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The Importance of Artificial Intelligence in Education: A short review

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Abstract

Today, high-tech artificial intelligence causes innovations and developments in many areas of our lives. Artificial intelligence has made significant progress in health, medicine, military, space, informatics, communication, industry, and similar fields. In addition, artificial intelligence has made tremendous progress and gained momentum in this field by contributing to education. The study aims to discuss the innovations and developments that artificial intelligence has brought to education. In our research, how necessary artificial intelligence is in education, artificial intelligence is an integral part of education, the conveniences, advantages, and disadvantages of artificial intelligence are discussed. The comfort that artificial intelligence brings to special (disabled) students for their education life and their contribution to their education and training are also examined in this study.

In this study, the applications of artificial intelligence technologies in the world are also mentioned. Among these applications, Seeing AI, Virtual Assistants, Virtual Reality, Augmented Reality, Classcraft, 3D Holograms, Chatbots, Vidreader, Quillionz are discussed. In today's pandemic (Covid-19) process, people can continue their education thanks to machines; education can be carried out even remotely (online) so that societies do not fall behind in education. So we can say that we owe a lot to the machines.

1. Introduction

Intelligence is defined as the computational part of the ability to achieve goals in the world. AI is defined as the science and engineering of making intelligent computer programs and intelligent machines (McCarthy, 2007). The first AI work was done by (McCulloch and Pitts, 1943). McCarthy first used AI in 1956 (Russell and Norvig, 2010).

AI applications are expert systems, computer vision, speech recognition, understanding natural language, heuristic classification, game playing (McCarthy, 2007). AI technologies help people with child education and medical care. They help people find valuable and accurate information on the internet (Li and Du, 2017). The evolution of artificial intelligence from Gödel to the present can be seen in Table 1 (Wolfgang, 2017).

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Table 1. The evolution of artificial intelligence from Gödel to the present (Wolfgang, 2017).

Date	Description
1931	Austrian Kurt Gödel showed that all valid expressions in first-order predicate logic are derivable (Gödel, 1931).
1937	Alan Turing pointed out the limits of intelligent machines with the halting problem (Turing, 1937).
1943	McCulloch and Pitts modeled neural networks and made the connection to propositional logic.
1950	Alan Turing defined machine intelligence with the Turing test and writes about learning machines and genetic algorithms (Turing, 1950).
1951	Marvin Minsky developed a neural network machine.
1955	Arthur Samuel (IBM) created a learning controller program that played better than its developer (Samuel, 1959).
1956	McCarthy organized a conference at Dartmouth College. Here the name Artificial Intelligence was introduced. Newell and Simon of Carnegie Mellon University (CMU) presented the Logic Theorist, the first symbol-processing computer program (Newell *et al.*, 1957).
1958	McCarthy invented at MIT (Massachusetts Institute of Technology) the high-level language LISP.
1959	Gelernter (IBM) created the Geometry Theorem Prover.
1961	The General Problem Solver (GPS), developed by Newell and Simon, mimics human thinking (Newell and Simon, 1961).
1963	McCarthy found the AI Lab at Stanford University.
1965	Robinson invented the resolution calculus for predicate logic (Robinson, 1965).
1966	Weizenbaum's program Eliza conducted a natural language dialogue with people (Weizenbaum, 1966).
1969	In their book called Perceptrons, Minsky and Papert showed that the perceptron, a very simple neural network, can represent only linear functions (Minsky and Papert, 1969).
1972	French scientist Alain Colmerauer invented the logic programming language PROLOG.
1976	Shortliffe and Buchanan developed MYCIN, an expert system for diagnosing of infectious diseases that can deal with uncertainty.
1981	Japan began the "Fifth Generation Project" at great expense to build a powerful PROLOG machine.
1986	Renaissance of neural networks through, among others, Rumelhart, Hinton and Sejnowski (Rumelhart *et al.*, 1986).
1990	(Pearl, 1988), (Cheeseman, 1985), Whittaker, Spiegelhalter brought probability theory into AI with Bayesian networks.
1992	Tesauros TD-gammon program demonstrated the advantages of reinforcement learning.
1993	Worldwide RoboCup initiatived to build autonomous robots that play soccer (Robocup).
1995	Vapnik developed support vector machines from statistical learning theory.
1997	IBM’s chess computer Deep Blue defeated the chess world champion, Gary Kasparov. The first international RoboCup competition in Japan.
2003	The robots in RoboCup demonstrated impressively what AI and robotics could achieve.
2006	Service robotics became a central AI research area.
2009	First, Google self-driving car drove on the California freeway.
2010	Autonomous robots began to improve their behavior through learning.
2011	IBM’s “Watson” beat two human champions on the television game show “Jeopardy!”. Watson understood natural language and can answer complex questions very quickly.
2016	Google DeepMind's Go program AlphaGo (Silver *et al.*, 2016) beat the European champion 5:0 in January and Korean Lee Sedol, one of the best Go players in the world, 4:1 in March. A humanoid robot named Sophia was created by Hanson Robotics (AI).
2017	The Facebook AI Research lab trained two “dialog agents” (chatbots) to communicate with each other to learn how to negotiate (AI).
2018	Alibaba (Chinese technology group) language processing AI surpassed human intelligence in the Stanford reading and comprehension test (AI).
2020	Microsoft introduced its Turing Natural Language Generation (T-NLG), which was then the "largest language model (Intelligence; Semantics).

AIED has Impacted both students and teachers. AIED enables personalized teaching by providing students with a better learning experience. For example, intelligent robots can always answer students' questions. Pattern recognition technology can reduce online learning by identifying student's gestures (Sijing and Lan, 2018). AI technology can replace teachers to reduce the burden of teachers, but it also places higher expectations on teachers. If we take special education as an example, education for exceptional children requires constant repetition, and intelligent robots can help teachers solve repetitive problems. Intelligent robots have certain limitations. Robots cannot provide outstanding guidance to students like a 'coach.' Therefore, future expectations of teachers should also be improved (Sijing and Lan, 2018).

Students are the future of a country. In the age of AI, students have two roles, AI users and developers. Today, AI technology can be applied to all aspects of our learning and integrates more closely with education. For example, students from different departments use AI techniques to varying degrees. Geographically specialized students use Python for positioning; financial students can use AI for data analysis, etc. From these examples, we can see that AI technology is not just for computer science students. Therefore, we should pay more attention to AI ethical learning while developing information literacy for college students (Sijing and Lan, 2018).

Teachers can use different teaching strategies to teach students about the values of AI. At the same time, teachers should know the honest thoughts of students. In the age of human-machine collaboration, teachers need more time to give emotional attention to students to prevent students from becoming dependent or overly reliant on machines (Sijing and Lan, 2018).

The AIED field has witnessed significant developments in the last twenty-five years (Roll and Wylie, 2016). AIED refers to using AI application programs or technologies in educational settings to facilitate decision-making, teaching, or learning. AI could play various roles in educational settings. The advancement of emerging computer technologies such as robot control, sensing devices, quantum computing, wearable devices, and the popularity of 5G wireless communication technologies and mobile has provided new opportunities and appearances for applying AI to learning and teaching design (Hwang *et al.*, 2020).

AI has been widely adopted and used in education in different ways, especially by educational institutions. AI initially took the form of computer and computer-related technologies, transitioning to web-based and online intelligent education systems, and ultimately with the use of embedded computer systems, together with other technologies, the use of humanoid robots and web-based chatbots to perform instructors' duties and functions independently or with instructors (Chen *et al.*, 2020a).

Different technologies have been developed to facilitate students' learning and build an environment where teachers can teach more efficiently. An example of this is called e-learning or intelligent tutoring systems (ITS). e-Learning is an educational system using online media and has developed together with web technology (Nagao, 2019).

Learning math has been considered a significant challenge for many students. The advancement of computer technologies, especially artificial intelligence, presents an opportunity to cope with this problem (Hwang and Tu, 2021).

(Baker, 2000) speculated on the near future of research in AIED based on three uses of models of educational processes: models as components of educational artifacts, models as scientific tools, and models as bases for the design of educational artifacts. (Devedžić, 2004) analyzed significant aspects of Web Intelligence (WI) in the context of AIED research. (Timms, 2016) assumed that “schools” will still

exist in some shape or form in 25 years and that teachers will continue to oversee and promote learning among students. He proposed that there will be educational cobots assisting teachers in the classrooms of tomorrow and provides examples from current work in robotics.

(Gadanidis, 2017) examined the intersection of AI, mathematics education (ME), and computational thinking (CT) for young students. (Ee and Huh, 2018) investigated the direction of mathematics education as the change of education paradigm and the development of AI according to the development of communication and information technology. (Goksel and Bozkurt, 2019) used social network analysis (SNA) as a guide to interpreting critical concepts in AI research from an educational perspective.

(Paranjape *et al.*, 2019) addressed the current state of medical education and proposed a framework for developing the medical education curriculum to include AI. (Zawacki-Richter *et al.*, 2019) provided an overview of research on AI applications in higher education through a systematic review. (Chen *et al.*, 2020b) contributed to AIED by enabling educators and scholars to understand the status and evolution of AIED-related publications and grants.

(Goralski and Tan, 2020) combined business strategy and public policy perspectives to analyze the impacts of AI on sustainable development, focusing on the development of the Sustainable Development Goals. (Luan *et al.*, 2020) discussed the new directions and challenges facing the use of AI and big data in education research, industry, and policy-making. (Renz and Hilbig, 2020) focused on Educational Technology companies and the barriers and drivers that currently affect learning paths and data-based teaching.

(Ouyang and Jiao, 2021) proposed AIED paradigms for systematically abstracting how AI methods address instructional issues and learning in education. (Chung *et al.*, 2021) assess happiness and sadness objectively to develop AI tools in education. (Xiao and Yi, 2021) proposed a technique to create a personalized training model based on AI. (Lin *et al.*, 2021) aimed to test the factor structure of students' AI learning motivation and examine possible gender differences in students' AI learning motivations.

The following are the uses of Artificial Intelligence in education:

- Smart content apps
- Smart lesson systems
- Intelligent teaching systems
- Subtitle creator programs
- Customize knowledge learning modes
- Language translators
- Evaluation systems
- Speech production systems
- Performance-enhancing programs
- Virtual reality tools
- Virtual learning environments
- Usage practices of student data
- Applied learning systems
- Virtual Reality (VR) learning
- Assistive technologies

2. Advantages Of Artificial Intelligence In The Education Sector

The advantages of artificial intelligence in the education sector are given below.

Access to Information: In the past, it was complicated to find the information sought among thousands of books by visiting libraries to access information. With artificial intelligence and technology development, it has become much easier and faster to reach the desired information by pressing just a few buttons. Virtual assistants used on phones have provided speedier access to the desired information with voice commands.

Distance Learning: The development of technology and computers has enabled distance education (online). In this difficult COVID-19 process we are in, machines have played a significant role in both the continuity of education and the prevention of the epidemic with distance education.

Personalization in Education: One teacher in the classroom cannot meet the expectations of all students. Artificial intelligence can provide a teacher for every student. Students can listen to the part they do not understand over and over again. Thus, the student can personalize their learning.

Global Knowledge: We do not know the education offered in a different language can be translated into our language with artificial intelligence systems. We can quickly get an education and learn a language that we do not know at all. In addition, we can translate texts written in different languages and adapt them to our language.

Student Attendance Tracking: With intelligent sensors at the entrance and exit of the school, the days of the student's attendance can be easily entered into the system. Absenteeism can be easily tracked without the need for teachers to take attendance.

Digitalization and Environmental Protection: The use of electronic resources has increased while educational resources are now transitioning from paper to digital. In this way, the cutting of trees was prevented, and a significant contribution was made to the environment. Moreover, since the shuttle vehicles used by students for transportation are no longer needed in online education, both the traffic problem and the effect of harmful gases released by the cars have decreased.

Removing Barriers: Artificial intelligence has made it much easier for special (disabled) students to access information. The aim is to ensure the full and equal participation of special (disabled) students in social life. Thus, disabled individuals are integrated into independent and free energy. Visually impaired people can receive education with systems that convert text to sound, and hearing-impaired people can receive training with systems that convert audio to text. Individuals with walking disabilities and sick people can attend both classes and meetings from their homes without going to school, and they do not fall behind.

Error Reduction: Artificial intelligence minimizes errors as much as possible. Since artificial intelligence lacks human emotions, it can make more professional and fairer decisions. For example, a teacher may read the exam paper, project assignments incorrectly and give incorrect grade evaluations. However, artificial intelligence programs minimize the error and make the least amount of error.

Taking on Challenging Explorations: Robotics is also used to search for mining and other energy sources. In dangerous environments where it is difficult or impossible for humans to explore, artificial intelligence robots can easily make discoveries. For example, artificial intelligence robots can search and research oxygen-free places such as the ocean bottom, caves, and mines.

Artificial intelligence technology is also used in space exploration. Intelligent robots are loaded with information and sent to explore space. These robots, also called reconnaissance robots, are designed to

hover on the surfaces of planets and gather information. These robots are made with metal. Therefore, it is resistant to atmospheres where space and life are impossible.

Medical Applications: Artificial intelligence applications are also applied in the medical sector. Doctors use artificial intelligence machines to examine the condition of their patients. There are artificial intelligence applications that analyze medical records to help doctors make faster and more accurate decisions. There are also artificial intelligence applications that enable medical students to understand their lessons better.

Uninterrupted Operation for Long Periods: Unlike humans, machines do not need to take frequent breaks and rest. The machines programmed to work for long hours continue to work without getting tired, bored, and distracted. For example, it is possible to reach training robots at any time of the day. In addition, the number of hours an instructor can give is limited. On the other hand, the robot that teaches can provide lessons for unlimited time as long as there is an energy source.

Daily Applications: We use artificial intelligence every day with smartphones. For example; Applications that correct our mistakes while writing messages and conform to spelling and applications that can identify people's faces in the photos we take and tag them on the social network are among the applications we use daily. In addition, you can easily find the address you need to go to with navigation technology. Today, artificial intelligence is used in almost every field.

3. Disadvantages Of Artificial Intelligence In The Education Sector

The disadvantages of artificial intelligence in the education sector are given below.

Technology Addiction: Students interact with each other on social platforms rather than social interaction. Since students spend too much time with technology, they cannot allocate enough time to their education and lessons and cannot provide motivation. Since a student spends almost 90% of his free time in virtual environments and games, he cannot give the necessary importance to his education. It is one of the issues that parents complain about the most.

Negative Impact on Social Life: Before the development of artificial intelligence, students were doing more social and group work. With the development of technology, work has become more individual. Tablets and computers, which are the closest friends of the individual, have replaced the libraries used to be visited by the class for research and study. Now, the ability of a single individual to access information with a few keys has isolated individuals and given them an asocial personality.

Negative Impact on Health: As the development of artificial intelligence increases competition among students, this situation will stress them. It will put pressure on them. In this case, it can negatively affect the mental health and psychology of students. In addition, technological products cause various health problems due to the radiation they emit. Health problems such as eye disorder, nerve compression, neck, waist, and wrist pain can also be seen in individuals who spend a lot of time with technology.

Probability of Causing Unemployment: The fact that machines replace people by doing the work that people do is an indicator of unemployment. As artificial intelligence develops, people may become dependent on machines and robots. This reduces people's creativity and causes them to be lazy individuals.

If we consider unemployment in terms of education, robotic teachers can replace ordinary teachers. Many jobs in the education sector are at risk. Unlike humans, robots are less likely to make mistakes.

Because robots do not have situations such as being late for work and not coming to work, they need to get the proper instructions.

Lack of Creativity: Imagination and creativity are features that do not belong to artificial intelligence. Although machines create designs, they cannot rival the invention of the human brain. People's intelligence and feelings are endless. They have emotional intelligence. People can shape their thoughts with their emotions. But machines cannot even imitate these emotions.

Income distribution imbalance: Some individuals can have the most advanced technologies because their incomes are high, while people with low incomes have less developed technology or no technology at all. This situation leads to tremendous unfair competition between students who can and cannot reach technology due to financial opportunities. Examples of this can be seen today. During the Covid-19 pandemic, students living in rural areas could not receive online education because they did not have internet and computers. In addition, this situation caused them to be deprived of their right to education. In developed cities, since students can access online education very quickly, it has caused a severe imbalance of education levels between the two groups. As a result, the level of education decreases when the financial situation is not good and there is no access to technology. In contrast, the level of education increased in cities with good economic conditions and development.

High Cost: Developing artificial intelligence is a difficult task because machines are highly complex. Repair and maintenance of these machines can also be quite costly. Because day by day, they need to be more innovative and renew themselves. In addition, to meet the desired demands, their software must be constantly developed and updated. Their system may crash, they may need to be rebooted. Solving such problems can cause significant loss of time and financial loss. This is also true for the education sector.

Unethical: Artificial intelligence can make unethical decisions when using their decision-making mechanisms because they do not have feelings and ethical understandings that are unique to humans. Human intelligence cannot be copied. Machines only do what they are programmed to do. In an extreme situation, they may not be able to make the right decision.

Lack of Experience: People can learn from their experiences and gain experience. However, machines do not have such a feature. Even if they have the data, they use it differently. Devices do not have feelings of worry or anxiety. These machines, which lack belonging, unity, and togetherness, cannot act like humans.

4. Artificial Intelligence Applications

Some artificial intelligence programs that can be used in the field of education are as follows:

4.1. Seeing AI

Seeing AI is a document scanner. With this function, it can read anything that is text. For example, a student with a disability takes a picture of the pages of the textbook. Later, the artificial intelligence scans these pictures and reads the information in the book to the person. Thus, the visually impaired person can easily access the written statement in the book.

With the Seeing AI application, objects are described. This application can quickly analyze and distinguish the captured photos. People can look where the sound comes from and take a picture. For example, there are people having fun in the park. Visually impaired people may wonder what these people are doing. For example, there is a child playing frisbee in the park. When a person looks that way and takes a picture, the AI can describe what that person is doing. It can also report the mood of the

listeners during a conversation. In this way, it can be understood whether people are listening to the conversation or not.

Seeing AI is a person recognition application. With this function, it can recognize people. For example, the person can introduce their family, trainers, and friends to the program. People can take pictures of people around them and present their faces to the application. Later, when AI sees this face, it recognizes that person and can tell who it is. As a result, when the person introduced by the visually impaired person comes across, the artificial intelligence means the user who person is using the image recognition technology with a voice command.

Seeing AI has product-barcode recognition. With this feature, a person can understand what he is buying in a supermarket and shop with peace of mind. With this program, it is much easier to recognize products. The resources, books, tools, and materials needed by the student can be found easily with this program.

Seeing AI is a short text reading and money recognition application. With this quick text reading application, a person can read the names of the departments when they go to a store. In addition, the money recognition application of this program helps the person how much money to pay at the cash register. When the person takes a picture of the money to be given, the program tells you how much it is. In addition, people can determine the change in the money they receive with the same method. Thus, visually impaired people can easily do their shopping.

The Seeing AI light detection feature allows detecting the light of the room, understanding whether the computer is on or not, and using other technological devices. Thus, it helps to prevent any home accident that may occur.

Seeing AI provides fast access to visual content. In this way, the person can read the signs and determine the direction (Languages).

In the normalization process, visually impaired students will read what their teachers write on the board in face-to-face education. They will be able to increase their interaction with their other friends. They will be able to have their educational resources scanned and read by artificial intelligence. This will facilitate the study of students with disabilities. It also benefits the use of social media. Artificial intelligence can describe images from the Internet. Thus, visually impaired people will be able to increase their interaction in the social network. Moreover, visually impaired individuals make their lives more accessible with the help of artificial intelligence and benefit from the blessings of technology without needing any outside help.

4.2. Classcraft

Classcraft takes classroom management and turns it into a game with students. Teachers develop students' lesson achievements with the help of a gamified story. With the help of this program, students aim to reach their full potential, connect with their parents, and students with low scores are identified and supported by teachers.

Classcraft enables gamification of education with teachers. There are tasks for teachers in the Classcraft program. Teachers prepare these tasks for their students. Students earn points as they complete tasks. With these points, they improve their performance and ability power. In this program, students, teachers and parents are in cooperation.

The program gives experience points according to the positive or negative behaviors of the students. These positive behaviors include completing online activities, being respectful of others online, helping other students with their studies, being positive and hardworking, and so on. On the other hand, harmful

behaviors give up when faced with a technical problem, being unattended/ uninterested, turning in homework late, not communicating with the teacher during the day, being rude to classmates, etc.

With the application, teachers can evaluate their students both individually and as a team. There are also mission maps in the program. Teachers plan the game and create the scenario with the rules, assignments, and tasks given to the students. Students develop themselves as a character and progress individually. Students can buy armor, weapons, and clothes for their feelings with the points they get. They can build and strengthen their personalities with these points.

Teachers and students can interact with the application. This program integrates easily with classroom activities. In this way, students learn teamwork, are encouraged, increase their interest in the lessons, become motivated, and receive quick feedback on their skills (Classcraft).

4.3. Virtual Assistants

Students can access academic content via voice communication. In addition, students can communicate by voice with the help of virtual assistants. Moreover, with the help of virtual assistants, it is much easier for people to share with their friends and family. These assistants are also a critical application for the visually impaired. With the help of this application, people can call their friends, family, send text messages, initiate conversations, send e-mails, and listen to their voice messages.

With the help of virtual assistants, people can access information very quickly. You can learn the time, weather, answer quiz questions, translate words and phrases, understand the meaning of unfamiliar words, convert between units, solve math problems, search applications on the device used.

Other features of virtual assistants include:

- Setting alarms and reminders.
- Sending text messages.
- Creating calendar events.
- Showing upcoming invoices.
- Scheduling schedules and meetings.

In addition, virtual assistants can play music, recognize songs, give information about the TV show watched, read a book, find a movie, search for pictures, take photos and videos.

4.4. Virtual Reality

Virtual reality disconnects the person from the physical world and carries the person to a virtual environment. There are virtual objects in this environment. There are realistic sounds and images in the virtual world. There are virtual reality glasses to use this technology. This technology is frequently used in the gaming, entertainment, and education industries.

Laboratory environments can be created, and technical training applications can be made with VR. With the help of this training, the hearing impaired also have the opportunity to develop themselves in technology.

Virtual reality is used for lessons that pose a risk and are not easily accessible. This application allows simulating such situations. For example, a virtual reality experience traveling into a volcano can be considered. Usually, this process was conveyed to students with visuals and animations in textbooks. With virtual reality, this process can be gamified, and the student can gain experience of traveling to the center of a volcano.

Virtual reality turns science lessons into a visual adventure. With the help of virtual reality, students can now travel inside a cell or into the depths of the solar system. Adding virtual reality to the science

curriculum contributes to the education of students. Students remember what they learned better with this application.

The VR application can also be used in the military and defense fields. For special operations, security forces can train in the most realistic environment without risk. Considering the investment costs, this training can be much cheaper than the training with real bullets and weapons. People can complete their education in the virtual environment by experiencing the same feelings and going through the same difficulties as in the standard environment. Thus, people who are trained in this field can improve their skills. Training tracks, scenarios of clashes with indoor terrorists can be simulated as if they were real.

Virtual reality is used for medical students to practice human anatomy. This application is also essential for medical students as education is online during the Covid-19 process. Medical students can learn human anatomy down to the smallest detail with this application. VR technology provides a 3-dimensional image close to the actual print. A virtual classroom is formed so that the teacher can transfer the information to the students in 3D. Virtual reality applications in medical education provide another benefit. Previously, cadavers were used for students to perceive the 3D anatomical structure. This system removes the cadaveric process. It is possible to see the details of human anatomy without working on any cadavers. In addition, real patient tomographies are also transferred to the system, providing a 3-dimensional view of tumors and various diseases.

Virtual reality is used in training pilots. Virtual flights are carried out among trained pilots, and more experienced expert pilots are trained. Virtual reality therapy can also be used for those who fear airplanes to overcome this fear.

Students can witness past events with this application. With virtual reality, they can go on historical travels, see historical events, and interact with historical people. In this way, students will better understand historical events. The history lesson will become enjoyable.

4.5. Augmented Reality

In education, support applications are made for textbooks. Students can see the skeletal and muscular systems. Students can see the pictures in the books in 3D. In addition, they can see the answers to the questions about mathematics, science, and social sciences in 3D. Students can see the ancient city pictures that appear on paper with augmented reality. Moreover, by reading images in children's books from the application, a tank can be seen in three dimensions. Experimental activities can also be done with this application. For example, with the help of augmented reality, students can design a spider from lego by watching its 3D animation from the program.

4.6. 3D Holograms

3D holograms provide visualization of complex concepts in classrooms—for example, molecular structures, DNA structure, musculoskeletal systems, etc. With the help of 3D holograms, students will understand the connections between atoms, complex human organs, magnetic fields, planet formation, and more in an easy and fun way.

Students have the opportunity to see and get to know animals in the animal kingdom. They can see the size of a whale with a hologram. Even students can have the opportunity to see various dinosaurs from the age of dinosaurs. In addition, 3D holograms provide the development of cooperation and communication among students. These applications are also used in the military and medical fields. During the COVID-19 pandemic, such technologies can create safe classrooms.

4.7. Chatbots

Chatbots are teaching assistants. These chatbots with artificial intelligence technology can turn a lesson into a series of messages and make it look like a normal conversation. It can also analyze and evaluate students' level of understanding and ensure that the next lesson's chapter is presented accordingly. In many cases, chatbots can be used to teach basic lessons. The goal is for chatbots to serve as virtual mentors and adapt to students' abilities in the process. In other words, they adapt to their learning speed. A project, study, training can be uploaded to chatbots. As a result of this upload, feedback about that work can be provided. Since these systems can collect feedback, they can be used to get students' ideas.

With chatbots, which are conversational feedback tools, we can get rid of the usual surveys. Likert scale responses are not helpful. Teachers may not have time to read open-ended comments to improve their education. Instead of using surveys, chatbots conduct short interviews with students. Feedback is automatically analyzed using advanced text analytics. As a result, it is much easier and faster for the teacher to see their class thinking.

4.8. Vidreader

When you take any video link and paste it into Vidreader, this program is a digital tool that converts all the speech in the video to text, and this text can be imported as pdf. The margin for error in the converted text is tiny. This program contributes to student learning. It is beneficial for us to use different resources.

This application is a handy application for special (hearing impaired) students, students with distraction, and visual memory. Hearing-impaired students can easily read the conversations in the video content by uploading a video that they are very curious about to the system. For example, when instructors who give video watching assignments ask their students to interpret the videos, they may say that they could not understand because the conversations in the video were too fast or not understandable. But thanks to this application, even if the discussions in the video are not comprehensible, they become straightforward to understand by reading the text (Tools, 2021).

4.9. Quillionz

This system is used to create exam questions from the loaded course materials. In addition, this system allows us to prepare questions according to the type of question we choose, such as multiple-choice, fill-in-the-blank, and sentence-completion questions from the loaded course materials, and get output. Thanks to this system, students upload their lecture notes to the design and can predict the questions that may arise in the exam. Teachers can also prepare very comfortable exam questions with the help of this program while preparing exams. Although this system is not very advanced today, we can say that it can be used a lot in the future (Quillionz, 2021).

5. Conclusions

In this study, the benefits of using artificial intelligence in education and the use of artificial intelligence in education have been researched and examined by its purpose and presented with its advantages and disadvantages regularly. In addition, artificial intelligence usage areas and artificial intelligence applications were also reviewed and researched.

Artificial intelligence holds great hope and a future for education. Wherever it is, it is used to support both formal teaching and lifelong learning. Flexible, inclusive, personalized, exciting, and effective

educational tools in artificial intelligence make learning more accessible and more enjoyable. Artificial intelligence methods such as gamified learning and project-based learning are used.

With intelligent systems, student and teacher interaction increases, access to information are facilitated, students who are not interested in the course are easier to identify, and feedback is developed between students and teachers. When education is mentioned, the instruction given only in schools should not come to mind. Since the transition to online education during the pandemic (Covid-19) process, the contribution of artificial intelligence to education is relatively high in every field (military, medicine, psychology, sociology, neurology, linguistics). In this context, considering the benefits of artificial intelligence applications in education, it is recommended that schools switch to artificial intelligence-supported education. Considering the benefits that artificial intelligence brings to education, schools have made learning more efficient by using artificial intelligence-supported applications.

As a result of the closure of schools during the pandemic (Covid-19) process, the distance education system was started. This proved once again how much the development of artificial intelligence and technology is needed. The more artificial intelligence systems develop, the more education develops and increases its quality. Investments and products in artificial intelligence innovation studies around the world are exciting but also promising. In our globalizing world, we can now easily reach information and individuals on the other side of the world. Artificial intelligence has helped us understand all the world's languages very quickly and has taken substantial steps in the name of globalization. Individuals can study in any language in a very comfortable and understandable way.

We can easily say that countries' education systems with developing technology and artificial intelligence systems are also excellent and developed. With concrete steps and investments to be taken in the future, education can be continued as online education, even if not wholly. The action to be taken together with face-to-face education can enter our lives as a hybrid system that combines both education systems by blending face-to-face education with distance (virtual) education.

Effective teaching can be carried out by using artificial intelligence in students with special needs or disabilities. AI tools can help make global classrooms open to everyone, including those who speak different languages and have disabilities. It also creates opportunities for students who cannot attend school due to illness or who need to learn about a particular subject. Artificial intelligence has dramatically facilitated the life of students with disabilities, students with specific diseases or conditions.

The biggest revolution to make a significant change in education could be the application of artificial intelligence. When we compare a classroom from 40 years ago with today's classroom, the gap between them can quickly show itself. One of the most worrying issues in education is whether artificial intelligence will replace teachers. To answer this question, it is not seen that artificial intelligence will replace teachers in the future. Teachers continue to improve themselves with artificial intelligence. With the integration of humans and machines, artificial intelligence creates a magnificent learning process in education.

References

AI, H. o., A Complete History of Artificial Intelligence, May 15, 2021. "*https://www.g2.com/articles/history-of-artificial-intelligence*".

Baker, M. J. (2000). The roles of models in Artificial Intelligence and Education research: a prospective view. Journal of Artificial Intelligence and Education 11: 122-143.

Cheeseman, P. (1985).In defense of probability. IJCAI-85. Morgan Kaufman, San Mateo, Ca.

Chen, L., Chen, P. & Lin, Z. (2020a). Artificial intelligence in education: A review. Ieee Access 8: 75264-75278.

Chen, X., Xie, H. & Hwang, G.-J. (2020b). A multi-perspective study on artificial intelligence in education: Grants, conferences, journals, software tools, institutions, and researchers. Computers and Education: Artificial Intelligence: 100005.

Chung, J. W. Y., So, H. C. F., Choi, M. M. T., Yan, V. C. M. & Wong, T. K. S. (2021). Artificial Intelligence in education: Using heart rate variability (HRV) as a biomarker to assess emotions objectively. Computers and Education: Artificial Intelligence 2: 100011.

Classcraft, Classcraft, May 15, 2021. "*https://www.classcraft.com/*".

Devedžić, V. (2004). Web intelligence and artificial intelligence in education. Educational technology & society 7(4): 29-39.

Ee, J. H. & Huh, N. (2018). A study on the relationship between artificial intelligence and change in mathematics education. Communications of Mathematical Education 32(1): 23-36.

Gadanidis, G. (2017). Artificial intelligence, computational thinking, and mathematics education. The International Journal of Information and Learning Technology.

Gödel, K. (1931). Diskussion zur Grundlegung der Mathematik. Erkenntnis 2(1): 135-151.

Goksel, N. & Bozkurt, A. (2019).Artificial intelligence in education: Current insights and future perspectives. In Handbook of Research on Learning in the Age of Transhumanism, 224-236: IGI Global.

Goralski, M. A. & Tan, T. K. (2020). Artificial intelligence and sustainable development. The International Journal of Management Education 18(1): 100330.

Hwang, G.-J. & Tu, Y.-F. (2021). Roles and Research Trends of Artificial Intelligence in Mathematics Education: A Bibliometric Mapping Analysis and Systematic Review. Mathematics 9(6): 584.

Hwang, G.-J., Xie, H., Wah, B. W. & Gašević, D. (2020).Vision, challenges, roles and research issues of Artificial Intelligence in Education. Elsevier.

Intelligence, T. o. A., Timeline of Artificial Intelligence, May 20, 2021. "*https://en.wikipedia.org/wiki/Timeline_of_artificial_intelligence#cite_note-Wired_Sterling_20200213-81*".

Languages, S. A. i. N., Seeing AI in New Languages, May 22, 2021. "*https://www.microsoft.com/en-us/ai/seeing-ai*".

Li, D. & Du, Y. (2017). Artificial intelligence with uncertainty. CRC press.

Lin, P.-Y., Chai, C.-S., Jong, M. S.-Y., Dai, Y., Guo, Y. & Qin, J. (2021). Modeling the structural relationship among primary students' motivation to learn artificial intelligence. Computers and Education: Artificial Intelligence 2: 100006.

Luan, H., Geczy, P., Lai, H., Gobert, J., Yang, S. J., Ogata, H., Baltes, J., Guerra, R., Li, P. & Tsai, C.-C. (2020). Challenges and future directions of big data and artificial intelligence in education. Frontiers in psychology 11.

McCarthy, J. (2007). What is artificial intelligence.

McCulloch, W. S. & Pitts, W. (1943). A logical calculus of the ideas immanent in nervous activity. The bulletin of mathematical biophysics 5(4): 115-133.

Minsky, M. & Papert, S. (1969). Perceptrons Cambridge. MA: MIT Press. zbMATH.

Nagao, K. (2019).Artificial intelligence in education. In Artificial intelligence accelerates human learning, 1-17: Springer.

Newell, A., Shaw, J. C. & Simon, H. A. (1957).Empirical explorations of the logic theory machine: a case study in heuristic. In Papers presented at the February 26-28, 1957, western joint computer conference: Techniques for reliability, 218-230.

Newell, A. & Simon, H. A. (1961).GPS, a program that simulates human thought. RAND CORP SANTA MONICA CALIF.

Ouyang, F. & Jiao, P. (2021). Artificial intelligence in education: The three paradigms. Computers and Education: Artificial Intelligence 2: 100020.

Paranjape, K., Schinkel, M., Panday, R. N., Car, J. & Nanayakkara, P. (2019). Introducing artificial intelligence training in medical education. JMIR medical education 5(2): e16048.

Pearl, J. (1988). Probabilistic reasoning in intelligent systems: Networks of plausible inference Morgan Kaufmann San Francisco.

Quillionz, Quillionz, May 20, 2021. "*https://www.quillionz.com/*".

Renz, A. & Hilbig, R. (2020). Prerequisites for artificial intelligence in further education: identification of drivers, barriers, and business models of educational technology companies. International Journal of Educational Technology in Higher Education 17(1): 1-21.

Robinson, J. A. (1965). A machine-oriented logic based on the resolution principle. Journal of the ACM (JACM) 12(1): 23-41.

Robocup, Robocup official site, May 20, 2021. "*http://www.robocup.org*".

Roll, I. & Wylie, R. (2016). Evolution and revolution in artificial intelligence in education. International Journal of Artificial Intelligence in Education 26(2): 582-599.

Rumelhart, D. E., McClelland, J. L. & Group, P. R. (1986).Parallel Distributed Processing, Volume 1: Foundations. The MIT Press, Cambridge.

Russell, S. & Norvig, P. (2010). Artificial Intelligence: A Modern Approach. Third Edit. Prentice Hall. doi 10: B978-012161964.

Samuel, A. L. (1959). Some studies in machine learning using the game of checkers. IBM Journal of research and development 3(3): 210-229.

Semantics, W., Web Semantics: Microsoft Project Turing introduces Turing Natural Language Generation (T-NLG), May 10, 2021 "*https://www.wired.com/beyond-the-beyond/2020/02/web-semantics-microsoft-project-turing-introduces-turing-natural-language-generation-t-nlg/*".

Sijing, L. & Lan, W. (2018).Artificial intelligence education ethical problems and solutions. In 2018 13th International Conference on Computer Science & Education (ICCSE), 1-5: IEEE.

Silver, D., Huang, A., Maddison, C. J., Guez, A., Sifre, L., Van Den Driessche, G., Schrittwieser, J., Antonoglou, I., Panneershelvam, V. & Lanctot, M. (2016). Mastering the game of Go with deep neural networks and tree search. nature 529(7587): 484-489.

Timms, M. J. (2016). Letting artificial intelligence in education out of the box: educational cobots and smart classrooms. International Journal of Artificial Intelligence in Education 26(2): 701-712.

Tools, O., Online Tools for Teaching & Learning, May 18, 2021. "*https://blogs.umass.edu/onlinetools/knowledge-centered-tools/vidreader/*".

Turing, A. (1950). Mind. Mind 59(236): 433-460.

Turing, A. M. (1937). On computable numbers, with an application to the Entscheidungsproblem. Proceedings of the London mathematical society 2(1): 230-265.

Weizenbaum, J. (1966). ELIZA—a computer program for the study of natural language communication between man and machine. Communications of the ACM 9(1): 36-45.

Wolfgang, E. (2017). Introduction to artificial intelligence. Spinger.

Xiao, M. & Yi, H. (2021). Building an efficient artificial intelligence model for personalized training in colleges and universities. Computer Applications in Engineering Education 29(2): 350-358.

Zawacki-Richter, O., Marín, V. I., Bond, M. & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education–where are the educators? International Journal of Educational Technology in Higher Education 16(1): 1-27.