

PEDAGOGICAL SCIENCES

AREAS OF APPLICATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES FOR SUSTAINABLE DEVELOPMENT OF THE EDUCATIONAL PROCESS

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Abstract

The article is devoted to the study of current trends in the implementation of artificial intelligence technologies in the educational process and analysis of their potential for ensuring sustainable development of modern education. The main attention is paid to four key areas of artificial intelligence in education: personalization of the educational process through adaptive systems that take into account the individual characteristics and needs of each student; automated knowledge assessment using natural language processing algorithms; introduction of intelligent chatbots and learning assistants for round-the-clock support of students; analysis of educational data, generation of educational content and creation of interactive learning environments using virtual technologies. Modern technologies for transcribing audio and video materials as an important tool for collecting and structuring educational information are analyzed in detail. The features of Google Cloud Speech-to-Text, OpenAI Whisper, transcription functions in Zoom and Google Meet platforms, as well as the possibility of their integration into the educational process are considered. A comparative characterization of the main transcription technologies by the criteria of accuracy, functionality, accessibility and scope is presented. The results of the study show that the introduction of artificial intelligence technologies contributes to improving the quality of education through personalization of learning, automation of routine tasks of teachers, and creation of a more inclusive educational environment. At the same time, certain limitations have been identified related to technical requirements, the need for staff training, and ensuring data confidentiality. The practical significance of the work is to systematize knowledge about the possibilities of artificial intelligence in education and to provide recommendations for the effective implementation of these technologies in educational institutions of various levels.

Keywords: artificial intelligence, educational process, personalization of learning, automated assessment, transcription, machine learning, adaptive systems, digital education.

Introduction. In today's world, artificial intelligence technologies are rapidly integrating into various spheres of human activity, and their impact on the educational process is particularly noticeable. Artificial intelligence is becoming a powerful tool that transforms traditional approaches to learning and creates new opportunities for personalizing education.

The modern educational system faces numerous challenges, including the need to provide quality education to an increasing number of students, adapt to different learning styles, support distance learning, and create an inclusive educational environment. Traditional teaching methods are often unable to effectively address these issues due to limited resources and a standardized approach that does not take into account the individual characteristics of each student. Given the rapid development of digital technologies and growing requirements for the quality of education, the introduction of artificial intelligence is becoming not only an opportunity but also a necessity to ensure the competitiveness of educational institutions.

The relevance of the study is due to the fact that the introduction of artificial intelligence technologies into the educational environment allows solving a number of key challenges: providing a personalized approach to each student, automating routine tasks of teachers, improving the availability of educational materials and making the learning process more efficient. Particularly noteworthy are the following areas of artificial intelligence in education: personalized learning, automated assessment, use of intelligent chatbots, and collection and processing of information from audio and video materials using various software solutions [3; 7; 9].

Another important aspect of the modern educational process is the need to effectively collect and organize information from various sources. With conferences, seminars, webinars, and online classes being held frequently, there is a need for fast and accurate conversion of audio and video content into text format for further analysis, archiving, and use. Automatic transcription technologies are becoming an integral part of

the modern educational process, especially in the context of distance and blended learning.

The purpose of this article is to analyze the main areas of application of artificial intelligence technologies to ensure the sustainable development of the educational process and to study modern tools for transcribing audio and video content that significantly expand the capabilities of the educational environment.

Key areas of artificial intelligence application in education. One of the key areas of application of artificial intelligence technologies in education is the personalization of the learning process. Adaptive learning systems based on machine learning algorithms analyze data on students' performance, preferences, and learning pace and, based on this analysis, offer individualized curricula and materials.

Such systems are able to identify problem areas for each learner and offer additional exercises or materials to help them better master complex topics. At the same time, the system can offer more challenging assignments for learners who are quick to learn, which keeps them engaged [1; 6].

An important aspect of personalization is also the adaptation of learning materials to the learning style of each learner. For example, for visual learners, the system can offer more graphic materials, while for audial learners, it can offer more audio materials. Examples of successful use of such systems are the Knewton and ALEKS platforms, which show a significant increase in learning efficiency when used.

Automated assessment is another important area of artificial intelligence in education. Thanks to natural language processing algorithms, artificial intelligence systems are able to analyze not only multiple-choice tests but also written works, evaluating them according to criteria such as grammar, style, and even content.

This significantly reduces the workload of instructors, freeing them from the routine work of checking assignments and allowing them to focus on more creative and interactive aspects of learning. In addition, automated assessment provides objectivity and instant feedback to students, which is an important element of effective learning [5].

Systems using large language models, such as GPT-3 or BERT, are able to provide detailed analysis of papers, identify logical errors, and provide recommendations for improving structure and argumentation. This contributes to the development of critical thinking and self-esteem of students.

Intelligent chatbots are becoming an increasingly common tool in education, especially in distance learning systems. They provide round-the-clock support to learners by answering their questions, making recommendations on learning materials, and explaining complex concepts.

AI-powered chatbots are able to understand the context of questions and provide relevant answers, making interaction with them natural and effective. They can help students plan their learning process, remind them of assignment deadlines, and recommend additional materials based on individual needs [11].

An important advantage of such systems is their accessibility at any time of the day, which is especially

valuable for learners who study at their own pace or have an atypical schedule. This creates a continuous learning process where each learner has access to support exactly when they need it.

In addition to the above, there are many other areas of artificial intelligence application in education that significantly expand the capabilities of the educational process. Educational data analysis allows AI-based systems to process huge amounts of information, identifying major trends, detecting student difficulties at early stages, and providing teachers with tools for timely support. Such analytical systems can detect that a certain group of students is struggling with a particular topic and recommend additional classes or materials for mastering, which allows not only to increase the level of knowledge but also to provide timely support to each student [13].

Generating educational content based on large language models is becoming an important tool for teachers. Thanks to the capabilities of artificial intelligence, you can quickly generate lesson plans, create additional learning tasks, or even prepare presentations. This makes preparing for classes much easier and allows you to focus on the quality of teaching, as well as use artificial intelligence to get recommendations on how to improve your teaching methods based on the analysis of student performance.

Virtual and augmented reality, combined with artificial intelligence technologies, allow for interactive learning environments where students can gain hands-on experience in a safe virtual space. For example, a student can learn chemistry by observing virtual reactions or study biology by traveling through a virtual cell. Not only does this make learning more engaging, but it also promotes a deeper understanding of the material through hands-on experience [2].

Creating educational games and simulations using artificial intelligence opens up new opportunities for developing practical skills without real risks. Students can participate in staff training exercises using artificial intelligence technologies, which allows them to assess the possible consequences of their decisions without risk. This creates a safe environment for experimentation and helps students develop practical skills, which is especially important when training military personnel or specialists in critical areas.

Query engineering, or formulating the right queries for artificial intelligence systems, is becoming an important aspect of working with large language models such as ChatGPT. The ability to correctly formulate a query affects the quality of the answer provided by the system. Therefore, it is important to teach students and teachers how to build queries correctly, ask clear and specific questions to get useful information and effectively use artificial intelligence in the educational process.

Transcription technologies in the educational process. An important aspect of the modern educational process is the efficient collection and processing of information from various sources, including audio and video materials. Transcription technologies that

convert voice content into text format open up new opportunities for documenting and analyzing educational content.

For a better understanding of the capabilities and features of different transcription technologies in the

educational process, Table 1 presents a comparative description of the main platforms and tools. The analysis shows that the choice of a particular technology depends on the specific needs of the educational institution, technical capabilities, and financial resources [4; 14].

Table 1

Comparative characteristics of the main transcription technologies in the educational process

Technology	Google Cloud Speech-to-Text	OpenAI Whisper	Zoom Transcription	Google Meet Transcripts	OBS Studio + Whisper
Advantages	High accuracy Support for 125+ languages Automatic punctuation Cloud processing Integration with Google Workspace	Free Local processing High accuracy Support for different accents Possibility of fine-tuning	Built-in function Automatic saving Integration with the calendar Instant availability	Free for Workspace Automatic saving to Drive Integration with Google Calendar Easy to use	Free of charge Full control High customization options Local processing
Disadvantages	Requires an internet connection Paid service File size limit (60 sec/10 MB) Dependent on sound quality	Requires technical skills Resource-intensive Longer processing time Requires installation	Requires a paid license Limited functionality Dependence on the quality of the connection Lower accuracy	For computers only Limited number of languages Requires Workspace Basic functionality	Difficult to set up Requires experience Resource-intensive Longer processing time
Field of application	Short audio recordings Lectures Seminars Online conferences	Long records Scientific conferences Research Content archiving	Online classes Web seminars Working meetings Distance learning	Educational meetings Corporate conferences Virtual classes Teamwork	Streaming of lectures Recording of presentations Creation of educational content Professional video

One of the key technologies in this area is Speech to Text, a system that converts spoken language into written text. Google Cloud Speech-to-Text is a powerful tool based on Google's deep learning neural network algorithms. This service supports more than 125 languages and dialects, ensuring high recognition accuracy even in the presence of different accents and speech features.

The process of using this technology involves several stages: audio data collection, pre-processing to remove noise, speech recognition, and post-processing to ensure the grammatical correctness of the text. An important advantage is the ability to automatically punctuate and format text, which increases its readability [10].

Whisper is an artificial intelligence-based speech recognition model developed by OpenAI that provides high accuracy in transcribing audio with different accents and speech features. It can work with a variety of audio formats and can be easily integrated into various software solutions to automate the transcription process.

OBS Studio, although originally designed for streaming and recording video, when combined with transcription technologies, becomes a powerful tool for creating text transcripts from video materials. This is especially useful for documenting lectures, seminars, and other educational events.

The main advantages of these tools are high accuracy of speech recognition, the ability to work with different languages and accents, and automation of the transcription process, which saves time and resources [8].

Modern video conferencing platforms, such as Zoom and Google Meet, also offer automatic transcription features, which is extremely useful for the educational process, especially in distance learning.

Zoom offers transcription capabilities for users with a Business, Education, or Enterprise license. The setup process includes activating cloud recordings and automatic transcriptions in your account settings. After recording a meeting, Zoom sends a link to the recording file and transcription.

Google Meet also supports a transcription feature that is available to users on a desktop or laptop. Transcripts are stored on the meeting organizer's Google Drive and contain everything that was said during the meeting [12].

These technologies greatly facilitate the process of documenting educational events, make information more accessible and structured, and provide the ability to quickly search for the information you need in text format.

Conclusions. The introduction of artificial intelligence technologies into the educational process opens up new horizons for improving the quality and accessibility of education. The main areas of artificial intelligence use, such as personalized learning, automated assessment, intelligent chatbots, and learning assistants, allow for a more adaptive and efficient learning environment that takes into account the individual needs of each student.

Transcription technologies, such as Speech to Text, Whisper, and transcription functions in Zoom and Google Meet, significantly expand the possibilities for collecting, processing, and analyzing educational information. They convert audio and video content into text format, making it easier to store, search, and use.

The use of these technologies not only increases the efficiency of the educational process, but also makes education more inclusive and accessible to all categories of students. Automation of routine tasks frees up teachers for more creative work and interactive interaction with students, which contributes to the quality of education in general.

However, it is worth noting that despite all the advantages, artificial intelligence technologies have certain limitations, such as dependence on the quality of input data, the need for significant computing resources, and possible accuracy issues in some cases. Therefore, for maximum effectiveness, these technologies should be used as a complement to traditional teaching methods, not as a complete replacement.

In the future, with the development of artificial intelligence technologies and increased computing capabilities, we can expect even deeper integration of these technologies into the educational process, which will help create a truly personalized, effective, and accessible educational environment for each student.

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