Artificial Intelligence in Education

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Abstract

With the growing focus on artificial intelligence (AI) in education, many experts predict that the roles of teachers, schools, and educational leaders will evolve significantly. This study aims to explore potential scenarios that may emerge with the integration of AI in education and its implications for the future of schools. Employing a phenomenological approach—a qualitative research method—this study gathers insights from participants across various sectors. The findings suggest that while the adoption of AI in education will introduce innovative tools and benefits, it will also pose certain challenges. Participants generally expressed a positive outlook toward AI, but teachers and academicians raised concerns about potential drawbacks affecting the teaching profession. In contrast, legal professionals emphasized the need to address legal and regulatory aspects, while engineers highlighted the potential of AI to enhance quality and benefits across the educational landscape. The study concludes with recommendations for the effective use of AI and strategies to mitigate possible issues.

***Keywords**: Artificial Intelligence; Education; School Administration*

1. Introduction

Artificial intelligence (AI), generally expressed by the general public as the ability of machines or computers to think and act as humans do, represents the efforts towards computerized systems to imitate the human mind and actions (Wartman & Combs, 2018). In this respect, the basic definition of artificial intelligence can be expressed as the skillful imitation of human behaviour or mind by tools or programs (Mohammed & Watson, 2019). According to Timms (2016), it may be an illusion of the current structure to think that artificial intelligence will come within the computer format used at home. It could get into our lives within different functions and shapes.

Ng (2017) claims artificial intelligence to be the new electricity of this age. Artificial intelligence is a candidate to be presented as the basic building block of the Fifth Industrial Revolution by providing itself to be a powerful factor in ensuring economic development with its potential (see, Golic, 2019). That could be why investments in artificial intelligence broke a record in China with $40 billion in 2017 (Mou, 2019). In line with its earnings from AI, China is expected to increase its gross domestic product (GDP) by 26% ($7 trillion) by 2030. North America is expected to have a 14.5% increase ($ 3.7 trillion) in the same timeframe (PwC, 2017). These data make the added value and global impact of artificial intelligence more understandable for the future economy, and in our case, for the future of education, which in turn, directs the economy and workforce, paving the way for the new Industrial Revolution.

The in-depth development of artificial intelligence will affect many situations, from the restructuring of the social order in the broadest sense to the education and administration processes in classes and schools. Schools that are expected to adapt to the digital age and embed 21st century skills in their main agendas are some of the main institutions that could be most affected by the development of artificial intelligence. Karsenti (2019) points out that new forms of technology will fill in our lives and captivate our youth, and this case may leave schools with no choice but to make room for them. In this regard, how the stakeholders from law, business, education, and engineering perceive this development, and how they foresee artificial intelligence in regard to education form the focus of this study. Thus, the purpose of this study is to examine what the use of artificial intelligence in education means and what kind of implication it can reveal for the future of education, according to the opinions of the participants from different sector.

1.1. Artificial Intelligence in Education

Roll and Wylie (2016) reference Henry Ford's famous quote, "If I had asked people what they wanted, they would have said faster horses," to draw a parallel to modern education. At a glance, one might say schools have become "faster classes," producing outcomes more efficiently. However, as we move further into the 21st century and approach the 22nd century, the question arises: Is it enough to simply teach skills, critical thinking, and metacognition? Or do we need to design entirely new systems that cater to the demands of a rapidly evolving world? How can artificial intelligence contribute to education in ways that preserve human emotional and social dimensions, setting us apart from robots and automated systems? These questions are already emerging as critical topics for policymakers and educators, alongside debates about whether AI could eventually replace teachers altogether (Felix, 2020).

Manyika et al. (2017) argue that skilled teachers will remain essential in the future, particularly in fostering students' emotional intelligence, creativity, and communication abilities. According to them, advancements in AI and automation will enhance, rather than diminish, human qualities. As Haseski (2019) points out, research suggests that artificial intelligence in education can personalize learning, create more effective educational experiences, help students identify their talents, boost creativity, and reduce teachers' workloads. On the flip side, some studies caution against fully transferring teaching responsibilities to AI, warning of potential risks in such a shift (Humble & Mozelius, 2019). To prepare for these changes, it is crucial for nations to cultivate a teacher workforce that can collaborate with AI systems (Wogu, Misra, Olu-Owolabi, Assibong, & Udoh, 2018).

Although AI in education has gained significant attention recently, the theoretical foundation of artificial intelligence stretches back centuries. It saw renewed momentum with Alan Turing's groundbreaking work in 1937 (Humble & Mozelius, 2019). Today, AI has become a central focus of academic research and scientific discourse. Discussions around "artificial intelligence leadership" in organizational management also highlight the expanding influence of AI in various domains (Canbek, 2020).

As the use of artificial intelligence in education continues to grow, significant transformations in educational systems and practices are expected. For instance, Sekeroglu, Dimililer, and Tuncal (2019) suggest that AI could support teachers in delivering personalized learning experiences tailored to individual students. Additionally, AI has the potential to provide better learning opportunities for marginalized groups, such as people with disabilities, refugees, those out of school, and communities in remote areas (Pedro, Subosa, Rivas, & Valverde, 2019). Research by Mohammed and Watson (2019) demonstrates how AI techniques and intelligent learning environments can facilitate highly effective, individualized education. While quality education still heavily relies on human teachers, artificial intelligence is envisioned as a tool to enhance learning outcomes and personalization across all levels of education (Grosz & Stone, 2018). Pedro et al. (2019) propose a dual-teacher model in which AI serves as an assistant, handling routine tasks like repetitive explanations and answering frequently asked questions. This setup would free up teachers to focus on guiding students and engaging in meaningful, one-on-one interactions.

2. Research Method

This study employed a phenomenological research design, which is a qualitative method. Qualitative research is particularly suitable for exploring a subject or issue in depth (Creswell, 2013). Phenomenological research specifically focuses on uncovering individuals' thoughts, perceptions, and interpretations (Yildirim & Simsek, 2008). Accordingly, this study sought to understand participants' perspectives on the use of artificial intelligence in education. The research examined opinions from individuals representing four distinct professions, and a triangulated approach to data collection was used to ensure comprehensive findings.

2.1. Participants

The study utilized purposeful sampling to select participants. Purposeful sampling involves identifying individuals who are likely to provide rich and relevant information aligned with the research objective (Buyukozturk, Cakmak, Akgun, Karadeniz, & Demirel, 2018). A total of 19 participants, divided into four target groups, were selected based on their expertise in AI in education. The groups included:

- **Academicians**: Five academics specializing in educational sciences.
- **Legal Experts**: Five legal professionals, including lawyers and judges currently practicing in

courts.

- **AI Experts**: Four technical experts in artificial intelligence working in private or public sectors.
- **Teachers**: Five educators actively teaching in public schools.

To protect participants' identities, pseudonyms were assigned. The names used for reporting results were Ahmet, Ayşe, Fatma, Hatice, Emine, Ali, Huseyin, Ismail, Suleyman, Tahsin, Kemal, Elif, Kubra, Mahmut, Burak, Mehmet, Ziya, Recep, and Esref.

2.2. *Collection of Data and Analysis*

The study utilized semi-structured interviews to gather data. Participants were asked a series of questions online, including their views on artificial intelligence (AI), how they envision its integration into education, its future potential, and both the positive and negative implications of AI in education. Additional questions were also included to explore their perspectives comprehensively. The responses were then analyzed to understand participants' perceptions of AI's role in education.

The interview questions were developed with input from three experts in the field of educational sciences. Initially, the questions were shared with participants via an online form, which they completed individually. To gain deeper insights, face-to-face interviews were later conducted based on their written responses. It was assumed that participants might express themselves more openly and thoughtfully in written responses, while the subsequent in-person interviews allowed researchers to clarify points or explore areas that required further elaboration.

The collected data were analyzed using the content analysis method, transitioning from specific codes to broader themes. Each piece of data was reviewed line by line to ensure no detail was overlooked. The process began with creating codes that were then grouped into themes, which were later compared with existing literature. During the coding process, every detail was carefully considered to refine the themes. In the findings section, particular attention was given to codes such as "individualization of instruction," which emerged prominently during analysis.

Participants' views on AI were examined in relation to their personal experiences and understanding of the technology, as well as the potential scenarios they imagined for its future use. Among the questions asked, only the final question was pre-coded numerically, as presented in Table 1.

2.3. Trustworthiness

Ensuring trustworthiness is critical in qualitative research. To maintain a reliable process in this study, all stages—data collection, coding, tabulation, and reporting—were overseen by an expert academician in the field. The researchers also outlined their initial assumptions about the topic, and participants were asked for their preliminary opinions. An independent analysis by three academicians was conducted using the analyst triangulation method. Additionally, the data source triangulation method (Streubert & Carpenter, 2011) was applied to further enhance reliability.

The researchers reviewed a variety of studies related to AI, covering fields from healthcare to industry, to incorporate perspective triangulation. Triangulation, as explained by Patton (1999), involves using multiple methods or data sources in qualitative research to gain a thorough understanding of a subject. Including experts from diverse fields in this research on AI in education contributed to rich and varied data. The consistency of the findings with similar studies in the existing literature was also meticulously analyzed. A comparative analysis was performed by integrating data and results from multiple sources, minimizing researcher biases. Both the raw data and the analyzed data were preserved for potential verification at a later stage.

The study's purpose, procedures, and methods were clearly communicated to the participants, and every aspect of the process was detailed to ensure transferability. Participants were also informed about ethical standards and assured of their right to withdraw from the study at any time.

3. Findings

The findings in this section are organized around the main themes derived from the codes most frequently highlighted by the participants. These codes, linked to the themes, are not ranked by frequency but are discussed based on their significance, with the most emphasized ones explained in detail. With participants' consent, the finalized codes and interpretations were validated by individuals from different professional backgrounds.

During the analysis, it became apparent that participants placed significant emphasis on the products,

applications, and outcomes that artificial intelligence will bring into our lives. All other themes identified in the study are elaborated upon below. As participants discussed various dimensions, including products, challenges, benefits, and suggestions, we have provided representative quotations under each category to illustrate the scope of the themes.

3.1. Products (Outcomes)

This theme highlights the products and tangible outcomes anticipated by participants in the education sector with the integration of artificial intelligence. Under this category, we compiled a list of potential tools, methods, systems, and models expected to emerge in education. The products identified extend beyond physical tools to include software and advanced systems. Some of the key products and outcomes that artificial intelligence might bring to the forefront in education are:

- Advanced technological software
- Robot assistants and AI-powered teachers
- Smart classrooms
- Individualized learning systems (customized instruction)
- Educational and lesson-based simulations
- Systems to create scenarios and case studies
- Tools for analyzing interests, abilities, and needs
- Career guidance systems for vocational support
- Attendance-tracking programs or devices
- Autonomous systems across various domains
- Tools to assess learning outcomes and student performance levels
- Personalized teaching aids
- Systems for analyzing attention and distractions
- Tools for identifying academic success and providing suggestions for improvement
- Cloud-based and virtual learning environments
- Curriculum design and editing tools
- Systems to track and report students' learning patterns

In support of this theme, Tahsin (an academician) remarked, “Artificial intelligence in education can be applied in many areas, including individual learning, assessment opportunities, facial recognition systems, and automated attendance tracking.” He emphasized the role of AI in personalizing learning. Similarly, Ziya (a legal expert) highlighted the potential for AI to "provide individualized education by virtualizing teaching processes." Additionally, Mahmut (an engineer) stated, “Curriculum planning could be managed by AI mechanisms through the development of machine learning algorithms tailored to educational systems.”

This theme illustrates the broad scope of AI-driven products that could revolutionize education through personalization, automation, and enhanced efficiency.

3.2. Drawbacks

In this section, the potential drawbacks and risks associated with the use of artificial intelligence in education are discussed. According to the participants, these challenges can be summarized as follows:

- The shift towards mechanical thinking, diminishing the role of intuitive knowledge.
- The potential replacement of humanistic values with a more pragmatic or utilitarian outlook.
- Concerns about the possible negative outcomes from fully evaluating students and categorizing individuals based on IQ.
- The emergence of an information-centered human type.
- The diminishing need for human involvement in the educational process.
- The risk of unchecked intelligence technologies in education, such as data security issues.
- The adverse effects on social relationships.

In separate interviews, participants highlighted these concerns, particularly teachers. Ayşe, a teacher, expressed the view that “Artificial intelligence will increasingly dominate the world, reducing the need for human intervention.” Ali, an academician, warned about a future where “machine-human interactions lead to mechanical thinking individuals.” Emine, another teacher, remarked, “In the future, we may not even need teachers.” Burak, a jurist, shared similar thoughts, noting, “AI will take over all educational functions,

and even teachers may become obsolete.” These concerns are partly influenced by the portrayal of dystopian futures in robot-themed films and popular media, which some participants fear could become a reality.

3.3. Benefits

This section highlights the benefits of using artificial intelligence (AI) in education, as reported by the participants. The key advantages identified are:

- The ability to assess or measure individuals.
- Supporting learners by allowing them to progress at their own pace.
- Accurately identifying individual learning needs.
- Offering practical solutions to persistent challenges.
- Reducing paperwork in educational institutions.
- Saving time by eliminating inefficiencies.
- Enhancing the overall quality of education.
- Simplifying tasks and processes.
- Assisting in making informed decisions through quick data analysis.
- Tailoring teaching methods to suit students' capacities and learning speeds.
- Selecting effective learning approaches using learning analytics.
- Enabling smaller group training with better planning.
- Improving the effectiveness of individual learning.
- Assisting policymakers, for example, through population prediction models to make informed educational investments in the right areas.

İsmail (an academician) noted, “AI allows for the monitoring and evaluation of a student’s progress, and helps in determining which career path the student should pursue.” Elif (an expert engineer) added, “AI can regularly report on students’ progress, provide suggestions based on these reports, and share the information with the appropriate stakeholders.” Esref (a jurist) mentioned, “AI tools can help assess exam results, track student movements, and facilitate communication between students.” Ahmet (a teacher) shared, “An AI tool can analyze students’ voices to assess how much they have learned and provide corrective or supportive guidance based on the findings.” These insights from participants align closely with the concept of ‘learning analytics’ discussed in existing literature.

3.4. Suggestions

This section outlines the suggestions provided by the participants regarding the implementation of artificial intelligence (AI) in education. The key recommendations are as follows:

- A standardized measurement system should be established for AI usage in education.
- AI-related applications or systems should undergo pilot testing before being fully integrated into educational settings based on their results.
- Academic research should be conducted to evaluate the effectiveness of the developed systems.
- Adequate infrastructure should be put in place to support AI integration.
- A monitoring and audit mechanism should be introduced.
- The psychological aspects of human users should be taken into consideration.
- Preventive and supportive software should be developed alongside AI systems.
- The impact of AI on people’s decision-making in their daily lives should be assessed.
- The process of integrating AI should be carried out in a way that does not negatively affect social relationships.
- AI should not be seen as a comprehensive solution; it should be used only in areas where it is truly needed.
- The implementation process should involve collaboration across disciplines with all relevant stakeholders, not just educators and engineers.

Hatice (a teacher) emphasized, "AI should be used consciously and only in the areas where it is needed." Ali (an academician) agreed, saying, "We need to proceed cautiously and conduct academic studies, including pilot applications." Kubra (an expert engineer) stated, "AI should not dominate educational activities; it should play a supportive role, assisting teachers and the human element. To minimize risks, AI systems must be closely monitored and controlled by humans."
Given the profound impact of technology on humanity, it is vital that this process is legally regulated to

avoid harm. Recep (a lawyer) suggested, “If AI integration can be supported by legal frameworks, potential drawbacks can be minimized.” Mehmet (a jurist) raised concerns about data privacy, particularly regarding mental analysis, stating, “Protecting personal data in AI systems should be a priority. The storage and confidentiality of this data need to be secured, with strict protocols for access. Violations of privacy should be addressed promptly and with minimal harm, and the government should enforce deterrent penalties for such breaches."

The final set of questions presented to participants sought their views on AI tools in education. They were asked to provide a percentage representing how beneficial or problematic they perceive AI-supported educational environments to be. The participants provided their estimates of both the positive and negative aspects of AI integration with education and society. The distribution of responses from different groups is shown in Table 1.

Table 1. Distribution of benefit - drawback percentages by groups

Groups	Benefit Average	Drawback Average
Academicians	56.00%	44.00%
Law Personnel	72.20%	27.80%
Expert Engineers	95.00%	5.00%
Teachers	62.00%	38.00%
General	68.67%	31.33%

In general, the participants seemed to view AI advancements positively. Academicians likely evaluated the potential benefits and challenges of AI primarily from the perspective of teaching, acknowledging potential issues related to the future of the teaching profession. However, they accepted the benefits in educational processes. Expert engineers, on the other hand, expressed strong confidence that AI would improve quality and offer substantial benefits across the education sector.

4. Conclusions

The interviews with participants generated four main themes and one descriptive theme regarding AI in education. The first theme focused on the potential AI products, including applications, media, and outcomes expected in the near future. These included simulation programs, evaluation-testing support systems, virtual reality (VR) classrooms, assistant robots, and personalized learning systems. One of the most frequently discussed aspects was AI’s role in personalized learning. AI in education can provide significant technical support for customized learning experiences (Chang & Lu, 2019). According to Goksel and Bozkurt (2019), adaptive learning, personalization, and learning styles are central concepts in AI-driven education. AI has the potential to replace a “one-size-fits-all” approach with tailored learning experiences for each student. This suggests that AI can help achieve optimal learning outcomes by supporting both teachers and students. Abdelsalam (2014) proposed an intelligent tutoring system (ITS) based on the mastery learning strategy, which aligns with this vision.

The second theme discussed the drawbacks and risks associated with AI. Participants expressed concerns that excessive reliance on AI could lead to overly mechanical approaches to information processing, with an emphasis on pragmatism and factual knowledge over aesthetics and emotions. There were also worries about reduced roles for teachers, ethical issues, security concerns, and negative impacts on social relationships. Similar issues are already seen with the uncontrolled use of mobile phones, which can lead to social and behavioral problems (Choliz, 2010). Participants feared that AI might exacerbate these issues. There was concern that as AI becomes more integrated into mobile devices, it could further diminish social interactions. Many participants also predicted that the role of teachers in schools would shrink as robots and AI assistants take over more tasks. According to Picciano (2019), many jobs, particularly in teaching, law, medicine, and the corporate sector, may be displaced by AI, but it will not be the machines themselves that replace humans, but rather those who can effectively use smart technologies. Roll and Wylie (2016) argued that teaching will evolve and teachers will need to take on new roles, such as mentoring and teaching lifelong skills, while focusing more on real-world problems.

Although AI has not reached the level depicted in popular media, its development is accelerating. Some participants referenced Isaac Asimov’s book *I, Robot* and its movie adaptation, where robotic laws are discussed. The laws, as outlined by Asimov (2004), are designed to protect humans from harm. A "zeroth" law was later added to emphasize that robots should not harm humanity in any way. A key recommendation from participants to prevent risks associated with AI was proportionality, urging academics, engineers, and professionals to use AI consciously.

The third theme focused on the benefits of AI. This theme highlighted AI’s ability to enhance learning by

aligning content with the learner's pace, reducing resource waste, enabling rapid data analysis, and supporting better decision-making. Participants noted that AI could help states invest in education by predicting demographic trends. Subrahmanyam and Swathi (2018) highlighted how AI's predictive capabilities can improve students' study schedules. Roll and Wylie (2016) emphasized that both students and teachers need personalized support, which AI can provide, allowing students to learn at their own pace. Subrahmanyam and Swathi (2018) also noted that AI could guide students towards mastery, revisiting lessons as necessary and customizing learning plans. The idea of "learning analytics" – using data to understand and improve learning environments – was mentioned by some participants as an integral part of AI's function in education. Learning analytics could play a significant role in creating flexible and adaptive curricula, making it easier to provide individualized content. Karsenti (2019) suggested that AI could even reduce school absenteeism by analyzing student behaviors.

The fourth theme revolved around the suggestions participants had for AI's integration into education. Participants emphasized the need for supervision at both technical and judicial levels. They advocated for limiting AI's involvement in personal matters and cautioned against viewing AI as a panacea. Instead, it should be seen as a tool to simplify processes where necessary. Participants also raised concerns about the legal implications of AI, including issues of accountability, intellectual property, privacy, and security. Laws should be adapted to account for technological advances, and new regulations should be developed to govern AI tools, especially in the context of robots or teacher assistants.

While AI holds exciting potential for education, it is important to manage its integration carefully. Participants in the study stressed that AI is not a cure-all and its implementation must be considered from legal, ethical, pedagogical, psychological, and sociological perspectives. Since technology affects humanity the most, it is essential that AI is introduced on a solid legal foundation to prevent harm.

The fifth theme of the study highlighted the generally positive view of AI among most participants. While teachers tended to see AI as beneficial for education, academicians were more skeptical, focusing on potential negative aspects. Experts in the field were more optimistic, believing AI would improve system performance and ease human labor. The varying perspectives seem to stem from media portrayals, fear of AI's impact on teaching careers, and actual experiences with existing online systems.

In conclusion, the study gathered insights from various professionals, providing a comprehensive view of the potential impact of AI on education. The findings were organized into four key themes: 1) Products – AI-driven educational outcomes; 2) Drawbacks – potential risks associated with AI use; 3) Benefits – expected advantages of AI in education; and 4) Suggestions – recommendations for the responsible use of AI. The participants generally viewed AI as offering new opportunities for students, but they acknowledged that challenges and risks exist. Schools need to adopt a proactive approach as AI becomes more integrated into educational settings. Policymakers should consider the literature's recommendations to ensure the effective and beneficial use of AI in education.

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