KAPITEL 5 / *CHAPTER 5* [5]
CURRENT CHALLENGES AND PROSPECTS OF USING ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN CONTEMPORARY EDUCATION

5.1. Exploring the possibilities of integrating artificial intelligence technologies in contemporary education

Currently, information technologies are no longer just present in all spheres of modern society but have already become an integral part as well. All innovative developments are quickly integrated into everyday life to optimize work processes and improve the quality of human life. The development of *artificial intelligence (AI)* technologies has been the latest advancement in the field of IT.

The concept of *artificial intelligence (AI)* was created to demonstrate that a machine, such as a computer, can think. Over fifty years ago, Allan Turing proposed a test to prove this, known as the *Turing test*. This test involves a subject communicating one-on-one with either a person or a computer without knowing who they are communicating with. Based on the answers they receive during the conversation, the subject must determine whether they are communicating with a person or a machine. The goal of the interlocutor (the other party in the conversation) is to convince the subject that they are a human being (Turing, 1950).

To fully comprehend the meaning of the Turing Test, it is important to consider the socio-historical context in which it was proposed. During that time, information regarding the workings of the human brain at both neurophysiological and psychological levels was quite limited. Computers were just starting to emerge, and they were extremely bulky and slow, primarily used for calculations. Considering this,

[5]***Authors:*** *Prykhodko D.*
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questioning the possibility of machine intelligence stirred up a lot of debate. In response, Turing did not propose his test as a practical way to test the intelligence of a computer. Instead, he suggested moving away from speculative and unproductive discussions about the possibility of machine intelligence and start conducting experimental research using computers. Ultimately, whether we call a certain machine intelligent or not is not as important as whether it can complete assigned tasks as well as a human (Turing, 1950).

Our understanding of the capabilities that machines possess and the ones that only humans have is continuously evolving. Today, the field of artificial intelligence is quite extensive, encompassing basic research, sophisticated advancements, practical applications, and several technical solutions from various domains. Artificial intelligence encompasses all the developments in automating problem-solving tasks such as creating game programs, image recognition, automatic driving systems, and machine translation.

Artificial intelligence can be defined as the ability of a computer system to interact with the environment around it, whether it is through visual perception or speech recognition. This system is also expected to demonstrate human-like intellectual behavior, such as analyzing available information and making rational decisions to achieve a desired goal (Rizzotto, 2017).

Artificial intelligence refers to a collection of technological solutions that enable the imitation of human cognitive functions, including self-learning and searching for solutions without a predetermined algorithm. The goal is to obtain results comparable to those achieved by human intellectual activity when performing specific tasks (Russell, Norvig, 2011).

Additionally, artificial intelligence technologies using deep learning algorithms have opened new horizons in data processing, pattern recognition, and automation. In the corporate sector, artificial intelligence, due to its ability to analyze huge volumes

of data and identify hidden patterns, makes it possible to predict effective development strategies, optimize logistics, predict market trends, and personalize the customer experience. In the healthcare sector, artificial intelligence is actively being introduced into the diagnosis and prognosis of diseases, increasing its accuracy, and suggesting optimal treatment methods. In everyday life, artificial intelligence technologies find application in various smart devices and vehicles, forming an ecosystem that adapts to the preferences of a specific user (Kong, 2020).

Cloud computing technologies and mobile Internet have made AI systems accessible to mass users: we constantly use them, forming search queries on the Internet, performing machine translation, and using intelligent assistants. Well-known examples of foreign intelligent assistants include **Siri** (by Apple), **Alexa** (by Amazon), and **Cortana** (by Microsoft).

The technologies underlying AI are still just coming to market. However, they are beginning to play an increasingly prominent role in the digital transformation of education that is developing today, along with the development of cloud computing and an increase in the speed of Internet access.

The future of education is believed to depend on intelligent learning programs and expert systems. However, these technologies are still in the research and development phase. While they hold immense potential and promise to simplify the work of both students and teachers, their practical use is currently limited. Despite this, a few intelligent training systems are already being used in practice today (Rizzotto, 2017). Here are some examples:

– **Thinkster Math**: A commercial service that helps students learn mathematics by combining intelligent software modules and online teachers. The software modules analyze each student's reasoning process while they solve arithmetic problems and identify any errors and their possible causes. If a student needs help, Thinkster Math provides guidance and shows them videos to overcome challenges. Personal tutors

monitor the students' progress and guide them through any difficulties that arise. The program also offers an extensive reward system that includes rewards for successful completion of assignments, math games, gifts, competitions, and a winners board.

– **Brainly**: A social networking site that allows students to ask questions about various academic subjects and get answers from their peers. The site uses machine-learning algorithms to filter spam, ensuring that users receive verified answers. Additionally, Brainly assists students in discovering the right answers on their own. Active students can comment on suggested answers and aspire to become a learning community moderator within Brainly. Within a community, group dynamics similar to those found in a traditional classroom emerge, with experts in various academic subjects gradually becoming visible and interest groups forming.

– **WriteToLearn**: A system that aims to improve literacy among primary and high school students. The system provides students with reading comprehension tasks, which require them to read carefully and write down their understanding of the text. It then evaluates their comprehension skills. The system comprises two main blocks: Summary Street and Intelligent Essay Assessor.

– **Mika**: Carnegie Learning Corporation has developed a system called Mika that uses AI tools to teach mathematics to university students. Unlike traditional tutorials, Mika provides educational material (e.g., tests) and responds immediately to students' difficulties. The program considers not only students' knowledge but also their ability to reason and apply specific techniques to solve various problems while creating an educational path.

– **MATHia**: Carnegie Learning Corporation has developed a product that uses AI tools to teach mathematics to students in the United States. This product is built on the same software platform as Mika, but it has been specifically designed for US students. The system analyzes student responses and provides explanations for any errors encountered. Like the Mika system, this product uses a blended learning model,

meaning that students receive support from a computer program and a personal tutor.

Currently, developers have access to software tools that make it much easier to create applications using AI technologies (e.g., Microsoft Cognitive Services). The time is not far off when every educational resource will process messages in natural language using built-in scripts, evaluate the emotional state, and recognize what exactly the user wants. However, for this to happen, not only technological but also methodological developments are needed. There are many reasons to believe that the time for the practical use of AI systems has already arrived. For example, today every user can purchase an intelligent digital assistant **Amazon Echo Dot**, which is built on the **Alexa AI** system and speaks fluent English/German. While communicating with this assistant, you can not only listen to the news, your favorite music, or get background information from the Internet, but also practice speaking English or German.

The rapid spread of artificial intelligence methods in the coming years can have a significant impact on changes in the content of education and will lead to the emergence of qualitatively new digital educational materials and tools.

In today's education sector, there is an increasing trend towards utilizing advanced technologies to enhance the efficiency of the educational process. As a result, the integration of artificial intelligence technologies has become prevalent. The use of AI in education offers a unique experience for each learner through the application of neural networks. The primary benefits of AI in education include automating the learning process, providing personalized feedback through data analysis, creating intelligent education environments, and adopting an individualized approach to the educational process (Luo, Yang, 2022).

The digital environment and contemporary information technologies have become essential components of modern education. They offer unparalleled access to information, advanced data analysis and processing tools, and the ability to automate

and optimize learning management processes. As a result, integrating AI into learning management provides a vast array of new opportunities to enhance learning processes and identify the potential of each learner (Luo, Yang, 2022).

During the early days of computers in the 1960s, the first steps were taken to introduce artificial intelligence technologies into the field of education. Programs were created to teach the basics of programming, which provided students with programming riddles and checked their answers. In the 1980s-1990s, expert systems were introduced in education. These software systems used knowledge bases to support decision-making in individual subject areas. Expert systems could conduct automated diagnostics of students' knowledge levels, identify gaps in understanding, and provide educational resources or links to them to eliminate those gaps. They also provided teachers with information about difficulties encountered in learning. By analyzing information about the students' interests and skills, the expert system could help with the choice of training courses or professions that suit them. Later, in the 1990s, adaptive learning systems emerged that could assess the level of knowledge of students and offer tailored educational materials and tasks based on subsequent analysis. With the advent of more powerful computing resources in the 2010s and the development of deep learning algorithms, neural networks have made it possible to tailor learning even more precisely to the unique characteristics of each learner (Tahiru, 2021).

5.2. Personalized learning strategy as a tool to improve students' academic performance and motivation

The transition to a post-industrial civilization, the exponential growth of knowledge, the informatization of all spheres of life, and the movement towards a "learning society" have changed the requirements for people and pose a serious

challenge to the education system. It is believed that the digital transformation of education should overcome society's dissatisfaction with the results of the educational system and bring these results and the educational system itself in line with the requirements of the new technological (digital) revolution. As a result of the development of information and communication technologies, digital resources, new types of educational environments, new carriers of educational information, including open content, new technologies for organizing interaction, and electronic learning management systems have emerged. These factors change the internal educational processes and the positioning of education in the socio-economic space.

In today's world, many factors influence the need and possibility of improving the educational process. The traditional approach to education is limited in managing student activities. However, modern trends in education provide new opportunities and tasks. These trends include personalization and individualization of learning, as well as continuity of education, which means there are multiple educational trajectories that students can take. To address these trends, digital technologies are increasingly being used to transfer some of the functions of learning management from teachers to technology (Kaur, 2023).

Personalizing the learning process involves considering individual characteristics such as cognitive abilities, motivation, interests, and existing experience. This is done during the planning, implementation, and monitoring of the educational process. It involves presenting educational material, choosing the level and content of tasks, and assessing educational results in a way that is tailored to each student's specific needs.

Personalized learning strategies have the potential to significantly improve academic performance and motivation among students by providing tailored instruction, differentiated support, student ownership, continuous assessment and feedback, flexibility, and enhanced motivation. By leveraging personalized learning approaches, educators can create learning environments that meet the diverse needs of

all students and empower them to reach their full potential.

A personalized, result-oriented approach to learning involves different types of content and the ability for students to work at their own pace. This is not solely the responsibility of the teacher; students must also be actively involved in the educational process and bring their interests, motives, and goals into the planning of educational work.

Individualization and personalization of learning have always been based on methodological developments, such as multi-level tasks, and the teacher's ability to find an individual approach that works for each student. However, due to the mass nature of traditional formal education, it has been difficult to ensure a sufficient level of personalization in the classroom.

Thus, with the help of digital education tools, teachers can now overcome the limited resources that previously prevented them from providing personalized work to each student. These tools allow for a more personalized approach to learning and can help students achieve greater success in their educational pursuits (Harry, 2023).

An important trend in the modern world is the concept of *lifelong education*. Education is no longer seen as a one-time event, but rather as a continuous process of purposeful accumulation of life and professional experience that contributes to a person's holistic personal and professional development throughout their life. This education requires multiple educational trajectories, allowing students to choose their path. The integration of formal, non-formal, and informal education, with the learner being the key player, is what makes lifelong education complete. This is due to the increasing need for constant self-education and the development of digital services and educational Internet resources that help individuals find and use digital sources to advance their knowledge.

The use of online educational resources and digital technologies brings about a significant change in a student's activity. It leads to a shift in motivation and regulation

of activity, with a greater emphasis on self-governance and less reliance on external control. In a world where information is abundant, education on the Internet becomes informational and educational. This means that it is a socially independent activity of a subject, carried out through the Internet, aimed at solving educational problems, expanding personal, educational, and professional experience. This kind of activity is an integral part of self-education in the context of digitalization. It is self-governed in nature and requires students to understand their own educational needs, interests, and tasks related to personal and professional development. They need to set educational goals, control the learning process and results, and optimize and improve work efficiency.

Although educational activities and information dissemination on the Internet are largely self-organized and self-developed, the unique features of the online space make these activities uncertain and risky. As a result, pedagogical support becomes necessary, which can be provided by digital assistants with the following functions:

– *motivational and stimulating* (help in setting goals, supporting interest, involvement);

– *guiding* (help in choosing a sequence of actions);

– *optimizing* (assistance in self-regulation, control, and reflection);

– *limiting* (avoidance of undesirable information events, risk prevention) (Rizzotto, 2017).

Personalized learning, providing different educational paths, and supporting non-formal and informal education, requires the use of digital tools. Therefore, the widespread use of digital tools and services in education will require intelligent technologies to identify the needs, interests, and characteristics of students, analyze their educational behavior, and adjust the learning process according to each student's requirements. Intelligent systems for educational purposes can be classified based on their functional characteristics, which include:

– *information systems;*

– *training systems;*

– *management systems* (diagnostic expert systems that compare learning goals, and strategies with achieved results);

– *accompanying systems* (systems that monitor the student's activities when working in any learning environment and provide assistance in detecting erroneous actions) (Rizzotto, 2017).

5.3. Prospects of implementation of AI-powered learning systems in modern education

In the future, AI-powered learning systems will claim to become a technological leader in the educational process. The following promising areas of their application can be outlined:

1) intelligent learning systems that promote personalization of learning, including chatbots that provide quick feedback to students directly during their educational work. With the development of technology, it becomes possible to create flexible personalized learning content that meets the dynamics of a particular didactic situation, including two-way semantic dialogue in the "machine-student" system;

2) systems for student work assessment;

3) systems for creating customized educational materials;

4) systems for collecting and analyzing information about a person and his educational behavior for understanding, forecasting, and managing the educational activities of students.

5) systems for educational analytics and consulting. Some universities already use chatbots or "digital assistants" that advise applicants and students on current issues.

6) gamification and virtual reality allow the use of artificial intelligence to increase the motivation of educational activities and the visibility of the phenomena being studied (Pendy, 2021).

Let us consider in more detail multifunctional intelligent systems that are actively being introduced into education and can significantly change its architecture: educational trajectory management systems, intelligent learning systems, and adaptive online learning platforms.

Educational systems nowadays rely on educational analytics, which involves measuring, collecting, analyzing, and presenting data about students and the educational environment. This helps to optimize the learning process and manage the educational system. In online learning environments, such as massive open online courses, psychometric information is collected and analyzed to evaluate learning outcomes and student behavior in the educational environment. Today, large volumes of educational analytics data are integrated into various elements of the university system. These include student recruitment and enrollment, educational program management, assessment of learning outcomes, resource analysis, student support, libraries, surveys, registration questionnaires and forms, and official communication channels.

A new direction of research has emerged – *Educational Data Mining (EDM)*, which uses intelligent methods of big data analysis (classification, clustering, modeling, identifying relationships) to search for patterns and interpret educational processes, forecasting, decision support, and forming recommendations for improving training. Research in the field of EDM is constantly expanding and includes analysis of the interaction between educational subjects, monitoring and evaluation of the teaching-learning process, administrator assessment of pedagogical actions, learning risks, and generation of recommendations. It is assumed that the use of big data technologies in education allows us to reach a new level of decision-making both in

the management of the organization and the educational process as well as in the formation of educational programs, increasing student motivation and learning effectiveness (Pendy, 2021).

To enhance the efficiency of online educational platforms and courses, developers are working on systems that gather data about the user's behavior while using the platform. This includes information related to types of controls, the links they follow within the system, and the content they view. By assessing the motivation level and cognitive effort expended by the student, these systems can provide recommendations for both students and educational providers to improve the effectiveness of training based on the collected data. These systems use artificial intelligence techniques to cluster students based on their behavioral strategies, predict the likelihood of incomplete course completion, evaluate learning productivity, and select educational content that best suits the individual cognitive characteristics of the student (Truong, 2016).

An array of data that reflects the formal educational indicators, characteristics, and actions of each student can be used not only to track their productivity but also to develop individual profiles and curricula, which help respond quickly to negative events or changing factors. Some systems enable educators to move from assessments that record past educational achievements to evaluating a students' future capabilities and recommending a curriculum that they are likely to complete successfully. For instance, the American educational platform, **Stellic**, offers an automated educational process that creates a set of courses and programs based on individual requests and goals, ideally suited to meet the needs and objectives of each student.

Intelligent tutoring systems are expected to revolutionize the way we learn by personalizing the learning process. These systems select learning materials and tasks for each student and monitor their learning progress. An intelligent learning system usually consists of several models, such as a domain model, a learner model, a

pedagogical model (or learner model), and an interface for interacting with the learning system. These models all work together to provide an effective learning experience (Truong, 2016).

Modern intelligent tutoring systems incorporate the preferred learning styles of students into their adaptive system. These preferred learning styles are determined through the collection and analysis of student data using computerized statistical algorithms. This allows for more tailored recommendations and instructions for optimizing the educational process for both students and teachers. Adaptive learning systems typically include an open learner model that collects and analyzes information about the students' achievements, emotional states, and biases. This model helps the system not only adapt to the students' needs but also enables the student to view themselves from an external perspective. This process allows students to analyze their studies, identify difficulties, and outline ways to overcome them.

In adaptive learning systems, artificial intelligence is used to implement the functions of a tutor. The system adjusts the learning process to make it as effective as possible and achieves the planned results. These systems may have different adaptive goals, such as adjusting the learning content, resources, format, and media to suit the students' needs (Troussas, Chrysafiadi, Virvou, 2019).

Solutions developed during the creation of intelligent tutoring systems are used in intelligent adaptive educational platforms. The platforms that are based on a combination of artificial intelligence and adaptive learning technologies (**Knewton, ALEKS, RealizeIT, MATHia, Squirrel AI, Dreambox Learning, STMath,** etc.), have been actively developing in recent years and bringing revolutionary innovations to the traditional learning model.

Knewton is a popular intelligent adaptive educational platform that offers personalized recommendations for students and educational organizations at all levels. It adapts standard educational content to meet the unique needs of students from all

over the world, analyzing a vast number of educational materials with varying characteristics such as content, format, and complexity. It creates a selection of content for each student and evaluates the educational content at each subsequent stage, providing recommendations to each student. Additionally, predictive analysis of training data is provided to determine the learner's status and improve the quality of training. The course content is evaluated, and the impact of the content on learners is analyzed as well. Knewton has been named a "Technology Pioneer" by the World Economic Forum and recognized by Fast Company magazine as one of the top 10 innovative big data companies in the world. Since 2008, Knewton has raised $137 million across eight funding rounds and has become a well-known company in the field of intelligent adaptive learning.

Squirrel AI is a modern adaptive learning platform that has gained popularity with over a million users. Developed by Chinese developers, this platform has achieved the highest level of decomposition of learning outcomes in the world. The Squirrel AI knowledge system divides one point of educational material into 13 points, resulting in a huge knowledge base of more than 400 thousand video fragments, over 10 million questions, and more than 500 teaching methods. There are over 30 thousand learning elements to describe just one academic subject of a basic school. The use of artificial intelligence algorithms allows for detailed comparison of student experience, timely filtering out of the knowledge elements that students have already mastered, identification of areas where they made mistakes, and recognition of the causes of errors. Afterward, an individualized training program is drawn up for each student, focusing on their unique abilities. The difficulty level is dynamically adjusted based on the students' knowledge, enabling them to improve their achievements. The Squirrel AI developers believe that their system is a collection of the experience and wisdom of teachers. Compared with a regular teacher, artificial intelligence can provide a better solution for each student, better organize the acquisition of necessary knowledge, and

develop learning abilities.

The use of artificial intelligence technologies for the digital transformation of education could involve creating *digital twins*. This approach aims to improve learning effectiveness, personalize the educational process, and assist with selecting an educational path. To achieve this, computer recognition systems will be employed to study students' psychology, emotional state during studies, and form a digital model of each student. The idea is that digital twins, which simulate experience, emotional state, perception, and memory, will enable educators to visualize students' development levels and select optimal teaching methods for everyone. Developing the concept, theory, and practice of digital twins in education will involve creating mathematical models of students and pedagogical and management processes. This will improve the quality of educational and business processes, as well as management within educational institutions (Kaur, 2023).

To support different forms of learning and manage learning activities while ensuring variability in educational trajectories and personalizing learning, various general-purpose digital tools and services are used, along with learning management systems. Among the latter, we will particularly highlight educational trajectory management systems, intelligent teaching systems, and adaptive online learning platforms, which not only perform a significant part of the teacher's work but also carry out intelligent management of the educational process.

However, despite the obvious advantages of digitalizing education, questions about the risks that may arise along this path remain open.

5.4. Possible risks of using digital and artificial intelligence technologies in contemporary education

The term *risk* is used to describe situations where circumstances arise that cause uncertainty or prevent the expected results when trying to achieve a specific goal. In this context, we will examine the risks associated with the integration of artificial intelligence and digitalization of education from a broader perspective. This includes evaluating the potential impact on the quality of educational activities, as well as its effects on various aspects of human development and the psychological well-being of both students and teachers.

The first set of risks associated with digitalization in education is the potential loss of quality. This is because digitalization alters the fundamental components of education and redefines the architecture of educational processes. What used to be taught (knowledge, skills, attitudes, etc.) is now considered content, while the diverse educational interaction between a teacher and a student has been reduced to communication. Although this reduction in the "dimension" of learning may lead to the formalization of processes through digital technologies and an illusion of better implementation, there are two important factors to consider.

Firstly, education is not solely about delivering content but also involves the transmission and mastery of cultural norms, patterns, and methods of interaction that shape a person's cultural identity, ability to consciously choose life strategies, and value systems. Secondly, remote learning, even in a synchronous format, limits the transmission of meanings and multidimensional feedback, especially in non-verbal and emotional components. When interacting with a person who is the bearer of knowledge, the cognitive activity is more emotional and reflective, which helps to expand meanings, overcome one's boundaries, and strengthen the motivation to learn. When working with information alone, without the "live" feedback, and non-verbal

signals, there is a decrease in students' motivation and involvement in the learning process. In addition to this, there are several technical risk factors. For example, the use of incorrect methods when developing adaptive learning systems, and inaccurate or incomplete data in artificial intelligence technology negatively affect the quality of decisions made by the system. The use of artificial intelligence in education requires the collection of sensitive information such as students' academic records and performance data. In that case, both technical and ethical issues arise: Who controls the data? How are its integrity and confidentiality ensured? Who is responsible for the leakage or misinterpretation of data? The abovementioned issues can also affect the quality of education.

In addition to risks that directly affect the quality of education, there are also risks to the personal development of students which can be attributed to the results and quality indicators of educational systems. To form positive relationships with oneself, others, and the world, and to develop important qualities like determination, responsibility, self-regulation, etc., various external conditions and a social context are necessary. In education, this is achieved not only through a variety of external conditions, but also through social context such as support, cooperation, partnership, and personal interaction among teachers and students, as well as within student groups (Essalmi et al., 2010).

Studies suggest that replacing traditional learning with digital learning can have negative effects on four interrelated aspects of personal development: *socio-psychological*, *motivational*, *regulatory*, and *emotional*. One of the main problems is the lack of opportunities to develop social skills, such as communication, interaction, teamwork, public speaking, and leadership. The process of transmitting behavioral patterns, interaction, and professional culture is also reduced in online learning, which limits the development of personality resources that are crucial for successful socialization and adaptation to different social groups. Additionally, online learning

makes it difficult to find the right balance between student self-government and external control, which is necessary to develop an individual's regulatory resources. Step-by-step activity management, including structured information delivery, strict management, and regular control, can make a person feel like a trainee rather than a learner. This reduces their responsibility, initiative, and ability to self-manage their activities, and prevents the development of appropriate qualities (Essalmi et al., 2010).

The widespread use of recommendation services, digital assistants, and other similar tools can cause several issues. When these tools replace human abilities, people fail to develop those skills and may even experience a decline in their abilities. This means that the substitution of human functions with artificial intelligence and human-like machines comes with risks for the development of complex mental abilities.

The increasing digitization of our lives and the shift towards online learning and other processes have brought with it several risks that can negatively impact a person's psychological well-being. These risks include addiction to the virtual world, socialization disorders, internet addiction, joining antisocial groups, and exposure to harmful and illegal content. It is important to consider the serious consequences of engaging with the online world.

The physical distance between individuals, which is often considered a disadvantage of digital learning, can have a negative impact on the mental health of both students and teachers. This is because, without direct communication that is emotionally fulfilling, the need for acceptance, recognition, and self-actualization may not be met. The lack of trust, meaningful communication, collaborative energy, and a sense of belonging during remote learning and interaction can cause discomfort and anxiety, leading to reduced self-confidence, satisfaction, and psychological well-being. Additionally, spending long hours in front of a computer, processing a large amount of information, can drain one's emotional resources, limiting opportunities for personal growth and development, leading to psychological issues such as depression.

Professional identity and psychological well-being of teachers are important factors in the quality of education, but the digital transformation of education is becoming a powerful stress factor, giving rise to fears about the inability to keep up with innovations, ensure the proper quality of work, lose workload, etc. In addition to this, digitalization, displacing fundamental pedagogical values, actualizes the risks of losing the professional identity of teachers.

Another significant risk associated with the shift towards digital learning is that it exposes student activities to external monitoring and management. The modern digital technologies employed in this process enable the collection of vast amounts of data about an individual, including their cognitive and personal characteristics, interests, and preferences. The concern is that this data can be exploited for malicious purposes, such as providing misleading analytical information to make decisions about a person's future, such as determining their social status or eligibility for benefits. This also opens up the possibility of manipulating a person's behavior by distorting their self-perception and the trajectory of their development.

Digital assistants, recommendation services, trajectory designers, and chatbots have the potential to greatly enhance the learning process. However, it is crucial to consider the quality and source of the data used, as well as who inputs the information and how. While we may hope that intelligent systems will eventually make decisions more effectively than humans, there is a potential risk that as subjectivity decreases, control functions in education may gradually shift to these systems. As intelligent systems become more and more autonomous, comprehensive interdisciplinary research is necessary to determine the division of functions between humans and artificial intelligence not only in education but also in other areas of social life (Essalmi et al., 2010).

The digitization of people and education, along with the collection of educational analytics, the use of recommendation services, and the implementation of intelligent

systems for monitoring and managing educational trajectories, have the potential to pose risks such as loss of subjectivity and manipulation of people's consciousness.

5.5. Guidelines for the safe use of artificial intelligence technologies in learning management

The presence of a wide range of risks from the use of digital and artificial intelligence technologies in education requires the determination of methods and measures to work with them. We suggest two key conditions for the safe use of artificial intelligence in learning management.

The first condition – is the methodological development and creation of an updated holistic educational system, in which the place and functions of intelligent digital tools and services are clearly and transparently defined. Education serves as a traditional system that preserves and shares fundamental human values and cultural significance. As it evolves and adapts to new technological advancements, it is crucial to uphold the continuity of educational culture, the established sense of purpose, and the humanitarian nature of educational procedures. Despite the integration of artificial intelligence, education must remain a domain of social interaction.

The second condition for the successful implementation of digital education – is ensuring that all students are ready to utilize digital opportunities in the new educational reality. While teachers' readiness is already a subject of close attention, it is now critical to focus on the readiness of students. Research has identified internal predictors of learning success in the digital environment and the internet, including students' cognitive and metacognitive abilities, motivation and involvement, responsibility, self-control, ability to participate in the learning process independently and actively, and skills in using information and communication tools. Five key

components of students' readiness for online learning have been identified: *attitude toward online learning*, *independence in learning*, *time management*, *communicative competence*, and *technical competence*. However, students' attitudes towards online learning are mixed. While they understand the importance of such training, they may not be willing to invest enough time and effort into it.

In today's digital age, there is an abundance of educational resources, training systems, and intelligent services that one can access to build their educational path. However, navigating through this vast amount of information requires more than just self-governance and decision-making abilities. It also requires a holistic understanding of one's goals and values, as well as a clear picture of the world. Having a complete picture of the world enables individuals to understand themselves and the world around them, interpret events, prioritize their goals, and establish guidelines that serve as reference points while perceiving and assessing their actions, aspirations, and prospects, including education and development.

To live a fulfilling life and achieve personal and educational goals, individuals need to establish a system of self-regulation for their actions and subjective qualities. This includes developing responsibility, determination, reflexivity, and self-regulation skills. With the digital transformation of education, there is a shift towards individualized educational trajectories, personalized technologies, various educational formats, and educational platforms. This requires a complete transformation of individuals from passive knowledge consumers to active self-directed learners.

A self-directed student or educational participant is someone who prioritizes values such as cognition, development, and creativity, which serve as appropriate internal motivation for educational activity. They possess self-regulation skills for planning, organizing, and controlling their education. They are aware of their capabilities and limitations, can set goals for education and self-development, make informed choices, and take responsibility for the results of their activities. Such

individuals will be able to utilize any digital resources and services responsibly and effectively for their education and personal development, including training, recommendation systems, learning management systems, and educational trajectories.

Although digital transformation in education is inevitable, it is important to note that the advantages of future education will not solely rely on intelligent systems and services. Instead, it will depend on practical experience, cooperation, emotional communication, mentoring, support, and many other factors as well. For education and society to make positive and fundamental changes, pedagogical systems should provide an environment that allows individuals to form a better understanding of the world and develop personal resources, thus becoming active participants in their educational journey.

5.6. Advantages of using distance learning and artificial intelligence technologies in learning foreign languages

Artificial intelligence has emerged as a valuable tool in education, with several studies exploring its use in pedagogy. The integration of AI technologies has led to advancements in the field of traditional and online education. By utilizing this technology, teachers can automatically analyze the learning process, which can result in potential improvements in pedagogy.

Distance (online) learning offers several advantages over classical one (face-to-face). Here are some key benefits:

1. *Flexibility:* Online learning offers students the convenience of accessing course materials and lectures at their own pace. They can learn whenever they want and fit their education around other commitments such as work or family responsibilities. This flexibility is particularly advantageous for those who have limited time or live in

remote areas with limited access to traditional educational institutions.

2. *Accessibility:* Online education breaks down geographic barriers and provides access to quality education for people who may not have access to classical programs in their area. This allows students from all over the world to enroll in courses offered by renowned institutions and learn from leading experts in the field.

3. *Cost-effectiveness:* Online learning often eliminates the costs associated with commuting, housing, and textbooks, making it a more affordable option for many students. Additionally, online courses often cost less than traditional on-campus programs, making education more accessible and cost-effective.

4. *Various learning resources*: Online learning uses a variety of multimedia resources such as videos, interactive quizzes, and online forums to enhance the learning experience. Students can access a wealth of digital materials, including primary sources, research papers, and multimedia presentations, providing a more immersive and engaging learning experience than traditional textbooks.

5. *Personalized learning*: Online education platforms often use adaptive learning technologies and algorithms to tailor the learning experience to specific students. These technologies can assess a student's progress and adapt the content and pace of learning accordingly. This personalized approach allows students to focus on their weaknesses and progress at a comfortable rate.

6. *Opportunities for collaboration and networking:* Online learning promotes collaboration and networking among students from different backgrounds and geographic locations. Virtual discussion boards, video conferencing, and group projects facilitate interaction and exchange of ideas, creating a rich learning environment.

7. *Up-to-date content:* Online educational platforms can quickly update course materials to reflect the latest research, developments, and discoveries (e.g., in the history of classical theory). This ensures that students have access to current and

relevant information, improving their understanding and knowledge (Betal, 2023).

As it was mentioned above, online learning has many benefits. However, traditional face-to-face learning also provides unique advantages. These include the opportunity to interact with professors and classmates in person, hands-on experience, and access to physical resources like libraries and archives. Ultimately, the decision between online education and traditional study will depend on individual preferences, circumstances, and learning goals.

Artificial intelligence learning systems, which are equipped with *natural language processing (NLP)* capabilities, provide personalized and adaptive learning experiences to students, helping them to improve their language skills independently. Additionally, AI algorithms can automate the assessment and evaluation process, making it more efficient and objective, thus providing a fair and accurate evaluation of students' performance (Yanhua, 2020).

However, the process of integrating AI into foreign language learning poses some challenges as well. Ethical considerations such as data privacy and algorithmic bias must be carefully considered to ensure fairness and protect student privacy. Hence, educators must find a balance between using AI tools and maintaining the important human element in language teaching by providing students with guidance, motivation, and emotional support (Zhu, 2017).

Nevertheless, the future of AI in foreign language teaching seems promising. The ongoing development of AI language models, based on large-scale data sets and improved understanding of natural language, will improve their ability to engage learners in authentic conversations and aid in language acquisition. Artificial intelligence technologies, including *virtual reality (VR)* and *augmented reality (AR)*, can create immersive language learning environments that mimic real-world contexts. Collaborative artificial intelligence platforms can facilitate global connectivity and cross-cultural communication, enhancing students' linguistic and cultural

competencies (Yang, 2020).

Learning, as a process of expanding knowledge, involves active participation in specific activities, allowing students to gradually move from "novice" to "expert" levels in their chosen fields. During this participatory process, students share their experiences and social interactions through a variety of direct and indirect means, allowing for the development of practical skills and recognition of personal values. Considering the growing importance of English as a global language, especially in countries where English is a second language, it is necessary to improve the classroom environment and increase students' proficiency in simulated language environments.

The creation of an English language teaching system based on artificial intelligence can be a breakthrough, promoting the integration of modern information technology into English teaching, improving the quality of English teaching, and increasing students' enthusiasm for learning the language (Zhu, 2017).

Recent advances in computer science, especially in language translation and understanding programs, have given rise to new ideas for human language processing. These systems can not only detect student errors but can also provide targeted recommendations and suggestions for improvement based on research (Sert, Boynuegri, 2017).

Integrating AI into English language teaching holds great promise for improving the language teaching and learning processes. By leveraging AI capabilities in personalization, interactivity, and assessment, educators can create more effective and engaging learning experiences. However, particular attention should be paid to ethical considerations and the role of human trainers (Ayala-Pazmiño, Alvarado-Lucas, 2023).

Artificial intelligence has the potential to revolutionize the way we learn languages. By leveraging machine learning algorithms, AI can provide personalized language learning experiences to students, adapt to their learning styles, and track their progress. AI-powered language learning tools can also offer comprehensive feedback,

suggest relevant study materials, and create engaging practice exercises that simulate real-life language use scenarios.

Additionally, AI can provide a rich source of authentic and effective English practice examples by analyzing large data sets of written and spoken English and identifying patterns, collocations, and idiomatic expressions. This can help learners to develop their language skills faster and more accurately, as they are exposed to real-life language use examples. Here are some ways to use AI for this purpose (Betal, 2023):

• ***Automated assessment***: AI algorithms can assess students' English proficiency through automated language tests and exercises. These assessments may include multiple-choice questions, oral assignments, writing prompts, and more. AI can analyze student responses, provide immediate feedback, and offer personalized recommendations for improvement.

• ***Chatbots for language learning***: AI-powered chatbots can engage in interactive conversations with students, helping them to learn and practice English. These chatbots can offer practical examples and exercises to assist students in improving their vocabulary, grammar, and speaking skills. Additionally, they can provide hints, ask questions, and engage in dialogue to enhance the learning experience. Furthermore, students can receive feedback and corrections in real time, which can further improve their language skills.

• ***Speech recognition and pronunciation practice***: AI-powered speech recognition technologies have made significant advancements in recent years, enabling the analysis of students' speech patterns to provide feedback on pronunciation accuracy. These systems leverage machine learning algorithms to compare students' spoken English to native speaker models, identifying areas for improvement with precision. By utilizing speech recognition technology, educators can offer personalized feedback

to students, highlighting specific pronunciation errors and suggesting targeted practice exercises to enhance their speaking skills. This approach not only facilitates language learning but also empowers students to refine their pronunciation through consistent practice and feedback. Moreover, the integration of AI-driven speech analysis tools in language learning platforms and educational applications allows for convenient and efficient practice sessions, enabling students to improve their pronunciation at their own pace and convenience.

- ***Language generation*:** AI language models are proficient at generating practice examples and sample sentences to illustrate various aspects of language learning, including grammar rules, vocabulary usage, and sentence structure. These examples can be tailored to suit students' language levels and specific learning objectives, offering them a diverse array of context-sensitive language practice.

- ***Adaptive learning platforms*:** AI-powered platforms can adapt to students' needs and provide customized learning experiences based on their strengths, weaknesses, and learning preferences. By analyzing student performance data, these platforms can identify areas requiring improvement and offer targeted exercises, vocabulary drills, grammar tests, and writing prompts to address those specific needs.

- ***Game-based language learning*:** AI-powered platforms can offer a wide variety of interactive games and activities designed to enhance language proficiency. These games may include vocabulary quizzes, grammar challenges, pronunciation exercises, and language puzzles. By making learning feel like play, students are more likely to stay engaged and motivated to practice English regularly. Moreover, AI algorithms can dynamically adjust the difficulty level of games and activities based on students' performance and progress. As students improve their language skills, the platform can gradually increase the complexity of tasks to provide an appropriate level of challenge, ensuring that learners remain engaged and motivated.

It is crucial to understand that while AI can offer useful language practice examples, it should always be used alongside human instructions and guidance. Human teachers are essential in providing context to the examples, giving explanations, and addressing the specific needs and inquiries of the students.

AI can enhance English language learning through personalized, interactive, and adaptive practice, thanks to artificial intelligence technologies. Students can receive immediate feedback, engage in authentic language interactions, and improve their language skills more effectively (Ayala-Pazmiño, Alvarado-Lucas, 2023).

The study of making the grammar learning process easier through the implementation of AI is an area of ongoing research and development (Betal, 2023). AI technologies can help language learners in a variety of ways, including grammar acquisition. Here are some examples of how AI can help make grammar learning easier:

▪ *Intelligent language learning systems:* AI-powered language learning systems can provide students with personalized feedback and guidance as they practice grammar. These systems can analyze students' written or oral responses, identify grammatical errors, and offer suggestions for improvement. By providing instant feedback and explanations, AI algorithms can help students understand and correct grammatical errors more effectively. By providing instant and personalized feedback, AI-powered language learning systems enable students to learn from their mistakes in real time, leading to more effective language acquisition and improved grammatical accuracy. Additionally, the interactive nature of these systems helps to keep students engaged and motivated in their language-learning journey.

▪ *Natural Language Processing (NLP) Applications:* NLP technologies can be used to develop grammar-checking tools that automatically detect and highlight grammatical errors in written text. These tools use rule-based or statistical approaches to analyze text and offer suggestions for correcting grammar. NLP can also help

students understand grammar rules by providing explanations and examples in a user-friendly manner.

▪ *Interactive conversational agents:* Chatbots or AI-powered virtual assistants can engage students in conversations and help them practice grammar in a conversational context. These agents can answer students' questions about grammar rules, provide explanations, and suggest corrections in real time during conversations. Through interactive and fun interactions, students can strengthen their grammar skills in a more practical and applied way.

▪ *Adaptive learning platforms:* AI can support adaptive learning platforms that tailor grammar lessons to the needs of individual students. Using machine learning algorithms, the platforms can assess students' strengths, weaknesses, and grammar progress and provide appropriate learning materials. AI can dynamically adjust difficulty levels, provide extra practice in difficult areas, and offer personalized recommendations for grammar exercises or resources.

▪ *Gamification and immersive experiences:* AI technologies can be integrated into language learning games and immersive experiences, making grammar learning enjoyable. AI can provide real-time feedback, adaptive challenges, and interactive storytelling to create a more interactive and immersive learning environment. Integrating AI technologies into language learning games and immersive experiences holds tremendous potential to transform grammar learning into a dynamic and engaging process. By combining real-time feedback, adaptive challenges, interactive storytelling, and gamification elements, these systems create a learning environment that is not only effective but also enjoyable and immersive for students of all ages and proficiency levels.

Conclusions

The study of artificial intelligence is incredibly important in today's world. AI is playing an increasingly significant role in various areas of life, ranging from business and science to medicine and technology. As a result, AI is becoming an essential part of many technological innovations. It is used in automation, data analytics, natural language processing, computer vision, education, etc. Studying AI allows us to better understand and use these technologies, as well as create new innovative products and services.

Digital and AI-powered technologies are completely transforming the traditional education model. Firstly, it makes learning much more interesting and engaging for students by providing an interactive learning format. Secondly, the use of AI technology enables personalized and adaptive learning experiences, which is impossible to achieve in traditional classrooms. Thirdly, the AI-powered digital assessment system allows teachers to quickly adjust the course of study based on student progress. Additionally, at the initial stage, AI can assess the student's knowledge level and select the most effective learning format.

To tailor teaching methods and accommodate the unique abilities of students, classification systems are utilized to customize the learning experience. Certain classification systems leverage big data and artificial intelligence in an English language learning environment, leading to enhanced learning outcomes and improved English language application capabilities when compared to traditional methods (Pikhart, 2020).

Artificial intelligence tools play a significant role in supporting the diagnostic process, adjusting learning materials, and helping students achieve their individual goals. These techniques mimic human thinking and decision-making processes to develop effective teaching and learning designs. They eliminate uncertainty and create

contexts that encourage meaningful learning. AI tools assist students in improving their listening, speaking, reading, and writing skills, enabling them to practice expressing emotions through imitated pronunciation. Additionally, students can verify the proper use of their language and explore translation options for relevant texts.

AI can undoubtedly be a helpful tool, but it is important to remember that human guidance and expertise are crucial. Teachers have a critical role in designing educational content, facilitating discussions, analyzing results, and fostering critical thinking skills. AI should be seen as an addition to human learning, enhancing the learning process rather than replacing it.

To enhance education in the era of globalization, we need to revamp the entire system by rethinking our approaches to learning. This includes modernizing the learning process, using various technologies, self-learning systems, artificial intelligence, and machine learning to optimize the learning process.