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Education and Artificial Intelligence: An Analysis Based on Teachers' Opinions

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ABSTRACT

Artificial intelligence has become increasingly present in people's lives, significantly impacting various fields, including education. The impact of artificial intelligence brings the opportunity to transform and adapt how the teaching-learning process is carried out. In this context, the research aimed to determine teachers' opinions regarding using artificial intelligence in education. The phenomenological pattern, one of the qualitative research methods, was used in the study. Criterion sampling, one of the purposeful sampling methods, was used. Research data was collected from 40 teachers working in different branches using a semi-structured interview form. The data obtained was analyzed using content analysis. The research findings underscore the potential benefits of integrating artificial intelligence into education, offering various opportunities for enhancing the teaching and learning experience. While acknowledging the efficiency and benefits highlighted by some educators, it is imperative to exercise caution and implement artificial intelligence within ethical boundaries. Within the school environment, artificial intelligence is poised to revolutionize physical, managerial, and technological aspects, alleviating administrative burdens and facilitating smoother operations. In the teaching process, artificial intelligence holds promise for creating enriched learning environments, promoting active student engagement, and optimizing time utilization for educators. Moreover, in evaluation, artificial intelligence stands to enhance objectivity in assessments. Artificial intelligence presents opportunities for students to save time, foster individual growth, and streamline learning experiences, ultimately facilitating their academic journey and professional development.

Keywords: Advantages, artificial intelligence, disadvantages, education, teacher opinions

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INTRODUCTION

The integration of Artificial Intelligence (AI) in education signifies a major shift, empowering educators rather than replacing them. Artificial intelligence offers tools for personalized instruction, better communication, and informed decision-making (Annuš, 2024; Gocen & Aydemir, 2020). It has the potential to transform the education sector by enhancing learning experiences, supporting teachers, and providing personalized learning opportunities for students. Therefore, it's crucial to equip teachers with the knowledge and strategies to effectively use this technology to improve daily processes and classroom implementation. Artificial intelligence can address significant challenges in education, innovate teaching and learning practices, and provide students with access to high-quality educational resources, regardless of their economic status or location. Therefore, this study aims to uncover teachers' perspectives on artificial intelligence. These insights can particularly facilitate a smoother transition for integrating Artificial Intelligence into learning environments.

The theoretical foundation of this research paper, framed within qualitative research, is rooted in phenomenology, which seeks to explore and understand the lived experiences and perceptions of individuals. This study adopts a phenomenological approach to delve into teachers' perspectives on the integration of artificial intelligence in education. The framework behind this qualitative research is that educators' experiences and interpretations of AI's role in their professional practices are central to understanding its potential impact on teaching and learning. By focusing on the meanings that teachers ascribe to AI, this study aims to uncover the nuances of how these technologies are perceived, applied, and evaluated in educational settings. This approach aligns with the qualitative research paradigm, emphasizing depth of understanding, the subjective experiences of participants, and the context within which these experiences occur, thereby providing rich insights into the intersection of AI and education from the teachers' viewpoint.

LITERATURE REVIEW

The origin of the term Artificial Intelligence dates to the "Dartmouth Artificial Intelligence Summer Research Project" in 1956, where three scientists gathered under the leadership of John McCarthy in the state of New Hampshire the USA, to discuss artificial intelligence (Burgard, 2022). According to the father of Artificial Intelligence, John McCarthy, artificial intelligence is the science and engineering of making intelligent machines and brilliant computer programs. Artificial intelligence makes a computer, a computer-controlled robot, or software think intelligently. It is accomplished by studying how the human brain thinks and how humans learn, decide, and work while trying to solve a problem (McCarthy, 2007). Artificial Intelligence is a science and technology based on Computer Science, Biology, Psychology, Linguistics, Mathematics, and Engineering disciplines.

As a comprehensive and interdisciplinary subject, its short-term goal is to build intelligent applications at the machine level and hopes to realize artificial intelligence at the human level (Lufeng, 2018). A major thrust is developing computer functions associated with human intelligence, such as reasoning, learning, analytical thinking, and problem-solving.

Artificial intelligence is the capacity for computers to perform tasks traditionally thought to involve human intelligence or, more recently, tasks beyond the ability of human intelligence. Stemming from relatively simple, general-purpose systems in the 1960s, artificial intelligence today generally involves more specific-purpose systems that complete a specific task involving reasoning about data or the world and then interaction with the world (more commonly through a phone or a computer interface than actual physical interaction). Machine learning (increasingly called data science, also called data mining and analytics) is a sub-area of artificial intelligence that has been present at a low level since the beginning of the field, but has become a particular emphasis in the 1990s through to today. Machine learning is when a system discovers patterns from data – becoming more effective when more data is available (and even more so when more comprehensive or representative data is available). A broad range of machine-learning methods is classified mainly into supervised learning (attempting to predict or infer a specific known variable) and unsupervised learning (trying to discover the structure or relationships in a set of variables). There have roughly been two generations of machine learning: a first generation of relatively simple, interpretable methods and a second generation of much more complex, sophisticated, and hard-to-interpret methods (Baker, 2021). Today, we can say that artificial intelligence is an excellent example of the second one.

Artificial Intelligence "in education" was an interdisciplinary sub-field in the early 1980s with a bi-annual (now annual) conference and a peer-reviewed journal. Much of the early work in artificial intelligence in education involved intelligent tutoring systems. However, the field has broadened over the years to include all types of educational systems/interactions and has expanded to include several independent conferences and journals. The revolution in machine learning and data mining also impacted artificial intelligence in education, with a significant shift around 2010. However, it has a long history; it has become increasingly present in people's lives, significantly impacting various fields, especially education. Today, artificial intelligence in education systems incorporates a range of functionalities for identifying aspects of the learner and ways they can interact with and respond to learners (Baker, 2021). The integration of artificial intelligence in education can not only allow a computer system to act as an intelligent teacher, but it can also facilitate decision-making in educational settings significantly improve the quality of teaching and learning, assist in assessment

and data collection, develop new strategies for learning processes, enable students to benefit from intelligent teachers and real-time learning (Hwang et al., 2020), improve lesson topics, adapt classrooms to students' profiles, and create various content related to students' interests (Fahimirad & Kotamjani, 2018).

Education has undergone a series of changes, and the impact of artificial intelligence brings with it the opportunity to transform and adapt how the teaching-learning process is carried out. There is a need to research the impact of artificial intelligence on education as we know it and how people can use this discovery to improve the experiences of students and teachers (Mureşan, 2023). Additionally, with the advent of ChatGPT, Google Bard, Midjourney, and Canva's magic features, artificial intelligence is quickly becoming an integral part of people's everyday lives. They transform industries and reshape the way people work, learn, and communicate. This rapid technological advancement highlights the importance of incorporating artificial intelligence education into the curriculum to ensure all students are well-equipped for their academic futures and workforce development (Bojorquez & Vega, 2023).

Artificial intelligence has led to a generation of technologies in education – for use in classrooms and by school systems more broadly – with considerable potential to bring education forward (Baker, 2021). Educators and researchers have looked to computers as having the potential to revolutionize e-education for decades. Today, much of the use of computers in education still falls short of revolutionary – much learning still involves one instructor teaching many students simultaneously, and considerable computer-based learning takes place using curricula and technologies replicating traditional practices such as drill and practice. However, the best practices of computers in education appear to go considerably beyond that. Millions of learners now use intelligent tutoring systems as part of their classes – systems that recognize student knowledge, implement mastery learning where students do not advance until they can demonstrate understanding of a topic, and have hints available on demand (VanLehn, 2011).

Artificial intelligence has the potential to revolutionize the education sector by enhancing learning experiences, supporting teachers, and offering more personalized learning opportunities for students. We must equip teachers with the knowledge and strategies to use this new technology to improve and streamline everyday processes and classroom implementation. Some areas in which artificial intelligence can transform the classroom include personalized learning, ideation, adaptive learning, special needs education, bilingual education, gamification, and immersive learning (Bojorquez & Vega, 2023). One major trend within learning driven by these technologies is the move towards personalizing learning to a greater degree. Personalization of learning did not start with computerized technology– in a sense, it has been available since the first use of one-on-one tutoring thousands of years ago (if not earlier). However, with the

increase in systematized and standardized schooling and teaching over a hundred years ago, awareness increased that a one-size-fits-all curriculum was poorly meeting many students' learning needs. Classroom approaches such as mastery learning (each student works on material until mastery and only then moves on to the next topic) were developed but proved difficult to scale due to the demands on the teacher. Educational technologies provided a ready solution to this problem – the computer could manage some of the demands of personalizing learning, identifying each student's degree of mastery, and providing them with learning activities relevant to their current position within the curriculum (Baker, 2021). Personalized learning involves artificial intelligence-powered systems that analyze students' learning styles, strengths, and weaknesses to create tailored lesson plans and suggest resources to serve their needs (Bojorquez & Vega, 2023).

When considering the development of artificial intelligence and its contribution to education, it becomes evident that institutions and organizations responsible for implementing education, along with teachers and education stakeholders, must accelerate their efforts towards integrating artificial intelligence into education. This is because the key to staying caught up in a rapidly changing world is known to be adapting to change (Afrianto, 2018). Teaching students about artificial intelligence can help them develop the knowledge and skills to pursue careers in technology, data science, and other in-demand industries. Artificial intelligence learning can inspire students to generate ideas and solutions, fostering creativity and innovation – essential skills in today's competitive and evolving job market. Providing students with access to artificial intelligence education can help close opportunity gaps, ensure they have the skills and knowledge to compete in the global workforce, and create a more diverse pool of talent in artificial intelligence and related fields. This diversity can lead to better problem-solving, creativity, and innovation in developing artificial intelligence technologies and solutions (Bojorquez & Vega, 2023). However, instead of just automating the teaching of students sitting at computers, artificial intelligence might help open up teaching and learning possibilities that are otherwise difficult to achieve, challenge existing pedagogies, or help teachers be more effective (Holmes et al., 2019). Research has also shown that teacher attitudes toward AI vary based on familiarity with the technology, suggesting that teachers' experiences and knowledge levels play a critical role in shaping their views on AI's applicability in education (Abuhassna et al., 2024).

In this context, the study by Edwards et al. (2024) discusses how AI and machine learning can support transformative educational spaces by addressing both the challenges and opportunities AI brings. Additionally, Abuhassna et al. (2024) highlight the need for deeper integration of AI in education through a structured and evidence-based approach to the information age. Meanwhile, Samsul et al. (2023) provide a bibliometric analysis on

the role of big data and learning analytics in education, underscoring the importance of data-driven decision-making for enhancing educational outcomes.

Artificial intelligence can lead to several negative consequences, both for individuals and society at large. Excluding students from learning about artificial intelligence can contribute to the digital divide, as they may need to gain the knowledge and skills needed to navigate artificial intelligence-driven technologies in their daily lives (Bojorquez & Vega, 2023). Shortly, "Artificial Intelligence" aims to mimic human intelligence by studying how the brain functions and incorporating disciplines like Computer Science, Biology, Psychology, and Engineering. This field has evolved, particularly in Machine Learning, which focuses on systems learning from data patterns. Artificial Intelligence has significantly impacted education, introducing intelligent tutoring systems and transforming classroom practices. It offers personalized learning experiences, aids teachers, and opens new educational strategies. Integrating artificial intelligence education into curricula is crucial to prepare students for evolving career landscapes. However, while artificial intelligence brings transformative potential, there are concerns about the digital divide and negative societal impacts if individuals need more artificial intelligence literacy. Therefore, adapting to artificial intelligence's integration in education is imperative for staying abreast of technological changes and nurturing diverse talents for the future.

The study is paramount in educational advancements and technological integration in learning environments. This research delves into the invaluable perspectives of educators who play a central role in shaping students' learning experiences. By exploring teachers' opinions on the intersection of education and artificial intelligence, this study offers a crucial understanding of how artificial intelligence impacts teaching methodologies, classroom dynamics, and student engagement. Teachers' insights serve as a guiding light in identifying the challenges, potentials, and ethical considerations associated with artificial intelligence in education. Their opinions contribute significantly to crafting effective strategies for integrating artificial intelligence tools into the curriculum, enhancing personalized learning experiences, and addressing the evolving needs of a technologically-driven educational landscape. Ultimately, this study facilitates informed decision-making for policymakers, educators, and educational institutions seeking to harness the potential of artificial intelligence while ensuring it aligns with the goals of fostering holistic and impactful learning experiences for students.

The contribution of this study to the existing literature is its in-depth exploration of teachers' perspectives on artificial intelligence technologies, aiming to provide a more comprehensive understanding of artificial intelligence's impact on education. While previous studies have generally focused on the overall effects of artificial intelligence in education,

its applications, or teaching tools, there are limited studies examining teachers' attitudes, experiences, and ethical concerns regarding artificial intelligence. This study aims to examine teachers' perceptions of artificial intelligence usage, the potential applications of it in teaching processes, and the challenges they face in greater detail. Another contribution is understanding the interactions between artificial intelligence technologies, teachers, and students, and offering practical suggestions on how these technologies can be integrated into classroom settings. Our study presents a more in-depth, teacher-centered perspective by investigating how teachers' attitudes toward artificial intelligence change according to their experience and knowledge levels, and how these differences reflect on educational practices compared to previous studies. Additionally, this research takes into account teachers' concerns regarding the ethical and practical aspects of artificial intelligence, drawing significant conclusions on how it can be used more effectively and responsibly in education. Specifically, it sheds light on critical issues that have often been overlooked in the existing literature, such as data privacy and the digital divide, which are important ethical matters teachers encounter regarding the role of artificial intelligence in education.

While the existing literature provides a broad overview of AI's potential in education, it often lacks a critical, teacher-centered perspective. There is a significant gap in understanding the attitudes, experiences, and ethical concerns of teachers regarding the use of AI. This study aims to address this gap by focusing on teachers' perspectives, which have been underexplored in the current body of work. Moreover, the research seeks to provide deeper insights into how AI can be integrated into educational practices, the challenges faced by teachers, and the ethical issues surrounding AI usage in classrooms.

This research will make a substantial contribution to the literature by providing a comprehensive understanding of teachers' perceptions of AI in education, which is essential for shaping effective AI integration strategies. The study's findings will inform policy development, curriculum design, and teacher training programs aimed at harnessing the full potential of AI in educational settings. By exploring how AI tools impact classroom practices, teaching methodologies, and student engagement, this study will offer valuable insights into the effective and responsible use of AI in education.

In the ever-evolving educational environment, the integration of artificial intelligence has emerged as an essential factor in reshaping teaching methodologies and learning environments. Despite the increasing presence of artificial intelligence-powered tools in educational environments, there remains a significant gap in understanding educators' nuanced perspectives. Exploring teachers' views on artificial intelligence in education is imperative to gain the comprehensive insights needed to design informed strategies that effectively leverage artificial intelligence's potential while pursuing

educational goals to promote enhanced student learning experiences. Therefore, in this research, by examining the multifaceted perspectives of educators, the pedagogical practices are used to focus on revealing perceptions, ethical issues, and possibilities regarding the use of artificial intelligence technologies. This qualitative study explores and analyzes teachers' opinions, attitudes, and perceptions regarding including artificial intelligence in education. Within the framework of this general purpose, the following answers were sought:

1. What are the meanings that teachers attribute to artificial intelligence?
2. What are teachers' opinions about the usability or applicability of artificial intelligence technologies in education?
3. How does using artificial intelligence technologies in education affect the school, teacher, student, teaching process, and evaluation positively or negatively?
4. How can artificial intelligence technologies be used in education? What should be taken into consideration when using artificial intelligence in education?

So the hypotheses of the research are listed below:

1. Teachers who are familiar with artificial intelligence (AI) tools perceive them as beneficial for enhancing personalized learning experiences in the classroom.
2. The integration of AI technologies in education is positively correlated with improved decision-making processes in teaching and learning activities.
3. Teachers believe that AI can support their instructional practices by automating routine tasks, allowing them to focus more on student engagement and interaction.
4. There is a significant variation in teachers' attitudes towards the applicability of AI in education based on their level of experience and familiarity with AI tools.
5. Teachers express concerns about potential ethical and practical challenges associated with the use of AI in educational settings, such as data privacy and the digital divide.
6. The successful integration of AI in education requires comprehensive professional development and support for teachers to effectively implement these technologies in their classrooms.

MATERIALS AND METHODS

Model

In this study, the phenomenology design, one of the qualitative research designs, was used. The phenomenology design aims to better understand the nature or meaning of daily experiences (Patton, 2002). In other words, this pattern focuses on phenomena that we are aware of in daily life but do not have in-depth and sufficient knowledge of (Yıldırım & Şimşek, 2018). In this context, this design was preferred because it aimed

to examine in-depth teachers' opinions about artificial intelligence, which has become popular in education and many areas of daily life in recent years.

Study Group

The research study group consisted of 40 teachers working in various branches of public schools affiliated with the Ministry of Education in Afyonkarahisar. The decision to include 40 participants was based on the principle of saturation, a common approach in qualitative research. According to Patton (2002), saturation occurs when no new information or themes emerge from further data collection. In qualitative research, a sample size of 40 is considered sufficient for obtaining rich, diverse perspectives on a topic like AI in education, especially given the specialized knowledge required from the participants. Additionally, the study's focus on depth rather than breadth meant that 40 participants, selected from various educational branches and backgrounds, allowed for a comprehensive exploration of the research questions.

Criterion sampling, one of the purposeful sampling methods, was used. Criterion sampling was chosen because the study aims to explore teachers' experiences and knowledge specifically related to artificial intelligence in education. By selecting participants based on these criteria, the study aimed to collect in-depth perspectives from teachers who have direct experience with the phenomenon under investigation. This targeted approach enables a detailed exploration of the meanings teachers attribute to AI in education, which would not be possible through random sampling or other general sampling methods. At this point, "having sufficient knowledge about artificial intelligence tools, using at least one of the artificial intelligence tools, and being a volunteer" were determined as criteria for determining the sample. In order to comply with these criteria, since "artificial intelligence in education" is still new, participants working in various branches with knowledge of this subject were included in the working group. The teachers who participated in this study were selected based on criteria such as having sufficient knowledge about AI tools, having used at least one AI tool, and being volunteers. This method ensures that the selected participants are not only knowledgeable but also have practical experience with AI tools in the educational context, making their insights more relevant and valuable for the research question. In determining these criteria, the ways teachers learned about AI tools (e.g., professional development training, self-directed learning, in-school seminars) were taken into account.

While the sample is specific to teachers in Afyonkarahisar, the insights gained can provide valuable information about teachers' perceptions of AI in education within a similar socio-cultural context. The goal of qualitative research is not to generalize to the broader population but to understand the complexities of a phenomenon, which in this case is the integration of AI in education. The study's findings can serve as a foundation for further research or inform local educational policy.

In addition, information was provided about the voluntary participation process; teachers were informed that participation in the study was completely voluntary, and participants participated in the process by signing an informed consent form. Information about some characteristics of the participants is presented in Table 1.

As seen in Table 1, 26 participants are women, and 14 are men. One of the participants is between the ages of 20-25, 9 of them are between the ages of 26-30, 20 of them are between the ages of 31-35, 9 of them are between the ages of 36-40, and 1 of them is 41 and over. The participants are from the fields of primary education (11), preschool education (5), Turkish language teaching (2), mathematics teaching (2), science teaching (3), social studies teaching (2), English language teaching (5), information technologies teaching (3), and psychological counseling and guidance (4). Five participants hold master's degrees, and 35 hold bachelor's degrees. Lastly, two participants have 1-5 years of experience, 21 have 6-10 years, 13 have 11-15 years, 1 has 16-20 years, and 3 have over 21 years of work experience. Ten work in provincial centers, 23 in district centers, and 7 in town/village centers.

Table 1
Personal ınformation about the study group

Personal Characteristics		N	%
Gender	Female	26	65
	Male	14	35
Age	20-25	1	2,5
	26-30	9	22,5
	31-35	20	50
	36-40	9	22,5
	41-above	1	2,5
Branch	Class	11	27,5
	Preschool	5	12,5
	Turkish	2	5
	Mathematics	2	5
	Science	3	7,5
	Social Sciences	2	5
	Religion	3	7,5
	English	5	12,5
	Information and Communication Technologies	3	7,5
	Psychological Counseling and Guidance	4	10
Education	Bachelor degree	35	87,5
	Master's degree	5	12,5
Professional Seniority	1-5 years	2	5
	6-10 years	21	52,5
	11-15 years	13	32,5
	16-20 years	1	2,5
	21 years-above	3	7,5
Type of School	Preschool	5	12,5
	Elementary	12	30
	Secondary	17	42,5
	High School	6	15
School District	City	10	25
	Town	23	57,5
	Village	7	17,5

Data Collection Tools

The 'Semi-Structured Teacher Interview Form' prepared by the researchers was used as the data collection instrument in the study—the preparation process for the form involved scanning the literature related to artificial intelligence. Alongside establishing the theoretical framework of the subject, recent developments, innovations, and needs, artificial intelligence in education were identified. Subsequently, questions

tailored to the purpose of the research were formulated. Afterward, input was sought from two experts in education programs and teaching, and two specialists with expertise in artificial intelligence. Necessary adjustments were made based on their feedback. Furthermore, the form was subjected to a pilot application with three teachers to test its clarity and comprehensibility. The form was revised to ensure clarity and readiness for implementation by refining any unclear terms. The form primarily consists of the following questions:

1. What is your understanding of artificial intelligence? What comes to mind when considering artificial intelligence in education? What are your thoughts on artificial intelligence?
2. When considering the future impact of artificial intelligence technologies, what are your thoughts on their usability or applicability in education?
3. As a teacher, how do you think the effective use of artificial intelligence technologies in education would impact you positively or negatively? For instance, does it cause concern, inspire hope, instill confidence, simplify your work, or complicate it? Please explain the reasons.
4. How do you believe using artificial intelligence technologies in education would impact the school, teachers, students, the teaching process, and assessment positively or negatively? Please explain.
5. In your opinion, at which stages of education can artificial intelligence technologies be applied, and how? Could you provide examples?

The interviews were conducted face-to-face with the participants on the specified dates and times. Each interview was audio-recorded after the participant's consent was obtained, and written notes were taken during the interview. Empty classrooms in schools or appropriate teacher rooms were used as the interview environment. The interviews were conducted between January and March 2024, and the participants were selected from various districts in Afyonkarahisar (center, district, and village schools). This diversity is important to cover the experiences of teachers in various educational environments. The participants were informed about the research, and their participation in the research was ensured by signing a consent form. The participants were also informed that their statements during the interview would be kept confidential and would be used only for research purposes.

Data Collection and Analysis

Thematic analysis is not a separate research approach/method like grounded theory or ethnography, but rather a process used to assist the researcher in their quest for insights and is often part of many qualitative methods. Thematic analysis is a process for coding qualitative data. The coding process can either be open coding, or a code list may be used, or both can be utilized within the same study. A theme can be

defined either at the manifest level, directly observable, or at the latent level, underlying the phenomenon. Themes can initially be developed inductively from raw data or deductively from theory and previous research (Boyatzis, 1998). However, the researcher needs to understand and explain why they have chosen a particular analytical approach. Thus, inductive thematic analysis is typically experiential, assumes a knowable world (reality), and "gives voice" to the experiences and meanings of this world. Deductive thematic analysis, on the other hand, typically takes a critical and constructivist approach within its theoretical framework by examining how the world is put together (i.e., constructed) and ideas and assumptions about the collected data (Braun & Clarke, 2013). In this study, both inductive and deductive thematic analyses were used to construct the nature of the research.

The inductive analysis allowed us to derive themes directly from the raw data, without imposing preconceived theories or expectations. This approach helped identify themes that reflect teachers' lived experiences with AI in education, such as *teachers' initial fears and excitement about AI technologies* or *teachers' perceptions of AI as a tool to reduce administrative workload*. For instance, one inductively derived theme was *"AI as a time-saver"*, which emerged from several teachers discussing how AI tools assist in automating routine tasks like grading. The deductive thematic analysis, on the other hand, was guided by theoretical frameworks and previous research on the potential impacts of AI in education. For example, existing literature on AI in education often mentions challenges related to accessibility and inequality. Hence, themes related to *"equity in access to AI technologies"* were explored through the data, ensuring that existing theories informed the interpretation of teachers' experiences and thoughts.

In the study, the participating teachers were initially provided with information about the research topic and how the research would be conducted. Participants who met the specified criteria (having sufficient knowledge about artificial intelligence tools, using at least one artificial intelligence tool, and volunteering) were identified and selected to participate in the research. Before the interviews, the participants were informed about the meeting time and the subject. The interviews were held face-to-face with each participant at the specified hours and lasted an average of 15-20 minutes for each participant. After the interviews, the participants checked the notes and were allowed to make corrections if they had any missing or different opinions. Then the data was transcribed and made ready for analysis.

Content analysis was used to analyze the data. Content analysis is a systematic and repeatable technique in which some words in a text are summarised with smaller "categories" using "codes" to reach concepts and relationships that can explain the data obtained. In other words, content analysis combines similar data within the framework of certain concepts and themes and understandably organizes them. This process consists of the stages

of "coding the data, creating themes, arranging the codes and themes, defining and interpreting the findings" (Büyüköztürk et al., 2010; Yıldırım & Şimşek, 2018). In this context, the data were examined by two researchers, and codes were determined. Then, themes and sub-themes related to these codes were created. In line with the codes obtained, the themes of "the meanings that teachers attribute to artificial intelligence, the usability and applicability of artificial intelligence in education, the positive/negative effects of artificial intelligence in education, the stages and recommendations at which stage of the education process it can be used, and how it can be used" were determined. In order to ensure consistency and harmony between codes and themes, the codes and themes created separately by two researchers were compared. The consistency reliability was calculated with the formula "Consensus/ Consensus+Disagreement" (Miles & Huberman, 1994), and the value was found to be 0.91. Afterward, tables containing codes, sub-themes, and themes were created, and the findings were presented with direct quotes from the participant opinions coded as T1, T2, T3…

After the interview, participants were sent transcripts and asked to provide feedback on any omissions or misunderstandings. Participants had the opportunity to review and correct their statements. This process was considered an important step in ensuring data accuracy. In addition, ethical permission was obtained from Afyon Kocatepe University Social and Human Sciences Scientific Research and Publication Ethics Board with the decision number 2023/145 and dated 12.04.2023 in order to carry out the study.

FINDINGS

The findings obtained from the analyses were presented by creating tables in line with the sub-problems.

1. The codes obtained from teachers' views on the meanings they attribute to artificial intelligence and the themes created are given in Table 2 below.

Table 2 shows that teachers' opinions about the meanings they attribute to artificial intelligence are collected in two themes: "advanced technology" and "education model". In this context, teachers have attributed meanings such as "interactive machine technology (f=12), technological systems or a mechanism that can imitate human intelligence (f=10), advanced technology supported by intelligent machines or devices (f=7), equipped with advanced software technology (f=5), and performing tasks with computers or robots (f=3)" to artificial intelligence within the theme of "advanced technology." Some of the opinions regarding the meanings attributed to artificial intelligence by teachers in this context are as follows:

> *"It is the mechanization of human abilities such as thinking, decision-making, and problem-solving. The best response to artificial intelligence in education is the machines' takeover of the*

Table 2
Teachers' opinions on artificial ıntelligence

Theme	Codes	f
Advanced Technology	Interactive machine technology	12
	The technological system or a mechanism that can imitate human intelligence	10
	Advanced technology supported by intelligent machines and devices	10
	Equipped with advanced software technology	5
	Performing tasks with computers or robots	3
	Bringing new suggestions to events or some situations	2
	Robots and systems that surpass human intelligence	2
	Adapting digital systems to the human brain	1
	An interdisciplinary, systematic, and intelligent system	1
	An innovation that makes life easier and more practical	1
Education Model	A contemporary teaching model supported by innovative technologies	5
	Practical teaching tools and technological educational material	3
	A system with the potential to replace teachers in education	2
	Robot teachers and programs	2
	Technological software that supports self-learning	1

instructional part. In other words, I can say that teaching is provided not by humans but by robots and machines."(T7)

"Artificial intelligence is creating an idea or suggestion in a computer environment, responding to an existing situation. In education, artificial intelligence involves generating suggestions with the help of computers in response to situations encountered in the teaching-learning environment."(T8)

"It is a technology that mimics human intelligence to perform tasks determined by machines, continuously updating knowledge to improve itself. For example, it can develop personalized knowledge and study programs tailored to a student's desired or difficult-to-learn subject."(T9)

"It is a system that enables non-naturally occurring entities (such as computers and robots) to utilize skills like reasoning. In short, we can call it machine learning." (T18)

"Artificial intelligence is characterized by the ability of the created software to self-renew and update without external influence. Artificial intelligence can be utilized in various fields within education." (T21)

In the theme of "Education model," teachers have attributed meanings such as "a contemporary teaching model supported

by innovative technologies (f=5), practical teaching tools, technological educational material (f=3), a system with the potential to replace teachers in education (f=2), and robot teachers and programs (f=2)" to artificial intelligence. Some of the opinions regarding the meanings attributed to artificial intelligence by teachers in this context are as follows:

> *"Artificial intelligence is a collection of software designed for specific purposes, aiming to facilitate the lives of individuals, including students and teachers, in education. The purpose of artificial intelligence in education is to facilitate educational activities, create technology-supported learning environments, and simplify learning and teaching processes.* (T5)

> *"I believe artificial intelligence is a technological mechanism that can mimic human intelligence and allow decisions to be made autonomously when necessary. Additionally, when I think of artificial intelligence in education, mechanisms that could potentially replace teachers or even render them obsolete come to mind."* (T13)

> *"It is a type of intelligence displayed by machines, as opposed to natural intelligence exhibited by humans. When we look at artificial intelligence research in education today, we see various applications based on rich teaching models with intelligent technological tools, including knowledge-based and data- and logic-based artificial intelligence applications in almost every field."* (T25)

2. The codes obtained from teachers' views on the usability and applicability of artificial intelligence technologies in education and the themes created are presented in Table 3 below.

As seen in Table 3, teachers' views on the usability or applicability of artificial intelligence in education are grouped into "positive views" and "negative views." In this context, more than half of the teachers have indicated that artificial intelligence will benefit education and provide different

Table 3
The usability and applicability of artificial ıntelligence in education

Theme	Codes	f
Positive Views	It will be beneficial; it will offer various opportunities.	23
	Applicable	22
	Available	22
	It will be efficient if it is controlled and limited.	16
	An inevitable necessity, it should be utilized in education.	10
Negative Views	Alarming, it could replace the teacher.	10
	It could make both teachers and students lazy.	3

opportunities (f=23). Additionally, they have stated that it will be applicable (f=22) and available (f=22). Furthermore, ten teachers have emphasized that artificial intelligence is an inevitable necessity in education and highlighted its importance in the evolving world of the 21st century. However, sixteen teachers have also stated that it will be efficient and beneficial at the desired level if used in a controlled and limited manner (f=16). Some of the positive views of teachers regarding the usability and applicability of artificial intelligence technologies in education are as follows:

> *"Education cannot be independent of technology. This should not be overlooked. Artificial intelligence is now an inevitable necessity. Because technology is a major factor in changing and evolving societies in the 21st century, it would be very wrong to separate this factor from education. Artificial intelligence emerges as an inseparable aspect of technology. Technology is evolving in this field. We can resort to artificial intelligence programs related to education, both in classrooms, work environments, and homes."* (T4)

> *"It will be beneficial in the field of education. However, I am concerned about its attempt to replace teachers. Therefore, it should be controlled with necessary precautions."* (T5)

> *"We must keep up with this age of technology because we are living in the age of technology. Artificial intelligence should be used in education, but not with full authority; it should be used in a limited manner."* (T6)

> *"Considering the success of artificial intelligence technologies not only in collecting and analyzing data but also in obtaining and presenting information, I believe it will help us move beyond traditional classroom-bound teaching and enable us to control students' learning at their desired time and place."* (T17)

> *"It should be used. The effective learning of students, which method they learn better with, or in which areas they are lacking and need to improve, can be determined objectively without the human factor, and appropriate education can be provided with artificial intelligence tools or robots tailored to the student's situation."* (T18)

In the theme of "negative views," ten teachers have expressed concerns that artificial intelligence in education is alarming and could replace the teacher. Therefore, they have stated that artificial intelligence can be used in education with necessary precautions taken. Some of the opposing views of teachers regarding the usability and applicability of artificial intelligence technologies in education are as follows:

"I am worried about this. Neither we nor our students are robots. We can think, feel, reason, analyze, and evaluate. More than just loading information with artificial intelligence will be required. If we use technology/artificial intelligence in a limited and controlled manner, future generations can accomplish creative tasks." (T15)

"I am even thinking maybe there will not be a need for teachers. This is also worrying me. Smart boards have taken their place in the corner of the classroom. Many teachers also benefit from this during much of the lesson. Of course, artificial intelligence should be utilized in a controlled and limited manner." (T29)

"Artificial intelligence is currently being used in education, depending on school resources, and it should continue to be used. However, if all tasks are left to artificial intelligence in the future, it may make teaching unnecessary and even end the teaching profession." (T35)

"Artificial intelligence is currently being used in education, depending on school resources, and it should continue to be used. However, in the future, artificial intelligence could bring an end to the teaching profession. This should be noted." (T35)

3. The codes obtained from teachers' opinions on the effects of artificial intelligence in education and the themes and sub-themes created are given in Table 4 below.

As seen in Table 4, the codes obtained regarding teachers' opinions on the positive or negative effects of using artificial intelligence in education were collected in two main themes: "positive" and "negative effects". Within these two themes, five sub-themes were created: "school, teaching process, evaluation process, student, and teacher".

In this context, when the positive effects of artificial intelligence in education are examined, under the "school" sub-theme, it is stated that artificial intelligence contributes to the physical, administrative, and technological development of the school (f=14), makes school (administrative) work more accessible and reduces administrative workload (f=10), it provides control in school management (f=5), and reduces the differences between schools and provides equal opportunities (f=2). In the "teaching process" sub-theme, it is stated that artificial intelligence enriches the teaching environment and ensures effective and efficient teaching (f=30), ensures active participation in the teaching process (f=12), facilitates teaching processes (f=10), enables efficient use of time (f=10), and increases interaction within the group (f=8). In the "evaluation process" sub-theme, it is emphasized that artificial intelligence allows objective evaluation (f=24). Additionally, it is stated that it enables accurate analysis during the evaluation (f=15) and rapid

Table 4
The effects of using artificial ıntelligence in education

Theme	Sub-theme	Codes	f
Positive Effects	School	It contributes to the physical, administrative, and technological development of the school.	14
		It makes school (administrative) work more accessible and reduces administrative workload.	10
		It provides control in school management.	5
		It reduces the differences between schools and provides equal opportunities.	2
	Teaching Process	It enriches the teaching environment and ensures that teaching is effective and efficient.	30
		It ensures effective/active participation in the teaching process.	12
		It facilitates teaching processes.	10
		It allows you to use time efficiently.	10
		It increases interaction within the group.	8
		It contributes to transferring information effectively in education.	5
		It reduces the risk of error.	4
		It increases communication between the teacher and student.	2
		It provides the opportunity to develop skills such as creative thinking.	2
	Evaluation Process	It allows objective evaluation.	24
		It enables accurate analysis in evaluation.	15
		It enables rapid analysis of evaluation.	8
		It contributes to a valid and reliable evaluation.	5
	Students	It provides time for learning.	20
		It contributes to individual development.	17
		It makes learning easier.	15
		It provides practical and permanent learning.	15
		It increases interest and curiosity in learning.	13
		It simplifies tasks and assignments.	10
		It attracts attention and motivates learning.	5
		It contributes to the determination of learning needs.	3
	Teachers	It facilitates teachers' tasks and duties.	21
		It provides them with the opportunity to save time and engage in more activities.	18
		It contributes to professional development.	8
Negative Effects	School	It may reduce the need for school.	5
		Problems may arise because there will be no humane management approach.	2
		It cannot solve discipline problems.	1
	Teaching Process	It may reduce the opportunity for experiential learning.	4
		It cannot provide a learning environment close to real life.	3
		There may be communication problems during the teaching process.	3

Table 4 *(continue)*

Theme	Sub-theme	Codes	f
	Evaluation Process	It may be inadequate in fostering affective characteristics.	5
	Students	It will be insufficient to gain emotional behaviors.	11
		It gets people used to being ready and pushes them towards laziness.	6
		It needs to improve its ability to research and obtain information.	5
		You may need the correct information.	5
		It cannot gain values such as conscience and tolerance; it can destroy them.	5
		It negatively affects socialization.	5
		It leads to soullessness in education.	1
		It does not improve reasoning skills.	1
	Teachers	It may reduce the need for teachers.	5
		It dulls the ability to research and develop oneself.	4
		Artificial intelligence cannot be a role model like a teacher.	4
		It can diminish the value of the teacher.	3
		It may make them get used to being ready and cause them to disrupt their duties.	3

analysis of evaluation data (f=8). In the "Student" sub-theme, it is mentioned that artificial intelligence provides time for learning (f=20), contributes to individual development (f=17), makes learning easier(f=15), provides practical and permanent learning (f=15), increases interest and curiosity in learning (f=13), and simplifies tasks and assignments (f=10). In the "Teacher" sub-theme, it is stated that artificial intelligence facilitates teachers' tasks and duties (f=21), provides them with the opportunity to save time and engage in more activities (f=18), and contributes to their professional development (f=8). In this context, some of the positive opinions of teachers are as follows:

"It makes my job, the teacher's job, easier, because we cannot take all foreign language students to the country of the spoken language, but with this method, it will be much simpler and easier." (T3)

"The positive aspect of artificial intelligence is that when used effectively, both students and teachers actively participate in the process, thereby creating the richest environment for teaching and learning. Active involvement of students throughout the process leads to lasting learning outcomes. At the end of the process, the objective evaluation process is also completed. ..." (T12)

"It will have a positive impact because it will ease the teacher's workload, allowing the teacher to

dedicate themselves to education fully. It will enable more activities to be conducted. The student will be able to participate more actively, leading to more lasting learning outcomes, facilitating the teaching process, and enabling fairer assessments. To stay ahead of the curve, we must adapt to innovations and keep ourselves open to development." (T39)

"It could positively impact schools and reduce disparities among them. However, it could also have positive and negative effects on students and teachers. Teachers and students who cannot adapt to artificial intelligence may face difficulties. There may be a positive impact due to the efficient use of time in the teaching process. Artificial intelligence can potentially negatively affect the communication between students and teachers, emotional processes, and students' socialization. In terms of assessment, artificial intelligence can offer more valid and reliable results, which has a positive impact." (T27)

Indeed, alongside their positive views, teachers have also expressed concerns about the potential negative impacts of artificial intelligence in education. At this point, within the theme of "negative impacts," under the "school" sub-theme, teachers have mentioned that artificial intelligence may reduce the need for schools (f=5) and could lead to problems due to the absence of a humane management approach (f=2). Under the sub-theme of "instructional process," teachers have expressed concerns that artificial intelligence may reduce opportunities for experiential learning (f=3), fail to provide learning environments close to real-life situations (f=3), and lead to communication problems during the instructional process (f=3). In the sub-theme of "assessment process," it is noted that artificial intelligence may be inadequate in measuring affective characteristics (f=5). Under the sub-theme of "student," concerns are raised regarding artificial intelligence's inadequacy in fostering affective behaviours in students (f=11), potentially fostering a reliance on ready-made solutions leading to laziness (f=6), dulling research and information-gathering skills (f=5), leading to the acquisition of incorrect information (f=5), being unable to instil values like conscience and tolerance, or even destroying them (f=5), and negatively affecting socialisation (f=5). Under the sub-theme of "teacher," concerns are expressed regarding artificial intelligence potentially reducing the need for teachers (f=5), dulling the ability to research and develop oneself (f=4), and being unable to serve as role models like teachers (f=4). In this context, some of the teachers' opinions are as follows:

"If artificial intelligence is used correctly, adequately, and for a supportive purpose, it will positively affect the school, teacher, student, teaching process, and evaluation.

However, when we become addicted to this artificial intelligence and hand over complete control, negative effects may be seen in the factors I mentioned. Artificial intelligence cannot be a model like a teacher. It cannot address the affective aspect of education at the desired level. It is wrong to consider the individual only cognitively. Students may experience emotional breakdowns, detachment from values, discipline issues, and communication problems. These problems also impact the family, school, and society. Therefore, the benefit derived from artificial intelligence should be maintained at a certain level, and the teacher's guidance should not be disregarded." (T4)

"I believe there can be a significantly positive contribution in terms of efficiency in all education processes, which would benefit the economy. It contributes to the development of the school, the student, the teacher, the teaching process, and evaluation. It saves time and provides convenience. Of course, when it comes to human situations, relying solely on logic may eliminate the conscience factor in students, which could lead to negative outcomes." (T8)

"I think artificial intelligence varies depending on how it is implemented in education. The teacher who serves as a guide in the educational process should oversee the use of artificial intelligence. I believe artificial intelligence should be supportive. If it stays within this scope, it will not cause concern, but if a program is implemented that completely replaces the teacher with artificial intelligence, that would be a mistake, and it concerns me." (T14)

"…The negative aspects of artificial intelligence include its function of presenting information readily available, which may lead students to be lazy. Students may skip processes like research, observation, and data collection, and attempt to use the first information they find online without filtering it through their minds, leading to misinformation." (T12)

4. Teachers' views on how artificial intelligence technologies can be used in education and what should be considered when using them are provided in Table 4.

In Table 5, as seen, the codes reached regarding teachers' views on how artificial intelligence technologies can be used in education and what should be considered when using them are grouped into four themes: "teaching process," "evaluation process," "other educational processes," and "recommendations." Within the theme of "teaching process," it is stated that artificial intelligence can be used to enrich the

learning environment in teaching practices (f=12), to support individual learning pace and teaching tailored to students' learning needs (f=9), to facilitate information acquisition, access to resources, and conducting research (f=5), and to determine

Table 5
Recommendations about using artificial ıntelligence in education

Sub-theme	Codes	f
Teaching Process	To enrich the learning environment in teaching practices.	12
	To support individual learning pace and teaching tailored to students' learning needs.	9
	To facilitate information acquisition, access to resources, and conducting research.	5
	To determine the learning needs of the student and provide the necessary instruction and content.	4
	As an assistant teacher.	2
	To develop problem-solving and decision-making skills.	2
	In simulations like pilot training.	2
	The skill of using information technologies consciously.	1
	Concretizing abstract concepts.	1
	Conducting risky experiments.	1
	In language education, vocational training, medical education, and so on.	1
	To enhance cognitive processes.	1
Evaluation Process	During the assessment phase (Objective, prevention of copying).	10
	Identifying learning gaps and providing feedback.	6
	Monitoring and tracking learning progress.	4
	In career selection and acquiring vocational skills.	2
	In tracking student development and checking assignments.	2
Other educational processes	Artificial intelligence can be utilized in all stages of education.	11
	Individualized artificial intelligence support can be provided to each student.	5
	In administrative tasks and responsibilities for teachers and administrators.	3
	In enhancing teachers' professional development.	1
Recommendations	Artificial intelligence in education should not be implemented independently of teachers. Necessary precautions should be taken and used under the supervision of teachers.	13
	Artificial intelligence should be used cautiously within ethical boundaries and without surpassing security limits.	11
	It cannot replace teachers; therefore, the role or mission of a teacher should not be assigned to artificial intelligence.	5
	It can be implemented as a complementary educational tool from preschool to higher education.	5
	Those who need help to adapt to artificial intelligence may face difficulties. Therefore, preparation is essential, and artificial intelligence literacy should be developed.	3
	Artificial intelligence should not be used at an early age. Instead, values such as ethics, conscience, and respect should be instilled early, and artificial intelligence should be used in secondary or higher education.	3

the learning needs of the student and provide the necessary instruction and content (f=4). In the "evaluation process" theme, it is indicated that artificial intelligence can be used during the assessment phase (objective and prevention of copying) (f=10), identifying learning gaps and providing feedback (f=6), and monitoring and tracking learning progress (f=4). In the theme of "other educational processes," it is stated that artificial intelligence can be utilized in all stages of education (f=11), and individualized artificial intelligence support can be provided to each student (f=5). It can fulfill administrative tasks and responsibilities for teachers and administrators (f=3). In this context, here are some opinions from teachers:

> *"Artificial intelligence can enrich teaching practices in the educational process. Indeed, for instance, if we consider the use of 3D glasses in science classes, students can virtually travel back to ancient times to explore the formation of the Earth and study the flora and fauna of those eras. Similarly, Turkish language classes can witness historical events like reading the national anthem in parliament on the day of its adoption. This immersive experience can significantly enhance students' understanding and engagement with the subject matter. Teachers must oversee these activities to ensure they align with reality and contemporary perceptions while exploring historical or fictional scenarios."* (T4)

> *"Artificial intelligence should be in a position like an intern next to the teacher. In other words, it should act as an assistant rather than a full instructor."* (T6)

> *"...It could be more effective in the assessment stage. For example, a question is asked, an answer is received, and feedback is quickly provided to the student. This allows the student to identify their shortcomings in the learning process and address them."* (T11)

> *"Artificial intelligence can be used in teaching activities. For example, in an art class where a student is asked to paint a natural landscape, they could first be shown real videos with artificial intelligence-supported augmented reality materials from natural beauties worldwide to help them visualize and create a draft in their mind. A student aspiring to become a pilot could be given a pilot simulation experience."* (T13)

> *"...Artificial intelligence will be used in many stages of the education process. For example, it can be applied in the cafeteria, canteen, attendance tracking, cleaning, and document preparation."* (T14)

"...It can support, monitor, and assess students' learning. For example, the learned subject can be repeated or applied through child-robot interaction, personalized assignments or questions can be created, and so on." (T22)

"Artificial intelligence technologies can be used with different methods and techniques at every stage of education. It can serve as a guide in the teaching process for any subject. Homework tracking situations can be done online. It can be used in assessments and exam applications." (T37)

Teachers have also provided some suggestions for using artificial intelligence in education and their views on how it can be utilized. At this point, teachers' recommendations for using artificial intelligence are as follows: Artificial intelligence in education should not be implemented independently from teachers. Necessary precautions should be taken and used under the supervision of teachers (f=13). It should be used carefully within ethical boundaries and without surpassing security limits (f=11). It cannot replace teachers; therefore, the role or mission of a teacher should not be assigned to artificial intelligence (f=5). While some suggest that artificial intelligence could be used as a complementary educational tool from preschool to higher education (f=5), others advise against using it at an early age. They propose that ethical values like conscience and respect should be instilled early, and artificial intelligence should be introduced at the secondary or tertiary education level (f=3). Additionally, some suggest that those who cannot adapt to artificial intelligence may encounter difficulties, emphasizing the importance of being prepared and developing artificial intelligence literacy (f=3). In this context, here are some recommendations from teachers:

"If artificial intelligence is used correctly (with a supportive purpose), it positively impacts the school, teacher, student, teaching process, and evaluation. However, if we become overly reliant on artificial intelligence and completely relinquish control, we may experience negative effects in the factors I mentioned earlier. Artificial intelligence cannot take the initiative or serve as a role model like a teacher. It may not address the emotional aspect of education to the desired extent. Focusing solely on the cognitive aspect of an individual is misguided. Students may experience emotional breakdowns, detachment from values, disciplinary issues, and communication problems. These issues affect the individual and their family, school, and community. Therefore, the extent of benefiting from artificial intelligence should be at a certain level, and the teacher's guidance should not be overlooked. Security should be taken into consideration." (T4)

"Certainly, adapting to the age of technology is essential, and incorporating artificial intelligence into education is a step in the right direction. However, using it in a controlled and limited manner is crucial, rather than giving it full authority." (T6)

"In education, artificial intelligence should be applied under the control and knowledge of the teacher. Necessary precautions should be taken, paying attention to ethical rules, and artificial intelligence should be utilized to a certain extent." (T13)

"Artificial intelligence should be used in a limited and controlled manner under the teacher's supervision. Otherwise, if it exceeds its purpose, it can negatively affect both the teacher and the student." (T22)

RESULTS AND DISCUSSION

In the study where teachers' opinions about artificial intelligence in education were determined, the opinions of 40 teachers from different branches were consulted, and the data obtained were analyzed using the content analysis method. The analysis revealed four main themes as "teachers' perceptions regarding artificial intelligence, the usability and applicability of artificial intelligence in education, the positive/ negative effects in education, and how artificial intelligence can be utilized at different stages of the educational process". Based on these themes, the following conclusions were drawn.

1. Teachers' Perceptions of Artificial Intelligence

Research Question 1: What are teachers' perceptions of artificial intelligence in education?

When examining the meanings attributed to artificial intelligence by teachers, it was found that teachers perceive it as "advanced technology" encompassing concepts such as "interactive machine technology, technological systems capable of mimicking human intelligence, mechanisms, advanced technology supported by intelligent machines or devices." In the "Educational Model" theme, teachers attributed meanings such as "a contemporary teaching model supported by smart Technologies, and an effective teaching tool, technology material." In their research conducted by Köse et al. (2023) investigated teachers' perspectives on integrating artificial intelligence into education. They found that while artificial intelligence is predominantly associated with military technologies, it also extends to various other fields, including electronic mobile phone technology, information technology, robotics, industrial-automotive, and engineering sectors. Our findings regarding teachers' perceptions of artificial intelligence (AI) in education align with those of Köse et al. (2023), who also found that teachers viewed AI as a useful tool that could streamline educational processes and make learning more personalized. However, our study expands on this by

also highlighting the concerns about the potential dehumanization of the educational environment, an issue that was less emphasized in their research.

In Aktaş's study (2021), which examined the metaphorical perceptions of school administrators and teachers regarding artificial intelligence, the metaphors reached were analyzed based on conceptual themes. It was concluded that both participant groups mostly perceive artificial intelligence as a "mechanical structure," such as a robot, computer, or artificial human. While similar studies, such as Aktaş (2021), found that teachers primarily perceive AI in terms of mechanical structures (e.g., robots or computers), our study adds a nuanced understanding by revealing that teachers attribute broader meanings to AI, including 'interactive machine technology' and 'systems mimicking human intelligence.' This difference suggests that the understanding of AI is evolving among educators, potentially indicating increased awareness of its broader implications in education.

Wollowski et al. (2016) carried out research with both artificial intelligence instructors and artificial intelligence practitioners to evaluate the concordance of current practice and teaching of artificial intelligence in tertiary education. However, this survey does not focus on the instructors' individual knowledge but rather examines their course concepts. They found that the instructed topics and the needs of artificial intelligence practitioners largely match. Both instructors and practitioners emphasize the importance of topics like search, knowledge representation, reasoning, and machine learning. Another research conducted by Lindner and Romeike (2019), for teachers, the subject of artificial intelligence seems to be linked with aspects of machine learning and typical application areas of artificial intelligence, such as language processing and data analysis. As seen in the studies, it is understood that artificial intelligence is associated with advanced technology and attributed with meanings related to mechanics or technology. This might show that teachers are often not aware of the full scope of the topic and the aspects forming the basic principles of artificial intelligence.

The analysis of teachers' perceptions of AI revealed that they predominantly view it as "advanced technology," encompassing interactive machine technology and systems that mimic human intelligence. Teachers also linked AI to an "educational model" that involves smart technologies, emphasizing its potential as an effective teaching tool. These findings resonate with previous studies (Köse et al., 2023) but also highlight the growing awareness of AI's broader implications in education, extending beyond mechanical or robotic associations.

2. Usability and Applicability of AI in Education

Research Question 2: How do teachers view the usability and applicability of AI in education?

When examining teachers' views on the usability or applicability of artificial

intelligence in education, within the theme of "positive views," it is found that more than half of the teachers stated that artificial intelligence would be beneficial in education, providing various opportunities and being feasible and usable. In addition, some teachers emphasized that artificial intelligence is an inevitable necessity in education and expressed that it should be used in the evolving world of the 21st century. However, some teachers also mentioned that artificial intelligence would be productive and beneficial if used in a controlled and limited manner. However, under the theme of "negative views," some teachers expressed concerns that artificial intelligence in education could be anxiety-inducing and might potentially replace teachers. Therefore, they emphasized that artificial intelligence could be used in education with necessary precautions taken. Similar to these findings, in a study on the use of artificial intelligence in education conducted by Demir et al. (2023), it was found that school principals and teachers regarded the use of artificial intelligence in education as an opportunity and believed that it would provide benefits in various fields. Köse et al. (2023) found that teachers had a positive attitude towards using artificial intelligence in education. They shared the view that artificial intelligence would facilitate teachers' work in educational processes and provide students with a more enjoyable environment for learning, leading to increased motivation and more lasting learning opportunities. Özer et al. (2023) stated that artificial intelligence has the potential to facilitate classroom management and student assessments for teachers, enabling them to process data more systematically and provide objective feedback. However, the study by Aktaş (2021) found that school administrators and teachers believe that artificial intelligence should be used carefully and attention should be paid to prevent it from acquiring features that could lead to the end of humanity. According to Rajest et al (2023), educators search for technological enhancements for teaching that would be safe, effective, and scalable. They rapidly search for artificial intelligence tools that are newly released in the market. Grammar checkers, sentence finishers, essay writers, voice assistants, ChatGPT, and chatbots are some of the most widely used technological aids in the classroom. Artificial intelligence's data analysis capabilities mean assisting teachers in tailoring lessons and assignments to each student's specific needs. Artificial intelligence can automate administrative duties like grading, allowing teachers more time to focus on student learning.

Teachers expressed both positive and negative views regarding AI's usability in education. More than half of the participants acknowledged AI as a valuable tool that can make education more personalized and effective. However, some cautioned that AI should be used with care to avoid potential issues such as teacher displacement or over-reliance on technology. These mixed opinions reflect the complex nature of AI integration into education and echo findings from Demir et al. (2023) and Özer et al. (2023).

3. Positive and Negative Effects of AI in Education

Research Question 3: What are the positive and negative effects of AI in education?

When examining teachers' views on the effects of artificial intelligence in education, it was stated that artificial intelligence would contribute to the physical, managerial, and technological development of the school, facilitate administrative tasks, reduce managerial workload, and contribute to the smooth running of programs in the school. It was indicated that artificial intelligence would enrich the instructional environment and ensure effective and efficient teaching, enable active participation in the instructional process, facilitate teaching processes, and enable efficient use of time. Additionally, it was stated that artificial intelligence would mainly enable objective assessment and also facilitate accurate and rapid analysis during the evaluation process. Artificial intelligence would save time for students to learn, contribute to their individual development, facilitate learning, ensure effective and lasting learning, increase interest and curiosity in learning, and make tasks and assignments easier. It would facilitate teachers' tasks and duties, save time, provide opportunities for more activities, and contribute to their professional development. However, teachers have also expressed that artificial intelligence could negatively affect education. In this context, some teachers have mentioned that artificial intelligence could reduce the need for human involvement in schools, which might lead to issues due to the lack of a human management approach. Moreover, some teachers have expressed concerns that artificial intelligence may reduce opportunities for hands-on learning, fail to provide a realistic learning environment, and potentially lead to communication problems in the teaching process. They indicated that it may be insufficient to measure affective characteristics.

Under the theme of "student," some teachers have expressed concerns that artificial intelligence may inadequately develop students' affective behaviors, lead to dependency and laziness, diminish research and information acquisition skills, result in misinformation, fail to instill values like conscience and tolerance, and even have a detrimental effect on socialization. Artificial intelligence may reduce the need for teachers and undermine research and self-improvement skills. Similar findings were reported in the study conducted by Özer et al. (2023), where the positive aspects of artificial intelligence-based education were highlighted, such as providing learning experiences tailored to students' learning styles and needs, recommending learning materials based on students' interests, and offering opportunities for students to identify and practice their weak areas. Additionally, it has been determined that artificial intelligence provides advantages such as creating a powerful and efficient learning environment, ensuring the correct and efficient use of technology, stimulating children's visual and sensory perceptions, enhancing visual perception, motivating

students with gamification and interactive learning features, continuously evolving and expanding in scope, enhancing students' advanced thinking skills, providing ideas and guidance related to researched topics, and enabling faster problem-solving. In another study conducted by Pekmez et al. (2024), participants emphasized the potential of artificial intelligence to enhance learning experiences, provide personalized learning opportunities for students, and ensure equality. However, some concerns have also been raised, such as the potential to foster laziness in students or hinder equal access due to socio-economic reasons. In the study conducted by Köse et al. (2023), some teachers approach using artificial intelligence in education with skepticism. They expressed concerns about the possibility of creating inequality among students due to the expensive nature of the technology, the inability to ensure the privacy of student and teacher data, and the risk of students becoming lazy due to excessive use of technology. It is understood by looking at the results of this study and other studies in the literature that artificial intelligence in education will have many positive effects. However, there may also be some adverse situations, and measures need to be taken for this.

The teachers identified both beneficial and harmful effects of AI. Positive effects include streamlining administrative tasks, enhancing teaching efficiency, and offering personalized learning experiences for students. On the negative side, concerns were raised about AI potentially diminishing human interaction in education, creating dependency among students, and limiting hands-on learning opportunities. These findings align with similar concerns expressed in the literature (Özer et al., 2023), suggesting a need for careful integration of AI to balance benefits with potential risks.

4. Application of AI at Different Stages of the Educational Process

Research Question 4: How can AI be utilized at different stages of the educational process?

Finally, when examining teachers' views on how artificial intelligence technologies can be used in education and what needs to be considered when using them, under the theme of "teaching process," it was stated that artificial intelligence could enrich the learning environment in instructional practices, support students' learning pace, facilitate information acquisition, access to resources, and research, and determine the student's learning needs to provide the necessary instruction and content. Under the "evaluation process" theme, it was also indicated that artificial intelligence could be used to conduct objective assessments, prevent copying (ensuring validity and reliability), identify learning deficiencies, and provide feedback. Similarly, Özer et al. (2023) found that the use of artificial intelligence can provide advantages such as creating personalised programs, speed and efficiency, ease of determining students' individual learning needs, reducing human errors, reducing risks, enhancing visual and auditory intelligence, facilitating understanding of the subject matter,

facilitating the tracking and evaluation of student's learning processes, and improving efficiency.

Pekmez et al. (2024) determined that there are impacts such as interactive learning opportunities, real-time feedback during the learning process, more opportunities for students to practice their weaknesses, making learning more enjoyable, enabling students to manage their learning process, and adding a new dimension to the assessment and evaluation process under the theme of the reflections of artificial intelligence on the learning process. Additionally, in the studies conducted by Holmes et al. (2019), Jones and McCoy (2018), Smith and Anderson (2019), and Özer et al. (2023), it has been emphasized that ethical and security issues are crucial in the use of AI-supported learning tools in education. It has been highlighted that attention should be paid to these issues, and teachers should be informed about them. A study by Xie and Reider (2020) stated that teachers need sufficient training and support to utilize artificial intelligence tools effectively. In the study conducted by Köse et al. (2023), it was determined that in the processes of utilising artificial intelligence in education, attention should be paid by educational planners to ensure equal opportunities in education, ensuring data privacy, providing regular training for teachers on this technology, ensuring fairness in the nationwide use of artificial intelligence, and preventing the overuse of artificial intelligence. While similar studies, such as Aktaş (2021), found that teachers primarily perceive AI in terms of mechanical structures (e.g., robots or computers), our study adds a nuanced understanding by revealing that teachers attribute broader meanings to AI, including 'interactive machine technology' and 'systems mimicking human intelligence.' This difference suggests that the understanding of AI is evolving among educators, potentially indicating increased awareness of its broader implications in education. The concerns about AI potentially reducing human involvement and fostering dependency among students, as reported in our study, mirror similar findings by Özer et al. (2023), who highlighted the potential risks to student autonomy and social development. These concerns resonate with broader debates in the literature about AI's ethical implications in education (Holmes et al., 2019; Jones & McCoy, 2018), which emphasize the need for careful, ethical considerations in AI integration. While our study contributes valuable insights into teachers' views on AI, it is important to acknowledge that the sample was limited to teachers from a specific region (Afyonkarahisar) and may not fully represent the diversity of perspectives found in other parts of Turkey or globally. Future studies should aim to incorporate a more diverse sample to better understand how geographical, cultural, and institutional contexts might influence teachers' perceptions of AI, as noted in the studies of Xie and Reider (2020) and Köse et al. (2023).

Teachers highlighted that AI could enhance the teaching and evaluation

processes by offering personalized learning experiences, supporting student assessments, and providing real-time feedback. AI could also help identify students' individual needs, tailor lesson plans accordingly, and improve the overall effectiveness of the learning process. However, it is essential to ensure data privacy, security, and ethical considerations when implementing AI tools, as emphasized by Holmes et al. (2019) and Xie and Reider (2020).

Our study contributes novel insights into teachers' perceptions of AI by revealing their concerns about the dehumanization of education, which has not been emphasized in much of the existing literature. This finding suggests that while AI is seen as a useful tool, educators are cautious about its broader implications for the teacher-student relationship. Additionally, our study underscores the importance of addressing the digital divide and teacher readiness in discussions of AI in education, ensuring that the technology benefits all students and teachers, not just those with privileged access.

Ethical and Practical Challenges

The Digital Divide

One of the major ethical challenges raised by our findings is the digital divide. Similar to the concerns expressed by Köse et al. (2023), teachers in our study were worried about the unequal access to AI technologies in different schools. AI has the potential to improve personalized learning, but if some students lack access to these tools, it could worsen educational inequalities. Policymakers and educational leaders must address these disparities to ensure equal access to AI-driven educational resources.

Teacher Readiness

Another challenge identified in both our study and previous research (Xie & Reider, 2020) is teacher readiness. While many teachers in our study saw the potential of AI, they expressed concern about their lack of training and the challenge of implementing AI effectively in classrooms. As AI becomes a more prominent part of education, teachers must receive professional development to ensure they can utilize AI tools competently and ethically.

Data Privacy and AI Bias

Ethical concerns regarding AI in education are also highlighted by the need to protect student data and ensure the fairness of AI systems. Teachers in our study expressed concern about the security of student data collected by AI tools and the potential for bias in AI algorithms. These issues align with the concerns raised by Holmes et al. (2019) and emphasize the importance of transparency, data protection, and algorithmic fairness in the development and deployment of AI in education.

CONCLUSION

In conclusion, teachers perceive artificial intelligence as an advanced technology capable of mimicking human intelligence and as a contemporary teaching model supported by smart technologies. While many view AI as beneficial and necessary in the 21st

century, some express concerns about its potential to induce anxiety and replace teachers, suggesting that its implementation should be approached with caution. There are several positive effects of AI, such as enhancing school operations, enriching instructional environments, enabling objective assessments, and facilitating tasks for both students and teachers. However, some potential drawbacks include reduced human involvement in schools, limited hands-on learning opportunities, and challenges in assessing affective characteristics. Overall, teachers believe that artificial intelligence technologies can enhance the teaching process by enriching the learning environment, supporting personalized instruction, aiding in objective assessments, and providing valuable feedback in the evaluation process.

This study offers a valuable contribution to the theoretical understanding of AI in education, particularly in relation to the Technology Acceptance Model and Constructivist Learning Theory. Teachers' perceptions provide insights into how technology is adopted in educational settings. That teachers' belief in AI's usefulness and ease of use directly influences their willingness to integrate it into their teaching practices aligns with the technology acceptance model (Marikyan & Papagiannidis, 2024). Additionally, the potential of AI to personalize learning and enrich instructional environments corresponds with the principles of constructivist learning theory, which emphasizes active, student-centered learning.

The recommendations made by participating teachers regarding the use of artificial intelligence in education emphasize that AI should not be implemented independently from teachers but should instead be used under teacher supervision, with necessary precautions, in a limited and controlled manner. Careful usage within ethical boundaries and without exceeding security limits must be observed. Teachers also believe that artificial intelligence cannot replace the role of the teacher, and as such, the mission of teaching should not be assigned to AI. Additionally, they recommend that AI should not be used in education at an early age, as values such as ethics, conscience, and respect should be instilled before introducing AI, which should be reserved for secondary or higher education. Furthermore, it is crucial to design professional development programs that not only introduce the basic concepts of artificial intelligence but also focus on its practical applications in the classroom, with these programs tailored to the specific needs of different subject areas and grade levels to ensure teachers can integrate AI effectively.

This study explored teachers' perceptions of artificial intelligence (AI) in education, revealing key insights that contribute to the ongoing discourse in the field. Teachers generally view AI as a powerful tool for enhancing education, but express concerns about its potential to replace human teachers or reduce hands-on learning. The findings highlight AI's positive effects, such as enriching the learning environment, facilitating personalized

instruction, and streamlining assessment processes. However, there are concerns about the over-reliance on technology and its impact on students' affective development. The unique contribution of this study lies in its identification of the dual role of AI in education: as both a supportive tool and a potential source of anxiety for educators. The teachers' suggestions emphasize the importance of AI integration under teacher supervision and within ethical boundaries.

Implications

In line with the study's findings and the teachers' recommendations, artificial intelligence is now indispensable in many fields. Therefore, necessary efforts should be made to move in this direction. Furthermore, it is recommended to emphasize the importance of producing suitable educational tools for artificial intelligence in education, raising awareness among teachers and all education stakeholders to enable effective utilization of these tools in the educational process, taking precautions for their careful use, adhering to ethical principles, and instilling these principles in students. Additionally, it is recommended to include research that examines the effects of artificial intelligence tools on success, attitudes, and motivation in education, as well as applied research that reveals how these tools can be used more effectively and efficiently. Educators should be actively involved in the selection and implementation of AI tools in the classroom. Teachers' feedback should guide the adoption of AI tools to ensure that the chosen technologies align with their teaching methods and the specific learning needs of their students. This collaboration between educators and AI developers can ensure that AI tools are user-friendly and pedagogically sound.

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Competing Interests

Authors have no financial or non-financial interest directly or indirectly related to the work submitted for publication. Authors agree to pay the publishing fee once the paper is accepted for publication in the journal.

Compliance with Ethical Standards

Ethical permission was obtained for the study from the Afyon Kocatepe University Social and Human Sciences Ethics Committee on 12.04.2023. (No:2023/145)

Disclosure of Potential Conflicts of Interest

The authors do not have any conflicts of interest to declare.

Research Involving Human Participants and/or Animals

There are people at work. Voluntary consent forms obtained from the participants are submitted to the relevant ethics committee while obtaining permission.

REFERENCES

Abuhassna, H., Awae, F., Adnan, M. A., Daud, M., & Almheiri, A. S. (2024). The information age for education via artificial intelligence and machine learning: A bibliometric and systematic literature analysis. *International Journal of Information and Education Technology, 14*(5), 700-711. https://doi.org/10.18178/ijiet.2024.14.5.2095

Afrianto, A. (2018). Being a professional teacher in the era of Industrial Revolution 4.0: Opportunities, challenges and Strategies for Innovative Classroom Practices. *English Language Teaching and Research, 2*(1), 1–13.

Aktaş, A. (2021, June). *Yönetici ve öğretmen görüşlerine göre yapay zekâ: bir metafor çalışması* [Artificial Intelligence from the perspectives of administrators and teachers: a metaphor study]. 1.Ulusal Eğitimde Yapay Zekâ Uygulamaları Kongresi Tam Metin Bildiri Kitapçığı, Turkey.

Annuš, N. (2024). Education in the Age of Artificial Intelligence. *TEM Journal, 13* (1), 404-413. https://doi.org/10.18421/TEM131-42

Baker, R. (2021). Artificial intelligence in education: Bringing it all together. In OECD, *OECD Digital education outlook 2021: Pushing the frontiers with AI, blockchain, and robots*. OECD Publishing. https://doi.org/10.1787/f54ea644-en

Bojorquez, H., & Vega, M. M. (May 2023). The importance of artificial intelligence in education for all students. *Intercultural Development Research Association. https://www.idra.org/resource-center/the-importance-of-artificial-intelligence-in-education-for-all-students/*

Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development.* Sage.

Braun, V., & Clarke, V. (2013). *Successful qualitative research: A practical guide for beginners.* Sage.

Burgard, W. (2022). Artificial intelligence key technologies and opportunities. In S. Voeneky, P. Kellmeyer, O. Mueller & W. Burgard (Eds.), The *Cambridge Handbook of Responsible Artificial Intelligence interdisciplinary perspectives*. Cambridge University Press.

Büyüköztürk, Ş., Kılıç-Çakmak E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2010). *Bilimsel araştırma yöntemleri* [Scientific research methods]. Ankara: Pegem Akademi. https://doi.org/10.14527/9789944919289

Demir, M., & Demir, Ş. Ş. (2023). Reflection of artificial intelligence applications on students' critical and analytical abilities. *InterConf*, Article 184, 459–467.

Edwards, B. I., Chinedu, C. C., Klufallah, M., Tanko, B. L., Abuhassna, H. (2024). Unveiling possibilities: challenges, opportunities, and ımplications of human–machine learning in transformative educational spaces*.* In Edwards, B.I., Tanko, B.L., Klufallah, M., Abuhassna, H., Chinedu, C.C. (Eds), *Reimagining transformative educational spaces.* Lecture Notes in Educational Technology. https://doi.org/10.1007/978-981-97-8752-4_1

Fahimirad, M., & Kotamjani, S. S. (2018). A review on application of artificial intelligence in teaching and learning in educational contexts. *International Journal of Learning and Development, 8*(4), 106-118. https://doi.org/10.5296/ijld.v8i4.14057

Gocen, A., & Aydemir, F. (2020). Artificial intelligence in education ans schools. *Research on Education and Media, 12*(1), 13-21. https://doi.org/10.2478/rem-2020-003

Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education promises and implications for teaching and learning.* Center for Curriculum Redesign.

Hwang, G., Xie, H., Wah, B. W., & Gašević, D. (2020). Vision, challenges, roles and research issues of

artificial intelligence in education. *Computers & Education: Artificial Intelligence, 1,* 100-110. https://doi.org/10.1016/j.caeai.2020.100001

Jones, R. L., & McCoy, J. P. (2018). The ethics of artificial intelligence in education: Considerations for teaching practice. *Journal of Educational Technology, 15*(3), 456–467.

Köse, B., Radıf, H., Uyar, B., Baysal, İ., & Demirci, N. (2023). Öğretmen görüşlerine göre eğitimde yapay zekanın önemi [Teachers' Perspectives on the Importance of Artificial Intelligence in Education]. *Journal of Social, Humanities and Administrative Sciences, 9*(71), 4203-4209. DOI: https://doi.org/10.29228/JOSH AS.74125

Lindner, A., Romeike, R., Jasute, E., & Pozdniakov, S. (2019). *Teachers' perspectives on artificial intelligence*, In 12th International conference on informatics in schools: Situation, evaluation and perspectives (pp. 22-29), ISSEP.

Lufeng, H. (2018). Analysis of new advances in the application of artificial intelligence to education. advances in social science. *Education and Humanities, 220,* 608–611.

McCarthy, J. (2007, November 12). *What is artificial intelligence?* (Revised). Stanford University. http://www-formal.stanford.edu/jmc/whatisai.pdf

Marikyan, D., & Papagiannidis, S. (2024), Technology Acceptance Model: A review. In S. Papagiannidis (Ed), *TheoryHub Book*. Online: Edition.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: an expanded sourcebook.* Sage Publications.

Mureşan, M. (2023). Impact of artificial intelligence on education. *Research association for association for interdisciplinar studies studies, 8*(9), 82–85. https://doi.org/10.5281/zenodo.8132828

Özer, S., Sancar Yazıcı, A., Akgül, S., & Yıldırım, A. (2023). Okullarda yapay zekâ kullanımına ilişkin öğretmen görüşleri [Teachers' Views on the Use of Artificial Intelligence in Schools]. *Ulusal Eğitim Dergisi*, *3*(10), 1776–1794.

Patton. M. Q. (*2002*). *Qualitative research and evaluation methods (3rd ed.).* Sage Publications.

Pekmez, S., Coşkun Çoban, T., Kılıç, M., & Duman, Y. M. (2024). Eğitimde yapay zekâ teknolojilerinin kullanımına yönelik öğretmen görüşleri [Teachers' Views on the Use of Artificial Intelligence Technologies in Education]. *Ulusal Eğitim Dergisi, 4*(2), 601–619.

Rajest, S. S., Regin, S., Ajitha, Y., Paramasivan, P., Christabel, G., & Shynu, T. (2023). The analysis of how artificial ıntelligence has an effect on teachers and the education system. *EAI Endorsed Transactionson e-Learning, 9*. https://doi.org/10.4108/eetel.3494

Samsul, S.A., Yahaya, N., & Abuhassna, H. (2023). Education big data and learning analytics: a bibliometric analysis. *Humanities and Social Sciences Communications, 10,* Article 709. https://doi.org/10.1057/s41599-023-02176-x

Ciklum India. (2021, November 10). *AI is a way of making computer-controlled robots or software think intelligently in a similar manner the intelligent humans think?* [Image attached] [Post]. LinkedIn. https://www.linkedin.com/pulse/ai-way-making-computer-controlled-robots-software-think-

Smith, A., & Anderson, J. (2019). Teacher perspectives on AI in the classroom: Promoting data privacy and security. *Teaching and Teacher Education,* 43, 113–120.

VanLehn, K. (2011). The relative effectiveness of human tutoring, intelligent tutoring systems, and other tutoring systems. *Educational Psychologist, 46*(*4),* 197-221. https://doi.org/10.1080/00461520.2011.611369

Xie, Y., & Reider, D. (2020). Preparing teachers to use artificial intelligence: A study of teacher

education programs. *Journal of Teacher Education, 71*(4), 475-490.

Wollowski, M., Selkowitz, R., Brown, L.E., Goel, A., Luger, G., Marshall, J., Neel, A., Neller, T., & Norvig, P. (2016). *A survey of current practice and teaching of AI. Proceedings of the AAAI Conference on Artificial Intelligence, 30*(1), 4119-4125. https://doi.org/10.1609/aaai.v30i1.9857

Yıldırım, A., & Şimşek, H. (2018). *Sosyal bilimlerde nitel araştırma yöntemleri* [Qualitative research methods in social sciences]. (6. baskı). Ankara: Seçkin.