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Artificial Intelligence and Innovative Applications in Education: The Case of Turkey

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ABSTRACT

Artificial intelligence can be defined as a set of techniques that enable computers to imitate human behavior. The concept of artificial intelligence, which started to be used in the 1950s, has been used in many stages of life today, with more important developments every day. It has active applications in many areas from finance to health, from automotive to production, and from sports to education. Simultaneous transfer of innovations and developments in technological fields to education and training environments directly affects the educational, and development levels of the countries. The most basic requirement in creating artificial intelligence algorithms is to provide a sufficient amount of data. In this process in education; It will be possible to collect data from many education stakeholders such as students, teachers, parents, school employees, administrators, and employers. These data, which are gathered comprehensively, will both provide the opportunity to make policies based on data in general for education policies and will form the basis of the software to be developed with artificial intelligence regarding the learning process and patterns. In this study, the concept of artificial intelligence and its usage areas are explained; moreover, its application areas in education and training are explained with its advantages. Artificial intelligence strategies in our country were discussed and suggestions were made for their applications in education.

Yapay Zeka ve Eğitimde Yenilikçi Uygulamalar: Türkiye Örneği

MAKALE BİLGİSİ

ÖZET

Yapay zekâ, bilgisayarların insan davranışlarını taklit etmesini sağlayan teknikler bütünü olarak tanımlanabilir. 1950'li yıllarda kullanılmaya başlayan yapay zekâ kavramı her geçen gün daha önemli gelişmelerle birlikte, günümüzde hayatın pek çok aşamasında kullanılmaya başlanmıştır. Finans sektöründen sağlığa, otomotivden üretime ve spordan eğitime kadar pek çok alanda aktif uygulamaları bulunmaktadır. Teknolojik alanlardaki yeniliklerin ve gelişmelerin eş zamanlı olarak eğitim öğretim ortamlarına aktarılması, ülkelerin eğitim öğretim seviyelerine ve gelişmişlik düzeylerine doğrudan etki etmektedir. Yapay zekâ algoritmalarının oluşturulabilmesinde en temel gereksinim, yeterli miktarda verinin sağlanmasıdır. Eğitimde bu süreç içinde; öğrenciler, öğretmenler, veliler, okul çalışanları, yöneticiler, işverenler gibi birçok eğitim paydaşından verilerin toplanması söz konusu olacaktır. Kapsamlı olarak toplanan bu veriler, hem eğitim politikalarına genel anlamda veriye dayalı politika yapma imkânı verecek hem de öğrenme süreci ve örüntülerine dair yapay zekâ ile geliştirilecek yazılımların temelini oluşturacaktır. Bu çalışmada yapay zekâ kavramı ve kullanım alanları açıklanmış, eğitim öğretim faaliyetlerindeki uygulama alanları ve sağlayacağı avantajlar ile faydaları açıklanmıştır. Ülkemizdeki yapay zekâ stratejileri tartışılmış ve eğitimdeki uygulamalarına öneriler getirilmiştir.

1. INTRODUCTION *(GİRİŞ)*

Artificial intelligence (AI) is the general name of the technology of developing machines that are created with completely artificial tools and that can exhibit human-like behaviors and movements, without using any living organism. It is a set of techniques that enable computers to imitate human behavior [1].

Although the concept of AI has been used since the 1950s, this concept encourages computer scientists to develop new and increasingly complex technologies and creates excitement for those who use these technologies in daily life. AI studies, which have been a factor in pushing the limits of imagination, especially in recent years, appear with innovations every day. In recent years, the world's leading information technology (IT) sector organizations such as Microsoft, Google, Apple, Facebook have announced that there is no longer a mobile-priority world. Instead, they stated that it is the AI-priority world where digital assistants and other services will be the primary source of information and perform their tasks. The United Arab Emirates established a Ministry of AI, breaking new ground in the world [2].

It is possible to think about many different techniques to understand and use AI. The key to machine intelligence when there are many different ways; meaning, reason and action, and then adaptation based on experience [3]:

Meaning: Identifying and recognizing meaningful objects or concepts in big data.
Reason: Understanding the wider context and making a plan for achieving a goal.
Action: Suggesting the best course of action or starting directly.
Adaptation: Adapting algorithms based on experience at every stage and making them smarter.

With the development of mobile technologies, the human world has become more technologically equipped, more data productive, and smarter. The emphasis on smartness here is measured by the software used by the devices. The areas of use of AI technologies, which come to mind when it is called smart technologies, are increasing day by day, and the AI universe is expanding further over time. Both individuals and institutions have come to use these technologies in daily life. Almost every sector, especially in sectors such as finance, health, automotive, manufacturing, sports, and education, has been using the applications of AI technologies.

In today's world where AI will shape the future of humanity, the amount of data produced in all sectors, and daily life can be shown as the building block of this formation. As we pass through the times of the data revolution, how and for what purpose these data will be processed remains an up-to-date question. Data is just as important today as raw materials were in the times of previous revolutions, and even more.

The remaining of the article is as follows. In the second part of this article, the usage areas of AI and their contribution to data production are explained. While the examples of AI usage in education were described in the third part, Turkey's AI strategy and practices were explained in the fourth section. In the conclusion section, discussion and suggestions for AI applications in education were presented and the study was completed.

2. USAGE AREAS OF ARTIFICIAL INTELLIGENCE *(YAPAY ZEKA KULLANIM ALANLARI)*

The 70-year development adventure from the 1950s, when AI applications were put forward by a British mathematician, computer scientist, and cryptologist Alan Mathison Turing, has reached enormous dimensions. At that time, the ideas that started as understanding whether the answers given to the questions were given by a machine on the other side of a curtain or by a human being have been implemented with different services in many stages of our lives today.

2.1. Usage in Finance *(Finansta Kullanımı)*

Large companies and institutions have recently started to be interested in AI technologies. If the AI applications carried out are accurate and conscious, significant improvements can be made in the balance sheets of businesses. There are many opportunities offered by AI for companies. Thanks to AI technologies, not only the old computer systems have changed, but also the way new computers work, and advantages are provided with corporate and special solutions. AI-based applications provide such benefits not only on the frontend but also in server systems and financial processes; customer service, algorithmic transactions, loan/insurance, portfolio management, financial product recommendations, fraud detection and prevention, data security, network security, sentiment, and news analysis, marketing, etc. [4].

From the point of view of companies, these smart systems are used to make instant and/or future decisions, while from the perspective of customers - in other words, users - they are important in terms of sustaining, developing, and directing their financial assets. Almost all individuals, from the most professional users to the most basic users, pass

through AI applications in the financial sector. Although this style of expression may seem different at first glance, it will not be too different considering that all kinds of data passing through the application are individual profiling data. For example, providing information to the bank when a loan application is like; age, education, job, income, gender, number of children, etc. many personal data create a profile for the bank to evaluate the individual and draw a risk map and credibility. The accumulation of this information is contributing to the formation of clusters in the society and the inclusion of the groups in the profile pool.

With the decrease in the cost of processing data and accessing meaningful information from the data with big data analysis methods and developments in the field of AI, it has become much easier to make a prediction based on past data while making business decisions. Data-driven management decisions open up a different management style in which company managers will ask the right questions to machines, not human experts, and evaluate their answers in their decisions [5]. Undoubtedly, the finance sector stands out among the systems where the most effective decisions will be made using smart technologies. In the finance sector, which is one of the sectors where statistical information is regularly and compulsory, business and transactions are carried out through data. The increase in estimation and modeling capabilities, the development of data processing equipment, the development of new algorithms and computing mechanisms in this regard have made great contributions to this sector.

2.2. Usage in Healthcare *(Sağlıkta Kullanımı)*

Hospitals, clinics, and medical and research institutes produce a large amount of data daily, including laboratory reports, imaging data, pathology reports, diagnostic reports, and drug information [6]. The rapid expansion of healthcare data is one of the biggest challenges for doctors. Current literature shows that big data and AI solutions are the solutions for handling this big data explosion as well as meeting social, financial, and technological demands in healthcare. Analyzing such large and complex data is often difficult and requires a high level of skill for data analysis. The most difficult is the interpretation of results and recommendations based on medical experience. These require years of medical work, knowledge, and special skills [7].

AI solutions in the field of health are among the studies that require collaboration. Here, healthcare professionals who have knowledge of medical and computer scientists who have programming knowledge have to work together. Although there are many multidisciplinary studies in the literature on this subject, the studies in the health sector are the most prominent. The importance of these studies has shown itself, especially in the last months. The importance of using AI in health has become more evident with the Covid-19 epidemic, which has affected all over the world. The use of AI in health shows itself not only in disease detection and diagnosis, but also in many applications such as robotic surgeries, remote surgery technology, drug production and testing, and the security of medical data. Because data are continuously produced in all units of the healthcare field.

In the healthcare field, data is produced, collected, and stored in many formats, including digital, text, images, scans, sounds, and videos. If AI is to be applied to the data, first of all, the quality of the data and all the questions to be answered from the target data set should be understood. It helps to formulate the neural network, algorithm, and architecture for data type AI modeling [7].

Hundreds of analysis, imaging, reporting, diagnosis, medication, and treatment data are entered into health systems every day. Although these data contain very important information for the health sector, the continuous increase in data creates problems for doctors. Thanks to decision support systems, it is possible to support doctors in diagnosis and treatment by comparing patient data with previously diagnosed and treated patient data. In other words, AI technologies in the health sector are the technologies that will produce solutions for systems that generate large amounts of digital data such as imaging (MR), tomography, ultrasonography (USG), x-ray, and angiography. Even with foresight beyond the solution, many diseases can be prevented. Although estimates, recommendations, and explanations of results made by medical experience require special skills and knowledge, there is a serious negative ratio between the number of doctors and the number of patients. Solutions to eliminate this deficiency are offered by AI technologies.

According to researches, the AI market in healthcare could reach $ 6.6 billion, a growth rate of 40%, by 2021, and could potentially reduce the cost of treatment by up to 50% [8]. AI studies have the potential to save 150 billion dollars annually in the health sector by 2026 [9]. Effective solutions provided to the health sector using AI are constantly evolving; Tools to ease the burden on clinics and enable medical professionals to do their jobs more effectively; Filling gaps in healthcare during the growing need for labor; Improving efficiency,

quality, and outcomes for patients; Integrating health data on various platforms and expanding the access network; Providing greater efficiency, transparency and interoperability benefits; Ensuring information security, etc. can be given as examples of these solutions.

Another use of AI in health is its use in the pharmaceutical industry. Different patients may react differently to medications and treatments. Therefore, personalized treatment is critical in extending the life expectancy of patients, but it is not easy to determine the factors used to determine which treatment method should be chosen. As Dr. Bertalan Meskó, who describes AI as "the stethoscope of the 21st Century", is capable of making "one-type" treatment a thing of the past and suggesting personalized treatments, therapies, and drugs [10].

2.3. Usage in Automotive *(Otomotivde Kullanımı)*

Cars are gradually transforming from metal boxes with only four wheels to vehicles that serve their original purpose. Currently, a widely known concept called inter-vehicle communication is applied. With this process, a communication network will be established between vehicles, so that smoother traffic and less congested roads will be in question. This type of AI system, unlike humans, is designed to make the necessary decisions immediately [11].

According to the data of the World Health Organization, approximately 1.35 million people die in traffic accidents every year in the world. More than half of the deaths happen to unprotected people such as pedestrians, cyclists, motorcyclists, and passengers. These accidents also cost 3% of most countries' gross domestic product. Traffic accidents are at the top of the list of causes of death, especially for people aged 5-29. Interesting information; 93% of traffic accident deaths occur in low and middle-income countries, but the rate of vehicles in these countries constitutes 60% of the vehicle rate in the world. Between 20 and 50 million people are faced with non-fatal injuries due to traffic accidents. Many of them are disabled due to injuries. If the reasons for the occurrence of traffic accidents in the world are listed [12];

- Human mistake,
- Speeding,
- Driving under the influence of alcohol and other psychoactive substances,
- Not using motorcycle helmets, seat belts, and child seats,
- Distracting driving,
- Unsafe road infrastructure,
- Unsafe vehicles,

- Inadequate maintenance after a collision,
- Inadequate traffic regulations.

The most important element left behind by automotive technology is human error. Traffic accident data have reached serious dimensions in the world [13]:

- The number of deaths in accidents: 1.3 Million per year, 3.287 per day.
  - 400,000 of them are under 25 years old (about 1000 a day)
- The number of injured or disabled: 20 to 50 million people.
- The overall cause of death rate in the world: 2.2% (9th place)
  - According to the simulation on the data, it will go down to 5th place in 2030 (if no action is taken).
- The overall cost of road accidents is $ 518 Billion.

These results make AI an important element in motor vehicles. AI technology is about ensuring safe road driving for drivers and minimizing the possibility of accidents between cars and communication between vehicles. If applied correctly, this technology will significantly improve road safety, safety, efficiency, and driving experience [11]. The use of AI in the automotive industry has become widespread not only at the user level but also at the production level. Many factories have now adapted their automation systems to AI technologies and switched to smart production technologies. Here, the use of AI in the industry came into play.

2.4. Usage in Industry *(Endüstride Kullanımı)*

AI technology provides significant improvements in the production sector in areas such as quality control, product design times, residual material amount, and reusability. To increase product quality, efficiency, and employee safety, manufacturers have the data collected in real-time in their production processes analyzed by artificial intelligence-based systems. Thanks to machine learning, which is one of the AI technologies, it is now possible to analyze a huge amount of data and make predictions. AI can generate information from experience on its own with the pattern recognition feature provided by machine learning algorithms. Therefore, AI is indispensable for industry 4.0 [14].

The concept of Industry 4.0 is getting more and more in our lives with the introduction of AI technologies into factories and production facilities. Production is made in factories called dark factories and adapted to business life. The human workforce now finds a place for itself in more qualified positions. Intelligent

technologies are used not only in what is called power but also in calculations. In case of failure in a production line, all systems are informed and technical service can be activated immediately.

The fact that AI technologies deeply affect and transform production technologies is now accepted by the whole world. For this reason, companies that want to survive in the next decade have already started to use AI in production tools, R&D processes, customer relations management, employee training moreover recruitment processes [15]. In this direction, not only the manufacturers but also the employees should adapt themselves to the place of AI in the industry. These technologies applied to production systems need people at the user and programmer level, as well as interpreting units and employees by analyzing the results obtained from these systems.

2.5. Usage in Sports Field *(Sporda Kullanımı)*

AI has begun to make itself felt in sports as well as in many areas of life. For example, sports clubs establish teams called scouting and follow the performances of the players and make transfers according to certain criteria. There are many parameters in these performance data. At this stage, AI uses these parameters to analyze complex data and provide the scouting team with the information they want.

In the field of sports, AI technologies contribute significantly to sports games. Different from these, AI technologies are used in many stages, from rival team analysis to athletes' working statistics and physical readiness. In fact, as an AI study, a new game was designed using the data of 400 sports branches, and this game was named Speedgate [16].

In the movie Moneyball inspired by a real-life story in 2012; The subject of the Oakland Athletics general manager Billy Beane, who had to form a baseball team on a very small budget, was the subject, and the film was nominated for an Oscar. The manager found the solution in the AI application, based on data analysis, he formed a team with a very low budget compared to other teams, and in 2002 this team achieved significant success by winning 20 consecutive wins.

3. USAGE OF ARTIFICIAL INTELLIGENCE IN EDUCATION *(EĞİTİMDE YAPAY ZEKA KULLANIMI)*

The most basic requirement in creating AI algorithms is to provide a sufficient amount of data. When it comes to education, in this process; It will be possible to collect data from many education stakeholders such as students, teachers, parents, school employees, administrators, and employers. At the beginning of this process, it is necessary to determine which measurements will be made at which level of education for each stakeholder. For example; When a child, who starts school today enrolls, starts the education life without having any information about him/her other than his/her identity information. Evaluations are made over time and based on teacher observation. There is no control mechanism as to how distinctive the observations are made for each student. For this reason, it is essential to collect data in terms of factors that will affect learning from students from an early age and to use these data to give feedback to the teaching process. These data, which are gathered comprehensively, will both provide the opportunity to make policies based on data in general for education policies and will form the basis of the software to be developed with AI regarding the learning process and patterns [17].

Today, while every sector adapts itself to AI technologies, it is not possible for education practices, which are the most important building blocks of a country, to remain indifferent to developing technologies. It is an area that includes millions of individuals in education activities, where the results of all kinds of activities affect the future of countries. The inputs and outputs of this field are individuals. For this reason, vital activities are carried out. It is not possible to keep the use of technology, which is one of the requirements of our age, away from this area. AI technologies are needed in many aspects such as educational content, teaching methods and techniques, assessment, and evaluation systems, and career guidance.

The reflections of AI on education are far from being a holistic approach yet. Most of the research in the literature addresses the potential of AI in education and explains the benefits that it will provide in the future [18-21]. In addition, AI-supported pieces of training have started in some branches (in particular medicine), especially in undergraduate and graduate education. Again, these pieces of training are in the form of material support for the training contents. Chi Tung Cheng et al. (2020) developed an AI-based medical image learning system to highlight hip fracture on a plain pelvic film and applied this learning system to a group of students. They applied a normal learning system to another group of students. The increase in accuracy was significantly higher in the AI learning group than in the control group. The study demonstrated the viability of AI for augmenting medical education [22]. In another health

study, Kharbat et al. (2021) investigated the literature regarding the use of artificial intelligence in education for students with developmental/intellectual disabilities. They found many gaps in supporting students with developmental/intellectual disabilities through the utilization of AI and declared that the potential use of health information in artificial intelligence is even more critical. They created a block diagram for use of AI in education for students with developmental/intellectual disabilities [23]. Mirchi et al. (2020) studied a new framework using explainable AI for simulation-based training in surgery, and validate the framework by creating the Virtual Operative Assistant, an automated educational feedback platform. The Virtual Operative Assistant successfully classified skilled and novice participants using four metrics with an accuracy, specificity, and sensitivity of 92, 82, and 100%, respectively. In this study, the educational system outlined establishes a basis for the potential role of integrating AI and virtual reality simulation into surgical educational teaching [24]. Another field studied similarly to the medical field has been engineering education. Ouyang et al. (2020) investigated the advent, development, and future trends of AI-based smart engineering education. It is presented in the study that the key role of AI in improving smart engineering education is guidance for future learning, teaching, and design processes [25]. Some studies have been carried out on the path to be followed with the policies to be determined for the application of artificial intelligence in education. Some difficulties in the policies to be determined are listed as follows [26]:

- In digitally-driven knowledge economies, traditional formal education systems are undergoing drastic changes or even a paradigm shift.
- A large number of pre-service and in-service teachers are not ready to support and adopt new technologies.
- There is a pressing need for privacy and personal data assurance against unauthorized disclosure, commercial exploitation, and other abuses.

The use of AI and machine learning algorithms in education is a fact that will be applied not only to in-class applications of education but also to institutional studies. As an example of this, a study was carried out by Yurtsal, and Kaynar (2019) to solve the problems that arise during the curriculum prepared in the educational institution with genetic algorithms. With the algorithm developed in the study, a solution was found for the curriculum

problems in faculties and the performance of the algorithm was evaluated [27].

AI provides the ability to automate basic educational activities. The purpose of homework and tests created for a high school student today; Analyzing the competence of the student, completing the deficiencies in the subject, and determining in which profession group he/she will be successful in the future. AI creates this process with planning by evaluating the information of the student. In the first stage, the knowledge and skills of the student are determined with AI. AI, which creates a program for the weight of knowledge and skills, organizes the program per student because it knows the missing areas of the student. AI enables students to find themselves and to be productive individuals who love their job in the future with its personalized education [28].

In education, especially individual learning differences have come to the fore in recent years, and the variability of students' learning speeds has been discussed. The most important contribution of AI technologies in practice will be that they can be adapted to the learning speed of students by adapting them to individual learning skills. In this way, all students will be educated in learning environments at their pace, not necessarily learning at an equal pace. Thanks to these kinds of teaching methods and techniques, students who learn quickly will be able to progress faster and perform repeated learning so that students with learning difficulties can comprehend the subjects.

Teachers may not be aware of all the mistakes students have made in tests or assignments. It has become possible to solve this problem with AI. In applications supported by AI, if the student does his homework or a part of the homework wrong, the system warns the teacher and the teacher can provide clues about the homework to be done or the question to be answered. In this way, AI, fed with information, detects the problems that will occur in the future, makes use of the previously created information, and provides the student with the right answers by giving clues [18].

Career guidance is another important element of the use of AI in education. Students are followed up in the system for a long period, from the pre-school education time they are included in education to the age they graduate from secondary education. This process is based on teacher observations from past periods to the present. Especially in densely populated countries, when there are many class sizes; many students would avoid teachers' observation.

Besides, not all students can show themselves in the same learning styles. For this reason, very good inferences can be made about which area the AI systems will be directed to by analyzing the structured and/or unstructured data. This orientation can be carried out at the secondary education level. Thus, the happiness of individuals working in their favorite profession in society will be experienced in the future (Figure 1).
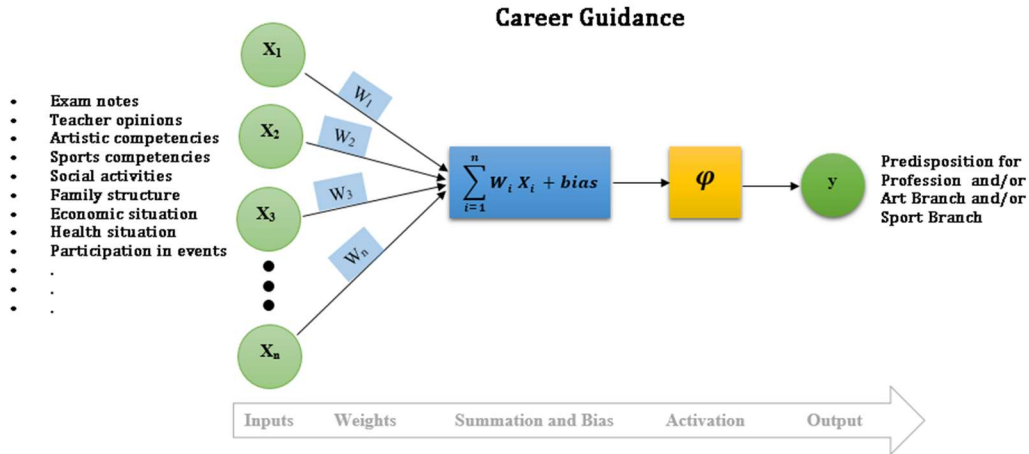

Figure 1. Career guidance in education with artificial neural network *(Yapay sinir ağı ile eğitimde kariyer rehberliği)*

To summarize the potential of AI in education [28]:

- It can automate basic activities in education such as classification.
- Educational software can be adapted to student needs.
- AI can show where lessons need improvement.
- The instructor staff created with AI can provide educational support to students.
- AI-supported programs can provide useful feedback to students and educators.
- How we find information and how we interact with it (information interaction) changes with AI.
- AI can change the role of teachers.
- AI enables more active use of trial and error learning.
- Data powered by AI can change the way schools find, teach and support students.
- AI can change what students learn, the one who taught them, and the way of how they acquire basic skills.

The results and advantages of using AI in education can be listed as follows [29]:

- The course booklets will become smart and there will be textbooks that can be adjusted according to the learning speed of the student.
- The periods when the same education is given to the whole class will gradually end.
- The missing points of the student will be detected instantly.
- Education will be given according to the interests of the student.
- The entire development process of the student will be stored.
- The loss of time spent by the student with unnecessary information will be prevented.
- Participation in the lesson will increase.
- More confident students will be trained.
- Not only the points that the student made wrong but also why they made those mistakes will be analyzed.
- Since character analysis can also be done while training the student, the foundations of personal education will be laid.
- Each student will potentially have the same opportunities to learn.

The potentials and advantages of using artificial intelligence in education are expressed with a block schema in Figure 2.
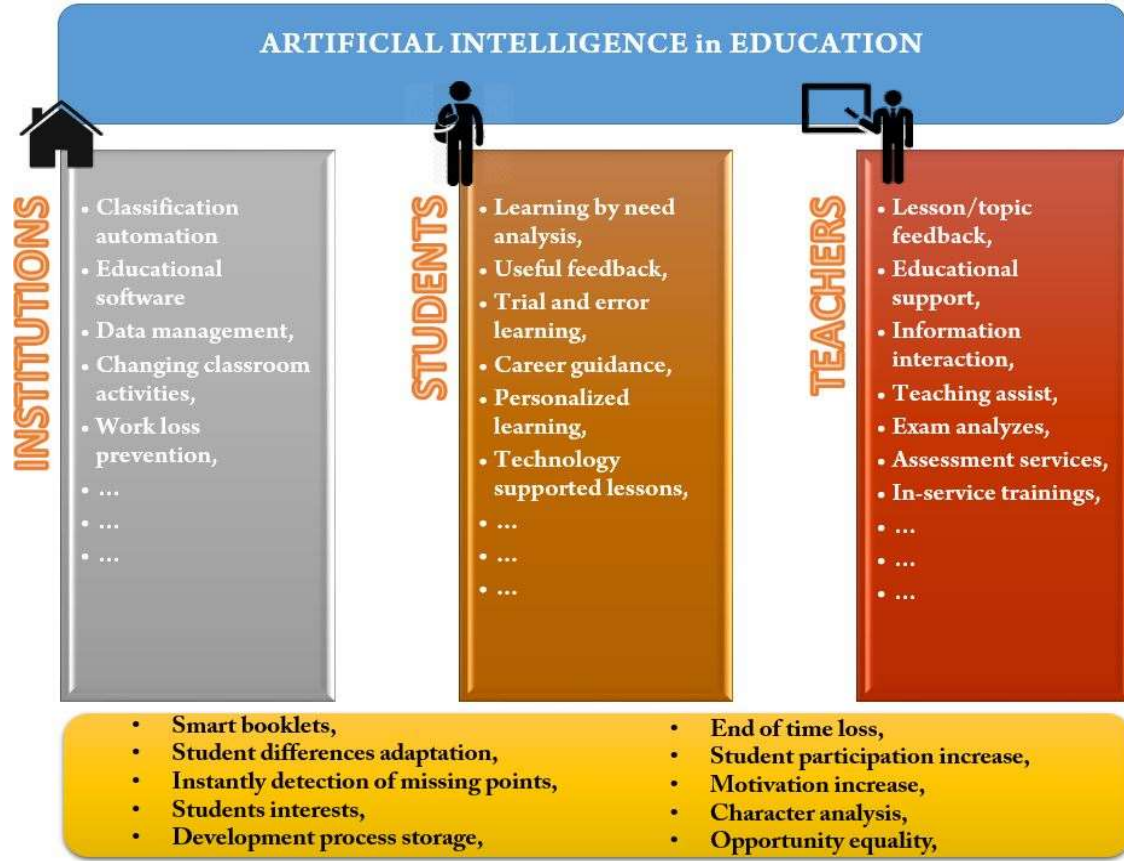
Figure 2. The potentials and advantages of using AI in education *(Eğitimde yapay zeka kullanmanın potansiyelleri ve avantajları)*

4. AI APPLICATION STEPS OF TURKEY IN EDUCATION *(TÜRKİYE'NİN EĞİTİMDE YAPAY ZEKA UYGULAMA ADIMLARI)*

Simultaneous transfer of innovations and developments in technological fields to education and training environments directly affects the educational and development level of the countries. Since the 2000s, significant developments have been experienced in the field of AI and recently it has been mentioned with many disciplines. Providing grounds for the emergence of this needs to be used in educational activities in Turkey are as follows:

4.1. 2023 Education Vision Document of the Ministry of National Education *(Milli Eğitim Bakanlığı 2023 Eğitim Vizyonu Belgesi)*

Seven separate items are listed under the heading "All Decisions of the Ministry Will Be Based on Data" in the 2023 Education Vision Document published by the Ministry of National Education. These are [30]:

- The Ministry's existing data systems such as; MEBBİS, E-School, EBA, MEIS, DYS, E-Guidance, E-Extensive, Open Education Systems, E-Personnel, E-Registration, Book

Selection, Norm Transactions, Physically Handicapped Inventory, E-Graduate, Center Exam Results Data will be integrated into an easily accessible Educational Data Warehouse.
- A Learning Analytics Platform will be established, which will work on the Educational Data Warehouse, where students' academic data are evaluated together with their interests, abilities, and temperaments.
- A competent Data Control Unit will be established within the Ministry to work on integrated data reliably.
- Learning analytics tools will be developed to better understand learning and teaching, provide effective feedback, and implement an education and learning process based on performance targeting.
- Necessary legislative changes and training activities will be made to actively carry out data-based decision-making processes.
- Within the framework of the data-based management approach, the processes will be improved and the bureaucratic workload will be reduced at all administrative levels, especially in our schools.

- A unit will be established to compile scientific studies conducted by universities and non-governmental organizations and to draw conclusions and reports from them.

When all these items are examined, it is seen that the Ministry of National Education has determined to use the data in the digital environment in the most efficient way. The AI discipline has become the most important discipline in the analysis and effective use of digital data, thanks to machine learning algorithms. It is of great importance to increase the number of self-developed and competent personnel who can carry out these analysis procedures within the Ministry and to take pioneering steps.

4.2. "AI Applications in Education" Cooperation Protocol with Istanbul Technical University *(İstanbul Teknik Üniversitesi ile Eğitimde Yapay Zeka Uygulamaları İşbirliği Protokolü)*

This protocol is signed between The Ministry of National Education Management and Istanbul Technical University. According to this protocol:

"Joint studies will be conducted on the use of AI in learning analytics tools to be carried out within the Ministry, and the scope of AI applications and guidance services will be increased. Within the scope of the protocol, where joint work will be carried out on the career planning of students with AI, it will also be aimed to create individualized educational content and environments that support the personal development of students for the first time. Besides, AI apps to be developed jointly in the Education Management Information System of the Ministry of National Education will be used. Thus, AI technology can be used as a support in the creation of education policies. The Ministry of National Education is preparing to include the topic of AI in the curriculum of relevant programs" [31].

"A three-step work plan will emerge within the scope of the protocol. The first step includes the preparation of individualized learning materials to contribute to the personal development of the student, providing guidance services, and developing AI apps to be used in the Education Management Information System on a system basis. The second step includes the joint work to define AI skills to prepare students for the future where AI technologies will be widely used. The existing training programs on AI applications in vocational, and technical education that are compatible with the labor market will also be updated within this scope. Finally, with joint studies, informative pieces of training will be organized for students and teachers in schools on the risks of AI technologies and applications and data use ethics" [31].

These protocol studies of the Ministry are an indication of the importance given to AI. The pieces of training that the Ministry will organize both at the university level and through R&D institutions will increase the number of personnel who can use AI algorithms and more robust steps can be taken by the Ministry.

4.3. Ministry of National Education, Artificial Intelligence Strategy *(Milli Eğitim Bakanlığı, Yapay Zeka Stratejisi)*

Minister of National Education, Prof. Dr. Ziya SELÇUK stated that *"AI Strategy has reached the final stage and this will be shared with the public soon. Stating that the Ministry has significant accumulation and will open the draft text for discussion, he stated that all kinds of contributions are valuable. Stating that 20 years are planned between 2020-2040, the Minister stated that we will be the world leader in AI education and that we will raise human-oriented generations for the age of AI. Besides, it has announced that it will be the third ministry that determines AI as a strategy after China and Australia"* [32].

The Ministry of National Education bases its 20-year policy on the AI Strategy by basing its planning studies on AI. Effective strategy management takes place with the team that can keep up with it. For this reason, it is of great importance to increase the number of qualified teachers who will implement the strategy determined by the Ministry.

4.4. Robot Competition Theme *(Robot Yarışma Teması)*

Ministry of National Education defined artificial intelligence as the theme of the 13th International Robot Competition.

Minister of National Education, Prof. Dr. Ziya SELÇUK stated that *"AI is a constantly spoken concept and that AI is at the basis of the Ministry of National Education in the 2023 Education Vision. All the work will be carried out in accordance with the principles of AI and Turkey as an interconnected operation of all sectors has stated that it will develop further. He stated that these studies are a sign of how the Ministry will implement and take into account AI at every step, from kindergarten to university desks, to postgraduate studies"* [33].

By basing the 2019 robot competition on AI, the Ministry of National Education has ensured that the applications are not only kept in theory but also put into practice. The applications to be made within the scope of the competition are important in terms of increasing the number of teachers and students who perform AI applications in the field. As the teachers, who will improve themselves with the competition, transfer this information to their students, a wider audience will be reached and the reflections of AI applications on the field will emerge.

4.5. BİLSEM Workshops (BİLSEM Atölyeleri)

BİLSEM's are science and art centers of The Ministry of Turkish National Education. In the 2019-2020 education term, it is declared by Special Education and Guidance Services of The Ministry of Turkish National Education, BİLSEM workshops will be equipped with AI technologies.

According to the plan made by The Ministry of Turkish National Education, the number that reached 160 across all BİLSEM's will be equipped with AI workshops within two years. Talented students will have the opportunity to develop revealing skills with AI workshops; to produce technological solutions, technological product development, data analysis, modeling, data communication, and system architecture design and development, critical and creative thinking, scientific observation, strategy development, original designs and products [34].

Another step of the field applications of the Ministry of National Education; Artificial Intelligence workshop in Science and Art Centers. The environments to be offered for more effective use of gifted students and to improve themselves should not only be equipped with equipment but also teachers should be found to counsel and guide students. With the pieces of training to be given in this context, the teachers, who will improve themselves, will have the opportunity to transfer their knowledge to students in these workshops. Increasing the number of teachers who can work with students in these workshops with AI training is another indicator of the importance of the AI steps in education in Turkey.

4.6. UNESCO Award (UNESCO Ödülü)

A document of the Ministry of National Education Lifelong Learning General Directorate on the Use of Information and Communication Technologies in Education was sent to institutions in Turkey. Within the scope of this document, UNESCO has determined the 2019 award of the Use of Information and Communication Technologies in Education as

"Using AI to Transform Education Learning and Teaching". International organizations now support the transformation of educational activities in our country with AI discipline practices. To take the first steps of this transformation, it is necessary to increase the number of teachers who are trained in the field with the training to be given.

5. CONCLUSION (SONUÇ)

AI studies have been carried out for 70 years and the speed of these studies has increased exponentially especially in the 2000s. All disciplines are working with AI technologies and have become to use practical applications in all areas of daily life. It is no longer possible for educational technologies to remain indifferent to AI technologies used by all sectors such as production, service, finance, sports, industry, and automotive.

The use of AI technologies in education manifests itself in all aspects of education, from materials used in educational environments to teaching methods and techniques, from measurement and evaluation services to career guidance. With the developing technology and the changing world, the diversity and application forms of educational activities also change. As the learning habits of the students change, the teaching habits of the teachers should also change.

It is necessary to increase the digital competencies of the people who will use these applications or provide data here, as well as the computer scientists who have implemented this application in the background of the applications. In particular, teachers need to use practical AI technologies in classroom environments, provide data here, and interpret the analysis and feedback from this data. Therefore, decision-makers and policy-makers in the management of education and training activities should take steps towards this.

Since AI systems will take teachers' opinions into account while making evaluations on students, the information to be entered into the system by the teacher may bring different problems. The first of these problems is the digital competencies of teachers. For a teacher, to make data entries correctly, they must adapt, and use the system; moreover, they should believe in the results of the system. Most of the teachers in the education system consist of X and Y-generation teachers. Digital technologies were later included in the life processes of these teachers, also known as digital immigrants [35, 36]. Therefore, not all teachers have an equal command of digital technologies. While determining AI strategies, the digital competencies of teachers,

who are one of the most important actors to enter data into this system, should also be taken into account and supported by pieces of in-service training. Another problem would be data entry by teachers who do not have complete, and accurate information about the student. Commissions can be created in schools to overcome this problem. In addition to the opinions of the student's classroom teachers, councils including school counselors, other teachers who take the student's course, and even the managers responsible for the class; They can enter the system by generating ideas through methods such as discussion, critical thinking, and brainstorming.

It is observed that some online sites that carry out educational activities in commercial terms take steps by using these applications. National education policies should not remain indifferent to these technologies to progress firmly into the future. The education data of individual members of each country are treasury. Education activities that catch the needs of the age will determine the future of the countries.

Booming, and innovative steps taken in Turkey and all the progressive plans are for it. The results of these steps will begin to show themselves in about 10 years. When these practices continue with persistence and determination, the contributions of their results to the country will begin to manifest themselves. As a result of the follow-up by these systems during the period from pre-school education and first grade to formal education, individuals who are happy for the workforce and social life of the country will be raised as a result of their talents, interests, and requests.

In the last part of the study, it is necessary to touch upon a problem that will arise with the adaptation of these systems to education. Whether parents will consider the suggestions made by AI systems, especially during career guidance. Here, a systematic study is required. This integration needs to be explained to the public sufficiently. Parents' belief in the system should be increased with both public service announcements and promotional guidance activities of schools. Here, as a next research topic, especially for those who will carry out graduate studies in educational management, and supervision; I recommend that the suggestion systems made with a possible AI career guidance, the positive or negative perspectives of the parents should be investigated. The policies of the Ministry should be prepared by taking into account these readiness levels of parents and necessary steps should be taken.

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