive educational environment for students of all levels with special educational needs, it is promising to use adaptive learning systems based on artificial intelligence. An example of such a system is *Squirrel AI,* which, analyzing the individual characteristics of each student, builds a personalized curriculum. This allows to accelerate the learning pace for gifted students by offering them more challenging tasks; slowly but surely progress for applicants who need additional time to master the material; reduce the learning load by focusing on key concepts; increase motivation through a sense of progress and achievement.

Adaptive learning systems such as *ALEKS and Knewton* offer an individualized approach to education. ALEKS, in particular, specializes in the exact sciences (math, chemistry, statistics), creating personalized curricula based on continuous assessment of students' knowledge. Knewton, in turn, uses big data to adapt learning materials to the needs of each student by analyzing their previous results, learning style, and individual strengths.

Microsoft's Immersive Reader is a powerful tool that uses the power of artificial intelligence to create a more inclusive learning environment. Thanks to its speech synthesis, power word split, and translation features, it helps students with various learning disabilities, such as dyslexia, autism, and attention deficit disorder, to more easily comprehend textual information. In addition, Immersive Reader can be useful for applicants who are learning a foreign language or have limited vision. This tool is a vivid example of how technology can be used to create a more accessible and effective educational process.

For educators, *Poe* is becoming a useful tool that simplifies the process of creating and adapting educational materials. Using this chatbot, teachers can quickly generate tasks, text or multimedia materials that meet the individual needs of students.

6. Results of the study

Artificial intelligence has the potential to revolutionize education, especially in the context of inclusion. AI platforms for distance learning can provide equal access to quality education for all learners, regardless of their geographic location, social status, or physical abilities. Adaptive AI-based curricula allow to take into account the individual needs of each student, providing optimal learning conditions. Artificial intelligence, represented by such platforms as IBM Watson Education, SMART Learning Suite, Cognii, and others, is revolutionizing the educational process.

AI offers a wide range of tools for creating an inclusive educational environment. However, to achieve this goal, it is necessary to understand that technology is only one element of a complex puzzle. The effectiveness of using AI depends on many factors, such as pedagogical approaches, organization of the educational process, social context, and individual needs of students. Therefore, to fully realize the potential of artificial intelligence in education, it is necessary to create integrated solutions that take into account both technological and social aspects.

7. Conclusions

The study confirms that artificial intelligence has significant potential to transform the inclusive educational environment. In particular, adaptive learning systems that use machine learning algorithms to analyze large amounts of student performance data allow for the creation of individualized learning paths. This helps to increase student motivation, improve their academic performance, and create a more comfortable learning environment. Collaboration between AI researchers and educators is key to developing effective and inclusive educational solutions. Continuous improvement of AI algorithms based on scientific research, combined with a deep understanding of pedagogical processes, will create tools that not only automate routine tasks but also enhance pedagogical interaction and facilitate individualized learning. Further research should be aimed at developing effective strategies for the above challenges and creating artificial intelligence systems that would foster critical thinking, creativity, and other key competencies necessary for students to succeed in the modern world.

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