



USE OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN THE EDUCATIONAL PROCESS

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The introduction of artificial intelligence technologies in the education process has become an urgent need at the current pace of development of society. The integration of various intelligent technologies is a key factor in this era. The article deals with the issues of adapting the educational process to new technologies.

Keywords: artificial intelligence, big data, cloud computing, Internet of Things, intellectual systems.

The first industrial revolution is associated with the development of light industry, the second (Industrial Society) with the advent of heavy and chemical industries, and the third (Information Society) with the introduction of computers and the Internet. The fourth industrial revolution implements various technologies such as artificial intelligence, big data, cloud computing, and the Internet of Things (IoT). The integration of various intelligent technologies is a key factor in this era. The data is really important. Information and data make decisions during this period, a person or society must prepare to meet him [1]. In Japan, this is known as the concept of Society 5.0. Society 5.0 is “a human-centered society that balances economic development with the solution of social problems through a highly integrated system of cyberspace and physical space.”

The Internet of Things (IoT) provides cyber connectivity. Without the Internet and an intelligent server system, the IoT is limited to just sensors and actuators. Support for artificial intelligence with machine learning, the use of big data allows you to process data better and faster, extract it and make decisions. Intelligent decision support systems are used in a variety of applications ranging from tourism, finance and education. Cloud Computing (Cloud Computing) provide a dynamic infrastructure that provides artificial intelligence (AI) solutions without large upfront costs [2].

Digital transformation is changing the way organizations operate and deliver services. The use of multiple technologies such as artificial intelligence, machine learning, big data, IoT, cloud computing will provide improvements. Using these technologies, an organization can better describe situations, be more flexible in turbulence because it





can better predict and apply the recommended strategies for the organization. Business process innovation driven by digitally driven business process reengineering is a key driver of digital transformation. AI is one of the main tools for innovation [3].

Can AI replace humans?

- AI can replace a human (replacement). Many media such as science fiction films see AI in this direction. People fear that AI will replace humans.
- AI helps the person (support). This is the current situation. AI-powered systems help people in their work environment. Most AI programs are inspired by "natural intelligence" and are not yet designed to replace it.

The Turing test is a way to test artificial intelligence for human abilities. This test is administered in the form of questions and answers. Based on the Chinese room paradox, the ability to answer all possible questions that a person can answer does not always indicate intelligence, but can also indicate the ability to remember, think, produce new knowledge - this is the ability of the mind.

Information technology and artificial intelligence enter many aspects of our lives. AI threatens jobs, but it also creates new opportunities. AI skills are required for all disciplines, not just technicians. It is necessary to prepare the younger generation for the future, otherwise there are more risks than opportunities. A national AI strategy is needed, and national AI talent should be part of the national AI strategy.

Implementation of AI can be carried out in primary or secondary schools using appropriate tools and teaching materials. However, the most important part of educational preparation at the national level is the training of teachers. It is far more important to teach students how to think computationally than how to use a computer.

The data is important. However, many organizations ignore how they manage data. An AI solution can only be developed based on data. Therefore, organizations seeking to implement artificial intelligence must first properly manage their data. This is a positive effect of artificial intelligence. Learning paths are important for an AI engineer. AI requires basic knowledge, students must follow learning trajectories. New professions require "old" knowledge and skills.

It is necessary to develop a special laboratory that encourages cooperation between students. This laboratory should be dedicated to solving AI problems. Students from different disciplines sit together at a table to solve AI decisions. Group discussion and collaboration and following directions are key learning strategies in this lab. The instructors move from one kiosk (group) to other groups. The group works at a table, discusses and displays the results on a large screen that the group members can see. Groups can work on different tasks or assignments and discuss them together in class.





Types of collaboration that can be used in the laboratory:

- Parallel arrangement: students receive the same instructions. It looks like a traditional cool model
- Clear order: in this model, each group works on a separate task. The desktop is a semi-private workspace.
- General arrangement: Collaboration between groups is possible, and discussion takes place in a large class.

AI can automate key activities in education such as assessment. Educational programs can be adapted to the needs of students. AI can point out areas where courses need improvement. Students can get additional help from AI tutors. AI-based software can provide useful feedback for students and educators. AI is changing the way we find information and interact with it. AI can change the role of teachers. AI can make learning by trial and error intimidating. AI-driven data can change how schools find, teach and support students. AI could change where students learn, who teaches them, and how they acquire key skills.

The use of artificial intelligence in the education system:

- Help the person learn at their own pace;
- Accurate determination of human needs;
- Practical solutions to chronic problems;
- Eliminate red tape in schools;
- Do not waste time in vain;
- Improving the quality of education;
- Ensuring comfort for work;
- For the right decision thanks to fast data analysis;
- Planning learning according to the abilities and pace of the students;
- Use or select effective teaching methods through educational analysis;
- Opportunity to practice in small groups with effective planning;
- Increasing the efficiency of the individual learning process.

Problems in education and their solutions with the help of AI are presented in Table 1.

Table 1

Problem	AI Solution
Standardized curricular does not suitable for individual needs	Personalized education
Limited time available of tutor	Personal virtual teachers
Big number of students in class, many questions cannot be answered	Virtual Classroom assistants
Personalized communication is very difficult to the big number of students	Chatbot quickly answers administrative questions





Selecting the best students from applications	AI can select based on criteria using multiple data
Increasing drop out rates	AI Sentiment Analysis
Difficult to analyse the success of learning experiences	Complements existing learning analytics by providing timely insights into student success, challenges, and needs that can be used to shape the learning experience.
Difficult to track the other skills	AI develops reliable and accurate metrics to track student progress, including hard-to-measure traits such as creativity and curiosity.
Teachers has to deal the clerical administrative works	The AI acts as an intelligent server to perform clerical tasks. However, the final decision still remains with the teacher, as human intelligence is still required.
Stop and test approach in assestment	AI can perform qualitative analysis, sentiment analysis, and provide personalized and tailored assessment, and provide role play and collaborative project within the assessment method.
Provide new insights that are difficult or impossible to ascertain from traditional assessments	AI can analyze various data sources to correlate and visualize them so that the teacher can better understand the students.

AI can be used in education in the following cases:

- Academic analytical assessment of students and schools using an adaptive learning method and a personalized learning approach;
- Grading papers and exams using image recognition, computer vision and predictive methods and learning analytics using datasets ;
- Real-time virtual personal assistant for analytical training;
- Intelligent automation of educational materials and processes;
- Creation of automatic learning programs using augmented intelligence, focused on the specific needs of students;
- Interaction with students and teachers based on artificial intelligence;
- Support for students with disabilities and health problems through robotics and virtual reality;
- Identifying students at risk of dropout, helping them reduce dropout and dropout rates;





- Learning a foreign language by speech recognition and analysis, pronunciation correction and error correction, reducing the percentage of errors by an average of 83%;
- Strengthening the decision-making process with the help of AI;
- Adaptation and personalization of training programs based on the knowledge, interests and strengths of users;
- Create customized textbooks for a particular school, course, or even group of students.

Functions of AI in education:

In control:

- Faster administrative tasks that require study time, such as grading exams and providing feedback.
- Helping teachers with decision support and data-driven work.
- Timely and direct work with the student.

When giving instructions:

- Predict how a student will exceed expectations in projects and exercises, as well as the dropout rate.
- Help teachers create an individual learning plan for each student.
- Allow learning outside the classroom, support for collaboration.
- Customize learning style for each student based on their personal information.
- Analysis of the proposed program and course material.

In the process of studying:

- Identification of shortcomings in the student's learning and their elimination at the initial stage of learning
- Customize the learning path for each student by collecting learning data.
- Identify learning situations and apply intelligent adaptive intervention to students.

A fixed test is the same number of questions for all students. Most tests currently used in this model. In an adaptive test, each student is asked a separate question, the questions are determined by preference and recommended by the AI, the question must be adapted to the abilities of the students. As a result of the test, qualitative and quantitative data can be processed. With the help of artificial intelligence, you can conduct analysis by connecting it with other data sources. It is guaranteed that the estimates will be of higher quality and more extensive.

The training catalog should be available on the knowledge sharing platform. The student database also stores the learning path, benefits, class schedule, student qualifications, and expected educational career. Students are enrolled in the system based on their wishes, tests and educational goals. The AI-based system offers a





curriculum that matches their learning goals. The AI also checks the available time, training schedule, workload, etc. After completing the training process and passing the exam, the system can provide a certificate of completion of the training as an assessment. This approach tailors the learning path to individual needs and goals.

AI can be applied to businesses and organizations to make organizational practices more efficient. Owning artificial intelligence is an important tool for the future. This need is necessary not only for workers associated with the computer, but also for other areas. Many technologies implement artificial intelligence. The decision to implement AI is a critical one for executives or decision makers. AI talents are huge opportunities for the development of countries. The role of universities and research centers should be enhanced.

Students can more freely choose the path of their competence. They may be general to the entire curriculum, but may focus on specific approaches. Students are encouraged to participate in extracurricular activities that are assessed as credit points. Collaboration between industry and universities supports, among other things, the development of artificial intelligence education. Competence standards in data science and artificial intelligence are required.

A learning process that can be easily replicated should be created to create a large amount of AI talent. It is necessary to develop complete teaching materials that will be free for teachers. Teachers should be trained in training courses before using the material. A national competency standard should be established prior to the development of training materials.

Python and R can be used as programming languages for AI. Python starts with minimal libraries and can be extended with additional libraries. There are several libraries for data science and artificial intelligence. Integrated Development Environment - Tools such as Jupyter are available notebook. Python runs on various operating systems as well as the Anaconda package manager. R is an open source statistical program. Designed based on the language S. Various ready-to-use packages (CRAN) are available. R can be used for statistical calculations. Integrated Development Environments - RStudio and RCmdr are available.

to teach children about artificial intelligence. Designed MIT, Scratch [<http://scratch.mit.edu>] can be used by children to create games or simple programs. It is a visual programming language. Snap ! [<https://snap.berkeley.edu/>] is used as a Scratch extension for AI. Kids can learn AI with this simple visual programming. Magenta.js [<https://magenta.tensorflow.org/>] is an AI web application. There are also projects such as Google Experiment





[<https://experiments.withgoogle.com/collection/ai>] and CS Unplugged
[<https://csunplugged.org>].

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