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Research Article

Social Studies Teacher Candidates' Perceptions of the Concept of Artificial Intelligence: A Metaphor Analysis

Sosyal Bilgiler Öğretmen Adaylarının Yapay Zekâ Kavramına İlişkin Algıları: Metafor Analizi

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Abstract

Purpose: *This study aims to examine the perceptions of social studies teacher candidates regarding the concept of artificial intelligence through the metaphors they generate. By revealing teacher candidates' mental representations of artificial intelligence, the study seeks to contribute to a better understanding of their perceptions and to provide an original perspective for teacher education and the literature.* ***Method:*** *A qualitative research approach based on a phenomenological design was employed. The study group consisted of 128 social studies teacher candidates enrolled at a public university in Türkiye during the fall semester of the 2025–2026 academic year. Participants were selected on a voluntary basis using convenience sampling. Data were collected through a form including personal information questions and the prompt, "Artificial intelligence is like ... because ...." The metaphors produced by the participants constituted the primary data source and were analyzed using qualitative content analysis.* ***Findings****: Social studies teacher candidates generated a total of 82 valid metaphors related to artificial intelligence. These metaphors were classified into 16 categories and organized under 3 overarching themes. The most frequently generated metaphors were brain, robot, teacher, library, and human, indicating that participants associated artificial intelligence with concepts related to knowledge, cognition, guidance, technology, and human characteristics.* ***Conclusion:*** *The findings suggest that social studies teacher candidates have multidimensional perceptions of artificial intelligence. These results contribute to the literature by providing insights into teacher candidates' conceptualizations of artificial intelligence and may inform education practices.*

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Anahtar Kelimeler

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Öz

Amaç: *Bu çalışmanın amacı, sosyal bilgiler öğretmen adaylarının yapay zekâ kavramına ilişkin algılarını geliştirdikleri metaforlar aracılığıyla incelemektir. Öğretmen adaylarının yapay zekâya ilişkin zihinsel temsillerini ortaya koyarak, onların algılarının daha iyi anlaşılmasına katkı sağlamak ve öğretmen eğitimi ile alanyazına özgün bir bakış açısı sunmak amaçlanmıştır.* ***Yöntem:*** *Bu çalışmada olgubilim desenine dayalı nitel bir araştırma yaklaşımı benimsenmiştir. Araştırmanın çalışma grubunu, 2025–2026 eğitim-öğretim yılı güz döneminde Türkiye'de bir devlet üniversitesinde öğrenim gören 128 sosyal bilgiler öğretmen adayı oluşturmaktadır. Katılımcılar, kolay ulaşılabilir örnekleme yöntemi kullanılarak gönüllülük esasına göre seçilmiştir. Veriler, kişisel bilgi sorularını ve "Yapay zekâ ... gibidir; çünkü ..." ifadesini içeren bir form aracılığıyla toplanmıştır. Katılımcılar tarafından üretilen metaforlar araştırmanın temel veri kaynağını oluşturmuş ve nitel içerik analizi ile analiz edilmiştir.* ***Bulgular:*** *Sosyal bilgiler öğretmen adayları yapay zekâya ilişkin toplam 82 geçerli metafor üretmiştir. Bu metaforlar 16 kategori altında sınıflandırılmış ve 3 üst tema altında düzenlenmiştir. En sık üretilen metaforlar beyin, robot, öğretmen, kütüphane ve insan olmuştur. Bu durum, katılımcıların yapay zekâyı bilgi, biliş, rehberlik, teknoloji ve insan özellikleriyle ilişkili kavramlarla bağdaştırdıklarını göstermektedir.* ***Sonuç:*** *Bulgular, sosyal bilgiler öğretmen adaylarının yapay zekâya ilişkin çok boyutlu algılara sahip olduklarını göstermektedir. Bu sonuçlar, öğretmen adaylarının yapay zekâya ilişkin kavramsallaştırmalarına yönelik içgörüler sunarak alanyazına katkı sağlamakta ve öğretmen eğitimi uygulamalarına yön verebilecek niteliktedir.*

Introduction

Advancements in science and technology have profoundly shaped the transformation of societies. Social development can be understood more holistically when examined through the historical milestones that mark turning points in science and technology. The first of these milestones was the transition to agricultural society approximately ten thousand years ago, the second was the Industrial Revolution at the end of the 18th century, and the most recent is the information society that emerged with the digital age (as cited in Toffler, 2018; Fidan & Debbağ, 2023). Indeed, the developments of the 21st century—defined by terms such as the information society and the digital age—have influenced societies in many domains, leading humanity into a rapid process of change (Başçı Namlı & Kayaalp, 2024). This process has given rise to successive technological revolutions, each laying the foundation for the next, though not always occurring in the same order or at the same pace across contexts. These revolutions include: 1.0, the beginning of agricultural activities; 2.0, the society model based on agriculture; 3.0, the industrial society; 4.0, the information society characterized by the production of digital work and services; and 5.0, the new era that strengthens the relationship between technology and human beings. In this context, technologies such as artificial intelligence, unmanned aerial vehicles, robots, the Internet of Things, automation, big data, and cloud

computing are regarded as the most significant components of the 5.0 technological revolution (Biçer, 2023; Bozdağ Tulum, 2025).

Artificial intelligence has been defined as a field of science, technology, and engineering that seeks to model the functioning of the human brain (Buchanan, 2005); systems that interpret external data, learn, and use this learning through adaptation to achieve a specific goal or task (Kaplan & Haenlein, 2019); intelligence-related behaviors demonstrated by machines (Obschonka & Audretsch, 2020); a continually evolving boundary of emerging computational capabilities (Berente et al., 2021); the use of a set of computer programs to simulate intelligent behavior with minimal human intervention (Tuvay & Ermetin, 2023); and a form of technology in which certain human-created features are processed, subsequently advanced through learning, and presented for human use (Güzey et al., 2023). Despite the variety of definitions, two central concepts stand out in the characterization of artificial intelligence: "intelligent programming" and "human-like responses" (Arslan, 2020). In particular, for artificial intelligence to effectively reflect human-like responses, it employs mathematical elements such as logic, probability, and statistics, while also drawing upon cognitive disciplines such as perception, interpretation, and learning (Artut, 2019).

Although research on the history and philosophy of artificial intelligence dates back centuries, practical applications have intensified only in recent years and continue to accelerate (Alanoğlu & Karabatak, 2020, p. 178). The first person to introduce the idea of artificial intelligence was the renowned British logician and mathematician Alan Turing. In 1950, Turing published an article entitled "Computing Machinery and Intelligence" in the philosophy journal Mind. In this article, Turing posed the question "Can machines think?" and opened it to philosophical debate, rejecting objections raised against the claim that machines could indeed think (Pirim, 2006). Approximately six years later, in 1956, the term artificial intelligence was formally introduced as scientific terminology through the "Dartmouth Summer Research Project on Artificial Intelligence" an eight-week workshop held at Dartmouth College in New Hampshire by Marvin Minsky, John McCarthy, Claude Shannon, and Nathan Rochester (Arinez et al., 2020; Haenlein & Kaplan, 2019). Another significant milestone in the development of artificial intelligence was IBM's computer "Deep Blue" defeating world chess champion Garry Kasparov in 1997, IBM's AI system "Watson" surpassing its competitors in the television quiz show Jeopardy! in 2011, and Google's AI program defeating the European champion in the game of Go in 2016. These events transformed public perceptions of artificial intelligence. Since then, the primary aim of AI has been to imitate and enhance human intelligence, thereby achieving substantial progress in this field. Indeed, from its inception, artificial intelligence has carried forward questions such as "What is intelligence?", "What is artificial intelligence?", and "Can machines think?" into contemporary debates, and it is expected to continue advancing further in the future (Biçer, 2023; Shi & Zheng, 2006; Vatansever, 2024).

Artificial intelligence has become a driving force in critical fields like the economy, healthcare, and education, enhancing the convenience of daily living. In the field of education, the integration of artificial intelligence provides a wide range of opportunities for innovation and improvement. With the advancement of technology, AI has been utilized in various fields and has contributed to the innovative and contemporary structuring of education. For example, it enables the preparation of content, teaching techniques, and assessment processes that consider students' needs, as well as the creation of interactive learning environments. Moreover, AI in education allows for the development of learning settings aimed at improving the lives of students with special needs. In this way, students can learn at their own pace, ensuring effective and lasting learning outcomes throughout their educational processes (Ağmaz & Ergüleç, 2024; Akduman & Öztürk, 2025; Chassignol et al., 2018; Drigas & Ioannidou, 2012; İşler & Kılıç, 2021; Luckin & Holmes 2016). The use of artificial intelligence in education has had significant impacts such as global learning, personalized learning, smarter content, and increased efficiency and effectiveness in educational management (Chen et al., 2020). Artificial intelligence can be said to help students improve their educational attainment and assist teachers in addressing specific problem areas for each student (Osetskyi et al., 2020). In addition, the rapid development of artificial intelligence has brought not only opportunities but also concerns. This anxiety stems from the feelings of worry experienced by students during their interactions with AI. While moderate levels of anxiety may enhance students' participation and motivation, excessive anxiety reduces their interest in learning and diminishes their self-efficacy (Chai & Sha, 2025). Therefore, it is expected that AI anxiety will affect both intrinsic and extrinsic learning motivations. When students experience anxiety regarding AI learning, they become less motivated to learn and fail to perceive the benefits and enjoyment of AI-based learning (Wang et al., 2024). Therefore, in order to effectively reflect these opportunities and concerns in education, it is essential that prospective teachers first develop an understanding of artificial intelligence. As Ağmaz and Ergüleç (2024) emphasize, it is important to determine how teacher candidates perceive AI applications, which will continue to emerge in different forms in the future. Therefore, for artificial intelligence to be used as intended, raising awareness and enhancing knowledge and skill levels regarding AI tools and applications is of critical importance. In this context, various methods are employed to identify the effects of innovations and technological developments in education. In the field of educational research, metaphor analysis serves as an important methodological tool (Eriçok et al., 2024). Metaphor is a tool that employs different analogies to express how individuals perceive life, the environment, situations, and objects (Cerit, 2008), and it represents a way of thinking and seeing (Çelikten, 2006). It has been emphasized that metaphors play a fundamental role in shaping our interactions with the world and serve as an important element for understanding new domains (Weller, 2022). The approach to the opportunities and concerns of artificial intelligence can also be reflected in the metaphors produced by prospective teachers. In this context, metaphors provide insights into perceptions of AI, which has become central to our lives, thereby enabling a deeper understanding of this concept.

Studies have been conducted to identify elementary school students' perceptions of the concept of artificial intelligence (Hava et al., 2025; Kalemkuş & Kalemkuş, 2025; Saçan et al., 2022), to determine middle school students' perceptions of artificial intelligence (Demir & Güraksın, 2022; Tartuk, 2023; Yüzbaşıoğlu et al., 2025), to examine high school students' perceptions of the concept of artificial intelligence (Akbay & Yıldırır, 2024; Arslantaş & Ataş, 2024), and to identify university students' perceptions of artificial intelligence (Altuntaş & Karabay, 2024; Sezer, 2024; Uçkun & Konak, 2023; Vatansever, 2024; Yan et al., 2024). There are also metaphor studies addressing the perceptions of educational stakeholders regarding the concept of artificial intelligence. Research has been conducted on teachers' metaphorical perceptions of the concept (Balıkçı et al., 2024; Demir Dülger & Gümüşeli, 2023; Lim, 2024; Kılıç, 2025). In addition, metaphorical studies have examined academics' perceptions of artificial intelligence (Dilek & Dilekçi, 2025). Furthermore, studies have investigated teacher candidates' perceptions of artificial intelligence across different departments (Ağmaz & Ergüleç, 2024; Erdoğan & Bozkurt, 2023; Eriçok et al., 2024; Gölbaşı & Okul, 2024; Savaşkan & Özer, 2024; Sayın & Orbay, 2025; Turan, 2024).

Research in the literature shows that the concept of artificial intelligence has been examined across different educational levels—including students, teachers, academics, and teacher candidates—and metaphor analyses have revealed its perceived meanings. In particular, teacher candidates' skills in using technology and their willingness to employ it are of great importance (Başçı Namlı & Kayaalp, 2024). With the widespread use of technologies in the digital age, various knowledge and skills are required for effective performance in digital environments (Yıldırım & Öztürk, 2023). Indeed, as the role of artificial intelligence in educational settings increases, teachers need to acquire new skills to be used in these environments and to utilize AI effectively. This situation may lead to attitudes, concerns, and anxieties among teachers and prospective teachers (Çelebi et al., 2025). In this context, determining how artificial intelligence is perceived, which is increasingly becoming central not only to social life in general but also to the field of education, is of great importance. Specifically, identifying prospective teachers' perceptions of the concept of AI is considered significant in terms of understanding how they will utilize AI in their professional careers and providing insights into the future. In this way, epistemological beliefs, opportunities, and concerns regarding artificial intelligence will be revealed in a multidimensional manner. Specifically, identifying the awareness of prospective social studies teachers on this issue is considered to contribute both to digital citizenship and to their perspectives on educational technologies. Therefore, the study will highlight the needs of prospective teachers regarding AI and provide input for the content and pedagogical strategies of teacher education programs. Accordingly, the aim of this study is to determine, through metaphors, the perceptions of social studies teacher candidates regarding the concept of artificial intelligence, as they are expected to implement AI technologies effectively in classroom settings soon. In line with the stated purpose, the study sought to answer the following questions: "What metaphors do prospective social studies teachers produce regarding artificial

intelligence?" and "What are the reasons behind the metaphors produced by prospective social studies teachers regarding artificial intelligence?"

Methodology

Research Design

This study was designed using the phenomenological pattern, one of the qualitative research methods. The phenomenological design focuses on phenomena that are recognized but not deeply or thoroughly understood. Such phenomena may appear in various forms, including events, experiences, perceptions, orientations, concepts, and situations. Phenomenology is employed in studies that aim to investigate phenomena that are not entirely unfamiliar, yet whose meanings are not fully comprehended (Yıldırım & Şimşek, 2021, p. 66). Phenomenological research aims to uncover the essence of individuals' experiences with a phenomenon and the interpretations they construct. In this way, the subjective aspects of individuals' behaviors can be revealed, contributing to an understanding of how a phenomenon or concept gains meaning in their world (Bogdan & Biklen, 2003; Creswell & Poth, 2018). In this study, phenomenology was deemed appropriate for exploring social studies teacher candidates' perceptions of the concept of "artificial intelligence" through metaphors. Accordingly, this study was designed with a phenomenological research pattern to reveal, through metaphors, the perceptions of prospective social studies teachers regarding the concept of "artificial intelligence," which has increasingly become a part of everyday life.

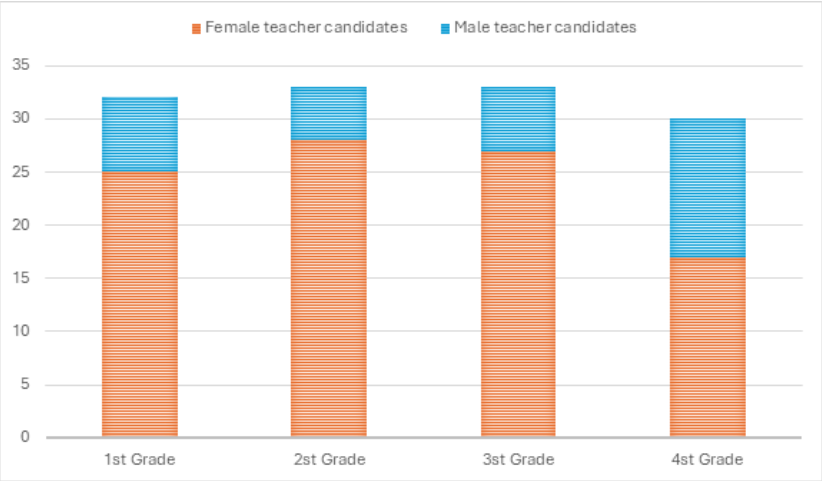
Study Group

The study group of this research, which aimed to identify metaphorical perceptions of artificial intelligence, consisted of undergraduate students enrolled in the Social Studies Teacher Education program (1st, 2nd, 3rd, and 4th years) at the Faculty of Education of a public university in Turkey during the fall semester of the 2025–2026 academic year. The study group was determined using convenience sampling, one of the purposive sampling methods. Convenience sampling provides speed and practicality to research by selecting individuals who are close to and easily accessible to the researcher (Patton, 2018; Yıldırım & Şimşek, 2021). Through the use of convenience sampling, the study was facilitated by enabling researchers to access participants who were readily available and suitable for the purpose of the research, thereby making the data collection process more practical and efficient.

A total of 134 teacher candidates participated in the study. However, the metaphor sentences of six teacher candidates were excluded from the data analysis due to being invalid (such as lack of justification, irrelevant analogies, or misinterpretations). In phenomenological studies, the sample size may vary depending on the phenomenon under investigation and the number of individuals who have experienced it (Ersoy, 2019). Since metaphor studies are predominantly qualitative in nature, data saturation and

thematic diversity are considered more important than quantity; therefore, the participation of 128 teacher candidates was deemed sufficient. Information regarding the participants' gender and grade levels is presented below.

Figure 1: *Information on participants' gender and grade levels*



As shown in Figure 1, a total of 128 social studies teacher candidates participated in the study. Among the first-year students, 25 were female and 7 were male; among the second-year students, 28 were female and 5 were male; among the third-year students, 27 were female and 6 were male; and among the fourth-year students, 17 were female and 13 were male.

Data Collection

The data of the study were collected using a form prepared by the researchers. This form included questions regarding personal information (gender and grade level) as well as a sentence completion task: "Artificial intelligence is like … because …." The purpose of this form was to reveal the meanings teacher candidates attribute to the concept of artificial intelligence. Specifically, the word "like" was used to identify the relationship between the subject of the metaphor (artificial intelligence) and its source, while the word "because" was employed to determine the logical reasoning underlying the metaphor.

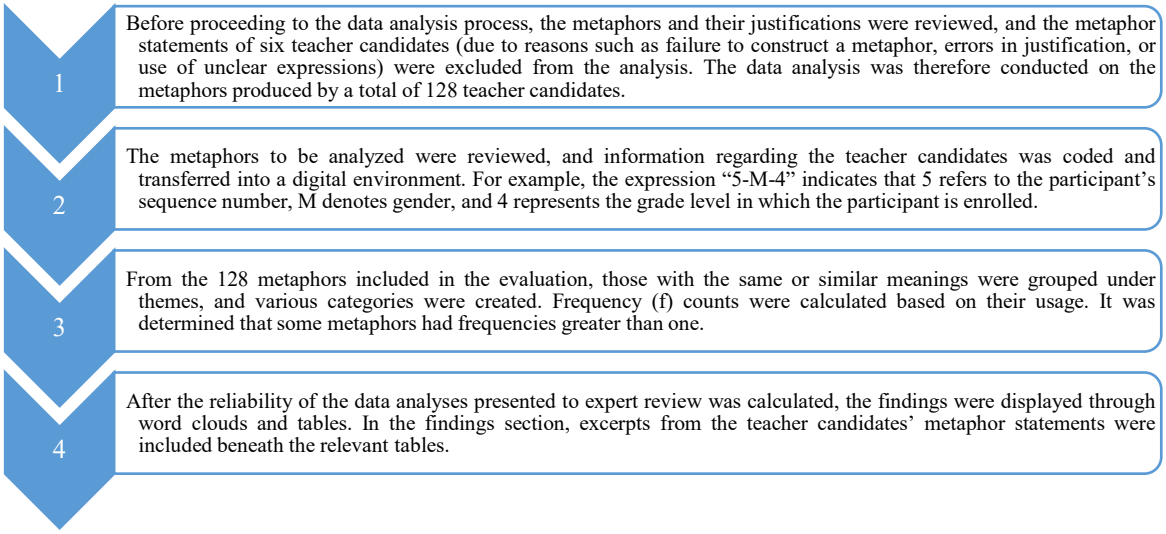
Data Analysis

Before collecting the data, a pilot study was conducted with four social studies teacher candidates enrolled in different grade levels at another public university who were not included in the study group, in order to test the comprehensibility of the metaphor form. In the preliminary application, deficiencies in metaphor constructions (structural shortcomings in both the analogy and justification parts) were identified. Accordingly, before collecting the actual data, the researchers presented an example of metaphor construction based on a different concept. After informing the teacher candidates in their classrooms about the purpose of the study and the sample metaphor, the form containing

the metaphor task and demographic questions was distributed by the researchers. Fifteen minutes were allotted for completing the form. The data of the study were collected between 13.11.2025- 20.11.2025.

In phenomenological research designs, data analysis is directed toward uncovering the meanings associated with the phenomenon under study. The research data were processed and interpreted using content analysis techniques. Content analysis aims to reduce and interpret qualitative data by identifying fundamental consistencies and meanings (Patton, 2014: 453). In the analysis of the data, the stages proposed by Corbin & Strauss (2007) were followed, as presented below.

Figure 2: *Data analysis process*



Validity and Reliability of the Research

To examine the consistency of the themes and associated categories created during the data analysis, expert opinions were sought. In order to ensure the reliability of data analysis, the opinions of two different experts (one specialized in measurement and evaluation, and the other in social studies education) were obtained. Using Miles & Huberman's (1994) reliability formula [Reliability = Agreement / (Agreement + Disagreement) × 100], the reliability rate was calculated as 85%. Since this rate is above 70%, the results obtained can be considered reliable. Data with consensus (85%) was directly included in the evaluation, while data without consensus (15%) was resolved through discussions and agreements among the experts. The research report was presented by the researchers with detailed descriptions. Furthermore, to ensure the verifiability of the data, direct quotations from teacher candidates' metaphor statements were included in the findings section in a way that does not reveal their identities.

Research Ethics

As the authors of the article, we declare in this form that scientific and ethical rules are followed in this article. Ethical approval for this research was obtained from the Bartın

University Social and Human Sciences Ethics Committee, numbered as 2025-SBB-0979, dated November 12, 2025.

Findings

As a result of the analysis of the metaphors developed by social studies teacher candidates regarding the concept of artificial intelligence, the metaphors produced are presented in Table 1 and as a word cloud in Figure3.

Table 1: *Metaphors Produced Regarding the Concept of Artificial Intelligence*

Serial Nu.	Metaphors	f	Serial Nu.	Metaphors	*f*
1	Brain	9	42	Rose	1
2	Robot	7	43	Sun	1
3	Library	6	44	Ghost	1
4	Teacher	6	45	Life	1
5	Human	5	46	Air	1
6	Encyclopedia	4	47	Tornado	1
7	Mirror	4	48	Teleportation	1
8	Book	3	49	Humanity	1
9	Slave	3	50	Pen	1
10	Water	3	51	Heart	1
11	Friend	2	52	Woman	1
12	Knife	2	53	Snowball	1
13	Light	2	54	Black Hole	1
14	Machine	2	55	Stopwatch	1
15	Ocean	2	56	Piggy Bank	1
16	New World	2	57	Glob	1
17	Tree	1	58	Labyrinth	1
18	Mind Coach	1	59	Mathematics	1
19	Lion	1	60	Matryoshka Doll	1
20	Mother	1	61	Season	1
21	Assistant	1	62	Pomegranate	1
22	Atomic Particle	1	63	School	1
23	Cook	1	64	Toy	1
24	Addiction	1	65	Student	1
25	Bomb	1	66	Spider	1
26	Void	1	67	Rubber Band	1
27	Chameleon	1	68	Psychologist	1
28	Iceberg	1	69	Compass	1
29	Translator	1	70	Radar	1
30	Child	1	71	Magician	1
31	Environment	1	72	Magic Wand	1
32	World	1	73	Magic Box	1
33	Electricity	1	74	Streetlight	1
34	Available	1	75	Sponge	1
35	Universe	1	76	Copycat	1
36	Evolution	1	77	Recipe	1
37	Men	1	78	Rain	1
38	Insightful	1	79	Supporter	1
39	Mystery	1	80	Star	1
40	Rainbow	1	81	Road	1
41	Sky	1	82	Time	1

Upon examining Table 1, it was found that social studies teacher candidates generated a total of 82 different metaphors, with the overall number of metaphors produced being 128. It is observed that the candidates generally associated the concept of artificial intelligence with technology, education, knowledge, and skills. Among the 128

metaphors, the most frequently repeated ones ranged between 2 and 8 occurrences, while the others appeared only once.

The analysis revealed that the most used metaphors for artificial intelligence were brain (f=9), robot (f=7), teacher (f=6), library (f=6), and human (f=5). The predominance of the "brain" metaphor can be interpreted as reflecting the candidates' tendency to associate artificial intelligence with thinking, reasoning, and human-like qualities. When the justifications for the most preferred metaphors were examined, it was found that they shared common references to education, school life, and everyday needs.

Figure 3: *Word cloud of metaphors produced regarding the concept of artificial intelligence*



When the justifictions for the mtaphors developed by social studies teacher candidates concerning the concept of artificial intelligence are examined, the categories emerging under the theme of "Technological Characteristics" are presented in Table 2.

Table 2: *Metaphors Produced in the Context of Technological Quality*

Theme	Categories	Metaphors	*f*
Technological Characteristics	Human-like interaction	Brain	9
		Human	5
		Friend/Companion	2
		Robot	2
		Heart	1
		Psychologist	1
		Mother	1
		Lion	1
		Male	1
	Creativity	Magic wand	1
		Magic box	1
		Magician	1
		Recipe	1
		Woman	1
	Harmful effect	Addiction	1
		Spider	1
		Rose	1
	Data flow	Rain	1
		Radar	1
		Electricity	1
		Sponge	1

	Stopwatch	1
Obedience	Robot	4
	Slave	3
Variability	New word	2
	Chameleon	1
	Season	1
	Time	1
	Tree	1
Digital assistant	Available personnel	1
	Assistant	1
	Translator	1
	Assistant	1
	Informant	1

Upon examining Table 2, it is seen that the metaphors developed by social studies teacher candidates regarding the concept of artificial intelligence fall under the theme of "Technological Characteristics", comprising a total of 54 metaphors across 7 different categories. The category with the highest number of metaphors is human-like interaction.

In this category, where teacher candidates perceive Artificial Intelligence (AI) as resembling human interaction, participants produced 23 metaphors using 9 different metaphorical expressions. These metaphors emphasize the strong aspects of artificial intelligence when compared to humans. The category is characterized by metaphors such as the following illustrative examples.

5-M-4. "AI is like the human brain because it answers every question."
84-F-2. "AI is like mothers because they help with everything."
82-M-2. "AI is like the most advanced version of the human brain because it can do things beyond the capacity of human intellect."

The metaphors of prospective teachers who perceive artificial intelligence as human-like interaction tend to define AI as the human mind or the most advanced version of the human brain, and to associate it with human behaviors. The metaphors developed in this category suggest that prospective teachers position AI both as a technology that imitates human cognitive functions and as one that surpasses human capacity, thereby reflecting a duality in their perceptions.

In the category where teacher candidates perceive artificial intelligence in terms of creativity, participants produced a total of 5 metaphors using 5 different metaphorical expressions. These metaphors highlight the positive aspects of AI in relation to problem-solving and versatility. Some examples of metaphors created in this category are as follows:

18-M-4. "AI is like a magic box because different things can always emerge."
22-F-4. "AI is like a magician because it offers solutions when we struggle."
68-M-2. "AI is like a woman because it has multiple perspectives."

Prospective teachers who perceive artificial intelligence as creativity regard it not merely as a system that processes information, but as a creative force capable of offering solutions in complex situations, adapting to different contexts, and presenting diverse

perspectives. The metaphors developed in this category emphasize AI as a distinctive, problem-solving, and supportive element.

In this category, which includes the metaphors of prospective teachers who perceive artificial intelligence as a harmful effect, participants developed a total of three metaphors through three different expressions. These metaphors indicate that AI is perceived as spreading invisibly and effectively, while being considered in terms of its harmful aspects. Some examples of the metaphors developed in this category are as follows:

8-M-4. "AI is like addiction because it makes people lazy."
12-F-4. "AI is like a spider because it gradually weaves a strong web and poisons people."
41-F-3. "AI is like a rose because although it is beautiful, it also has thorns."

Prospective teachers who perceive artificial intelligence as a harmful effect emphasize the aspects of technology that spread invisibly and may lead to negative consequences in the long term. The metaphors developed in this category characterize AI as a force that can weaken human will and cause adverse outcomes. Therefore, perceptions of potential risks associated with AI are prominent in this category.

In this category, which includes the metaphors of prospective teachers who perceive artificial intelligence as data flow, participants developed a total of five metaphors through five different expressions. These metaphors indicate that AI is perceived in terms of its ability to process and present a large amount of information within a very short time. Some examples of the metaphors developed in this category are as follows:

10-M-4. "AI is like rain because information flows continuously."
24-M-4. "AI is like radar because it scans everything."
119-F-1. "AI is like a stopwatch because it transfers a large amount of information within seconds."

When the metaphors of teacher candidates who perceive artificial intelligence in terms of data flow are examined, AI is seen as a tool that saves time, is dynamic and productive, and reveals hidden information. Emphasis is placed on the capacity of artificial intelligence to process and present a large amount of information within a short period of time.

In this category where teacher candidates perceive artificial intelligence in terms of obedience, participants produced a total of 7 metaphors using 2 different metaphorical expressions. These metaphors highlight the characteristics of AI as a system that operates in an orderly and systematic manner but remains dependent on human commands and guidance. The category is characterized by metaphors such as the following illustrative examples.

11-F-4. "AI is like a slave because it is constantly expected to do something."
43-F-3. "AI is like a robot because it instantly executes our commands."
80-F-2. "AI is like a robot because it works systematically and depends on humans."

When the metaphors of teacher candidates who perceive artificial intelligence as obedience are examined, AI is understood as a system that responds quickly and directly, serving unquestioningly. Conceptually, artificial intelligence is positioned as a tool that gains functionality solely through human commands and lacks autonomy.

In this category where teacher candidates perceive artificial intelligence in terms of variability, participants produced a total of 6 metaphors using 5 different metaphorical expressions. These metaphors emphasize AI as a technology that transforms over time and assumes different functions in different periods. The category is characterized by metaphors such as the following illustrative examples.

122-M-1. "AI is like time because it constantly changes and develops."
125-M-1. "AI intelligence is like seasons because there is continuous change."
17-M-4. "AI intelligence is like a chameleon because it changes according to its environment."

When the metaphors of teacher candidates who perceive artificial intelligence as variability are examined, AI is seen not as static but as a tool that evolves over time, adapting to circumstances. Therefore, the development process of artificial intelligence is evaluated as being in an inevitable state of change by associating it with natural cycles.

In this category where teacher candidates perceive artificial intelligence as a digital assistant, participants produced a total of 5 metaphors using 5 different metaphorical expressions. These metaphors emphasize AI as a supporter of creative processes and a solution-oriented tool. The category is characterized by metaphors such as the following illustrative examples.

62-F-3. "AI is like an assistant because it tells everything."
64-F-3. "AI is like an idea provider because it generates new and different ideas."
72-F-2. "AI is like a supporting staff because it helps us in areas where we struggle."

When the metaphors of teacher candidates who perceive artificial intelligence as digital creativity are examined, AI is seen as a tool that provides quick and direct access to information. In this category, the metaphors developed highlight perceptions regarding the potential benefits of artificial intelligence.

When the justifications for the metaphors developed by social studies teacher candidates regarding the concept of artificial intelligence are examined, the categories emerging under the theme of "Educational Characteristics" are presented in Table 3.

Table 3: *Metaphors Produced Under the Theme of Educational Characteristics*

Theme	Categories	Metaphors	*f*
Educational Characteristics	Access to knowledge	Library	6
		Teacher	5
		Encyclopedia	4
		Book	3
		Iceberg	1
		Teleportation	1
		Rainbow	1
		Mathematics	1
		School	1
		Star	1
	Justifications	Light	2
		Compass	1
		Sun	1
		Streetlamp	1
		Road	1
		Mentor	1
		Teacher	1

Upon examining Table 3, it is observed that the metaphors developed by social studies teacher candidates regarding the concept of artificial intelligence fall under the theme of Educational Characteristics, comprising a total of 32 metaphors across 2 different categories. The category with the highest number of metaphors is “Access to Knowledge”.

In this category, where teacher candidates perceive artificial intelligence as access to knowledge, participants produced 24 metaphors using 10 different metaphorical expressions. These metaphors emphasize AI as a tool for reaching educational resources and the information they need. The category is characterized by metaphors such as the following illustrative examples.

28-F-4. “AI is like a library because it provides us with knowledge in a vast space.”

56-F-3. “AI is like an encyclopedia because I can instantly find the information I seek.”

131-F-1. “AI is like stars because I believe it possesses infinite knowledge.”

An examination of the metaphors produced by prospective teachers who perceive artificial intelligence as a means of accessing information reveals that they view AI as a fast and comprehensive source that facilitates access to knowledge. These metaphors position technology as a resource that simplifies reaching information within educational and learning processes.

In this category where teacher candidates perceive artificial intelligence as guidance, participants produced 8 metaphors using 7 different metaphorical expressions. These metaphors highlight AI as a guiding tool, both in their education and in other

aspects of life. The category is characterized by metaphors such as the following illustrative examples.

20-M-4. "AI is like a compass because it enables us to reach accurate information."
53-F-3. "AI is like a mental coach because it has ideas on every subject."
111-F-1. "AI is like a street lamp because it illuminates us and provides assistance."

When the metaphors of teacher candidates who perceive artificial intelligence as guidance are examined, AI is understood as a point of consultation that can serve as a guide and helper. In this context, the concept of artificial intelligence has been evaluated as a digital guide that assumes an illuminating role in individuals' learning processes.

When the justifications for the metaphors developed by social studies teacher candidates regarding the concept of artificial intelligence are examined, the categories emerging under the theme of "Conceptual Characteristics" are presented in Table 4.

Table 4: *Metaphors Produced Under the Theme of Conceptual Characteristics*

Theme	Categories	Metaphors	*f*
Conceptual Nature	Versatility	Environment	1
		World	1
		Evolution	1
		Rubber band	1
		Maze	1
		Pomegranate	1
		Pen	1
		Matryoshka	1
		Toy	1
		Sky	1
	Reflection	Mirror	4
	Mechanicity	Machine	2
		Imitator	1
		Robot	1
	Uncontrolled power	Knife	2
		Bomb	1
		Tornado	1
		Atomic particle	1
	Intuitive effect	Ghost	1
		Mystery	1
		Sphere	1
		Void	1
	Instructive	Ocean	2
		Universe	1
		Student	1
		Snowball	1
		Child	1
		Humanity	1
		Chef	1
		Black hole	1
		Piggy bank	1
	Vital necessity	Water	3
		Life	1
		Air	1

Upon examining Table 4, it is observed that the metaphors developed by social studies teacher candidates regarding the concept of artificial intelligence fall under the theme of "Conceptual Characteristics", comprising a total of 42 metaphors across 7 different categories. The category with the highest number of metaphors is "Versatility".

In this category, where teacher candidates perceive artificial intelligence as versatility, participants produced 10 metaphors using 10 different metaphorical expressions. These metaphors emphasize AI as conceptually providing multifaceted support and embodying diverse characteristics. The category is characterized by metaphors such as the following illustrative examples.

37-F-3. "AI is like a rubber band because it can be used in many areas."
91-F-2. "AI is like a pomegranate because it appears as an application but contains many things inside."
114-M-1. "AI is like evolution because it constantly changes and develops."

An examination of the metaphors produced by prospective teachers who perceive artificial intelligence as versatility reveals that they view AI as a multifaceted, flexible, and continuously developing technology encompassing different functions. In this context, AI can be considered both a practical tool applicable in various fields and a system that evolves over time.

In this category where teacher candidates perceive artificial intelligence as reflection, participants produced a total of 4 metaphors using a single metaphorical expression. It has been determined that the metaphors developed in this category conceptually address artificial intelligence in terms of reflectiveness, framed within the characteristic of a mirror, as being dependent on the data reflected and considered from a user-centered perspective in different ways. Some examples of the metaphors developed in this category are as follows:

14-F-4. "AI is like a mirror because it reflects what it knows."
31-M-3. "AI is like a mirror because it reflects whatever we show to it."
33-F-3. "AI is like a mirror because it reflects the person standing in front of it."

An examination of the metaphors produced by prospective teachers who perceive artificial intelligence as reflection shows that they regard AI as a reflective, user-centered tool. The metaphors developed in this category portray artificial intelligence as an externalization of the person or as a mirror of information, emphasizing its role in generating feedback.

In the category where teacher candidates perceive artificial intelligence in terms of mechanicity, participants produced a total of 4 metaphors using 3 different metaphorical expressions. These metaphors emphasize AI as functioning like a machine and being characterized by mechanical features. The category is characterized by metaphors such as the following illustrative examples.

27-M-4. "AI is like an imitator because it is the mechanized form of human-like features."

35-F-3. "AI is like a machine because it operates through algorithms."

59-F-3. "AI is like a machine because it always works."

An examination of the metaphors produced by prospective teachers who perceive artificial intelligence as mechanical shows that they regard AI as a technological tool operating through algorithms, functioning continuously, and imitating human features. Therefore, it can be stated that AI is evaluated as a system that reproduces human behaviors but is essentially mechanized in nature.

In the category where teacher candidates perceive artificial intelligence in terms of uncontrolled power, participants produced a total of 5 metaphors using 4 different metaphorical expressions. These metaphors highlight AI as a structure that may exceed controllable limits and become unstoppable. The category is characterized by metaphors such as the following illustrative examples.

29-M-4. "AI is like a tornado because if you cannot escape, it pulls you in."

54-F-3. "AI is like a bomb because it can be misused at any moment."

83-M-2. "AI is like atom particles because, just as with the invention of the atomic bomb, its potential was unknown."

An examination of the metaphors produced by prospective teachers who perceive artificial intelligence as uncontrollable power shows that they regard AI as a technology that cannot be controlled, harbors dangerous potential, and carries the possibility of misuse. Therefore, attention is focused on the unpredictable outcomes of AI, which is evaluated as a force that may cause serious harm if used incorrectly.

In the category where teacher candidates perceive artificial intelligence in terms of intuitive effect, participants produced a total of 4 metaphors using 4 different metaphorical expressions. These metaphors emphasize AI as a structure that is undefined and distant from being fully understood. The category is characterized by metaphors such as the following illustrative examples.

39-F-3. "AI is like a ghost because it is intangible."

47-F-3. "AI is like a void because it is uncertain what will emerge from it."

81-F-2. "AI is like a mysterious sphere because one can obtain any kind of information, either positive or negative, whenever desired."

When the metaphors of teacher candidates who perceive artificial intelligence as intuitive effect are examined, AI is seen as an ambiguous, elusive, and mysterious construct. Artificial intelligence can be evaluated as a tool that presents information to the user from different perspectives while its functioning is not fully understood, creating an intuitive effect.

In the category where teacher candidates perceive artificial intelligence as instructive, participants produced a total of 9 metaphors using 10 different metaphorical expressions. These metaphors emphasize AI as a dynamic, instructive, and developmental structure in areas where research and assistance are needed. The category is characterized by metaphors such as the following illustrative examples.

61-E-3. "AI is like a student because it constantly learns and refreshes its knowledge."

115-K-1. "AI is like a cook because it continuously produces new things and develops."

120-K-1. "AI is like an ocean because it is boundless, with no limits to knowledge."

An examination of the metaphors produced by prospective teachers who perceive artificial intelligence as instructive shows that they regard AI as a dynamic, instructive, productive technology that provides an unlimited source of knowledge. The concept of AI can be evaluated as a tool that continuously develops, generates new information, and creates an infinite domain of knowledge within learning processes.

In the category where teacher candidates perceive artificial intelligence as a vital necessity, participants produced a total of 5 metaphors using 3 different metaphorical expressions. These metaphors emphasize AI as an indispensable structure for sustaining life and existence. The category is characterized by metaphors such as the following illustrative examples.

15-K-4. "AI is like air because everyone needs it."

30-K-4. "AI is like water because without it, life would stop."

118-K-1. "AI is like life because it is essential for existence."

When the metaphors of teacher candidates who perceive artificial intelligence as a vital necessity are examined, AI is seen as an indispensable part of modern life and survival, a tool that cannot be excluded. Conceptually, artificial intelligence has been evaluated as an essential element for the continuity of life, comparable to air, water, and existence itself.

Discussion

In this study, 128 social studies teacher candidates produced a total of 82 valid metaphors regarding the concept of artificial intelligence, categorized under 3 themes and 16 subcategories. It was found that teacher candidates perceived artificial intelligence through different conceptual lenses, with the most frequently developed metaphors being brain, robot, teacher, library, and human. This finding can be interpreted as indicating that teacher candidates' perceptions of artificial intelligence reflect a multidimensional perspective.

In the study, it can be stated that the metaphors developed by prospective teachers regarding the concept of artificial intelligence generally reflect its positive characteristics. The prospective teachers associate artificial intelligence, which is a contemporary and abstract concept, with different notions.

Within the theme of "Technological Characteristics", the category with the highest number of metaphors was identified "As human-like interaction". The metaphors developed highlight the strong features of artificial intelligence by comparing its characteristics with those of humans. The metaphors produced by teacher candidates in the context of human-like interaction associate technology with the human mind, linking it to human qualities such as cognitive capacity and helpfulness. In their metaphors, teacher candidates expressed perceptions of artificial intelligence not only as a technical tool but also as a reliable, close, and supportive digital entity. In this regard, it can be said that teacher candidates tend to view artificial intelligence as a useful and effective tool. Similar findings are reported in the literature. For instance, Erdoğan & Bozkurt (2023) found that physics teacher candidates associated artificial intelligence with metaphors such as "human" and "brain," attributing human-like characteristics to AI. Indeed, artificial intelligence possesses qualities unique to human intelligence, such as modeling thought processes, generating solutions to problems, making sense of information, and engaging in interaction (Yılmaz, 2020). For this reason, the results of the present study suggest that teacher candidates tend to associate artificial intelligence with human-like features. Therefore, this situation has been emphasized as a source of anxiety about artificial intelligence, with the notion that computers may assume the role of humans and threaten humanity (as cited in Çelebi et al., 2025 from Wang & Wang, 2019). In this context, the concept of AI is perceived as a human-like mind with a capacity that transcends human limitations.

Within the theme of "Technological Characteristics", in the category of "Creativity", the metaphors developed by teacher candidates emphasize the features of artificial intelligence, such as generating unexpected ideas, offering alternative solutions, and bringing together different perspectives. This result indicates that artificial intelligence is perceived not only as an information-providing tool but also as a learning instrument that supports creative thinking and fosters innovation. The findings are supported by Ferreira et al. (2025), who positioned artificial intelligence as a creative guide for students and individuals. This situation can be explained by the potential and efficiency of artificial intelligence in education (Zawacki-Richter et al., 2019). In this context, artificial intelligence is revealed to be not merely a technical tool but also a contributor to creative problem-solving processes. In this context, the metaphors produced indicate that prospective teachers perceive artificial intelligence as a positive technology.

Within the theme, in the category of "Harmful effect", the metaphors developed by teacher candidates draw attention to the negative consequences of technology, such as its invisible spread and potential to create dependency. Therefore, this result indicates that artificial intelligence is perceived not only as a beneficial tool but also as a technology that

carries risks and limitations. Akbay & Yıldırır (2024) found that middle and high school students expressed the concept of artificial intelligence with metaphors such as “snake” and “bomb,” while Erdoğan & Bozkurt (2023) reported that physics teacher candidates used metaphors such as “swamp” and “spy,” highlighting the threatening and harmful aspects of AI. The present study demonstrates that prospective teachers perceive artificial intelligence as a technology that entails potential risks and harms. This demonstrates that across different age groups, artificial intelligence is understood through negative associations. Moreover, AI, depending on human intentions, may threaten social integrity and human rights (Yang et al., 2021, p. 3). Attention is drawn to the development of critical awareness regarding artificial intelligence and to the importance of individuals using technology in an ethical, safe, and responsible manner.

Within the theme, in the context of the “Data Flow” category, the metaphors developed by prospective teachers emphasize the rapid, continuous, and comprehensive information processing capacity of technology. These metaphors indicate that prospective teachers perceive artificial intelligence as a reliable, productive assistant that saves time. Indeed, Martin et al. (2022) emphasize that with the digital revolution and the emergence of artificial intelligence, information has transformed from static data into continuous data flows within existing paradigms. A study conducted with prospective physics teachers shows that the use of metaphors such as “brain” and “library” highlights the information processing and storage capabilities of artificial intelligence (Erdoğan & Bozkurt, 2023). Demir & Güraksın (2022), in their study with different age groups (middle school students), found that artificial intelligence was perceived as possessing unlimited knowledge capable of solving any problem. Research results further support the idea that AI can analyze large datasets quickly and accurately, providing diverse content (Öznur & Gezer, 2025). Therefore, conceptually, artificial intelligence is characterized by its features as a powerful tool in education.

Within the theme, in the category of “Obedience”, the metaphors developed by teacher candidates reveal that technology is perceived as a tool dependent on commands, working unquestioningly, and remaining under human control. Therefore, the metaphors in this category emphasize artificial intelligence as controllable, task-oriented, and human-centered technology. Kalemkuş & Kalemkuş (2025) support this finding by likening artificial intelligence to a “puppet,” highlighting its controllable nature. Indeed, Yampolskiy (2022) emphasizes that it is important to be able to control such a powerful technology in order to benefit from it and avoid pitfalls. In this context, it can be stated that a more optimistic and control-oriented approach to technology use has been developed.

Another category evaluated under the same theme is “Variability”. The metaphors developed by teacher candidates in this category show that technology is perceived not as a fixed and one-dimensional structure but as a dynamic system that adapts to its environment and continuously evolves. Thus, the metaphors in this category emphasize artificial intelligence as open to change, adaptable, and an innovative tool for teaching and

learning. Similar findings are reported in the literature. Arslantaş & Ataş (2024) found that high school students perceived artificial intelligence as a changing and developing tool, demonstrating that across different age groups, AI is similarly understood as an "evolutionary" technology. With technological advancements and humanity's continuous acquisition of new knowledge, artificial intelligence is defined as a concept that evolves and transforms over time (Yüzbaşıoğlu et al., 2025). Artificial intelligence is perceived not as a fixed tool, but as a technology that assumes different functions in different periods, progresses within an evolutionary process, and responds to emerging needs.

Within the theme of "Technological Characteristics", in the category of "Digital Assistant", the metaphors developed by teacher candidates show that technology is perceived as a tool that supports creative processes, is solution-oriented, and guides the user. Artificial intelligence is perceived as a technology that generates knowledge and ideas, and provides support in problem-solving processes. Similarly, another study reported that prospective teachers used metaphors such as "assurance," "clue," and "right-hand man," indicating that they view technology as a supportive assistant in daily life (Eriçok et al., 2024). In particular, artificial intelligence is defined as a tool that helps with everyday and simple tasks. According to the views of school principals, Demir Dülger & Gümüşeli (2023) emphasized that the use of artificial intelligence facilitates administrative tasks, assists people, and makes life easier. When these qualities are examined, it becomes evident that artificial intelligence is positioned as a supportive tool in the pedagogical context and possesses the potential to enhance accessibility.

Within the theme of "Educational Characteristics", the metaphors developed by teacher candidates were most frequently found in the category of "Access to Knowledge". These metaphors were addressed in different ways in terms of their contribution to education. Teacher candidates associated artificial intelligence with educational concepts such as "library," "encyclopedia," "teacher," and "school." Therefore, this category reveals that artificial intelligence is perceived in the educational context as a technology that accelerates, facilitates, and enriches access to information. Similar findings are reported in the literature. Balıkçı et al. (2024) noted that teachers described artificial intelligence with metaphors such as "brain," "teacher," and "sage," emphasizing its role in knowledge access. Indeed, the use of artificial intelligence facilitates easy and rapid access to information, thereby enhancing individuals' potential and supporting their development (Sezer, 2024). Therefore, in terms of educational characteristics, artificial intelligence can be positioned as a tool that transforms access to knowledge, accelerates learning, and increases individuals' learning potential.

Within the theme of "Educational Characteristics", in the category of "Guidance", the metaphors developed by teacher candidates emphasize the qualities of artificial intelligence as a "guide," "source of light," and "supportive mentor." These metaphors reveal that prospective teachers perceive artificial intelligence as a technology that provides guidance, offers direction, and supports decision-making processes. Vatansever (2024) similarly found that university students described artificial intelligence with

metaphors such as “friend,” “traffic sign,” and “a tool illuminating the future,” highlighting its guiding role in education. Indeed, systems modeled after human intelligence can provide students with guidance, support, and feedback (Hwang et al., 2020). In this context, artificial intelligence is considered a tool with significant benefits in various domains (Gölbaşı & Okul, 2024; Güzelgörür & Çevik Sever, 2025). It demonstrates that AI can be used pedagogically as a support system that enhances learners’ motivation, illuminates learning pathways, and provides direction according to individual needs.

Within the theme of “Conceptual Characteristics”, the metaphors developed by teacher candidates were most frequently found in the category of “Versatility”. It has been determined that the metaphors developed conceptually associate artificial intelligence with objects by highlighting their strengths. These metaphors associate artificial intelligence with concepts that possess versatile characteristics, such as “matryoshka,” “world,” “pomegranate,” and “toy,” which can be used in different domains or contain more meanings than they initially appear to hold. In this context, the category tends to perceive artificial intelligence in education as a tool that provides versatile support and responds to different needs. This result of the study is consistent with the views of prospective teachers from different departments, who hold a comprehensive understanding of the role of artificial intelligence in education (Eriçok et al., 2024). Moreover, Lim (2024) found in a study with teachers that artificial intelligence was described as a versatile concept, showing that technology is understood in different contexts through diversity and comprehensiveness. Therefore, the results of this research indicate that artificial intelligence is evaluated as a multifaceted technology, containing diverse elements and offering a broad perspective.

Within the theme of “Conceptual Characteristics”, in the category of “Reflection”, the metaphors developed by teacher candidates emphasize the qualities of artificial intelligence as a tool that reveals the knowledge within individuals and reflects the information and characteristics of the person using it. This result shows that teacher candidates perceive artificial intelligence not only as a source of knowledge but also as a tool that makes personal thoughts and values visible, functioning as a mirror. Kontandinidis (2025) similarly defined artificial intelligence with the metaphor of a “mirror,” highlighting technology as a tool that reflects individuals’ preferences and priorities. This approach demonstrates that artificial intelligence assumes a reflective function, enabling users to reconsider their own values and purposes. In the context of these qualities, the research findings indicate that the concept of artificial intelligence has been evaluated as a user-dependent technology that transmits the data it receives in different forms and relies on the user for knowledge production.

In the category of “Mechanicity” under the same theme, the metaphors developed by teacher candidates draw attention to the non-human, mechanical aspects of artificial intelligence (robot, imitator, machine), emphasizing its digital and non-human characteristics. Thus, this category indicates that teacher candidates do not associate artificial intelligence with human qualities but rather interpret it as a mechanical tool

similar to other technological devices. Similar findings are reported in the literature. Tartuk (2023) found that middle school students explained the concept of artificial intelligence with more technical and mechanical metaphors such as "robot" and "machine." Other studies also defined artificial intelligence and AI tools as "machines" (Alanoğlu & Karabatak, 2020; Balıkçı et al., 2024; Haenlein & Kaplan, 2019; Kış, 2019). In this context, the findings suggest that teacher candidates perceive artificial intelligence as analogous to other technological and mechanical tools serving humanity. Studies conducted with different age groups reveal that artificial intelligence is understood more through its mechanical and technological functions rather than its human-like aspects.

Within the theme of "Conceptual Characteristics", in the category of "Uncontrolled Power", the metaphors developed by teacher candidates emphasize that artificial intelligence can become dangerous and is not a controllable entity. These metaphors indicate that artificial intelligence is described as a technology that may pose risks when it cannot be controlled. Artificial intelligence brings to mind not only a useful tool but also danger and lack of control (Akkaya et al., 2021). Risk perceptions related to artificial intelligence are based on concerns that students may use it in inappropriate and unethical ways (Sellnow, 2025). Moreover, when individuals experience anxiety about artificial intelligence, they become less motivated to learn (Wang et al., 2024). Kılıç (2025) found that classroom teachers described artificial intelligence with metaphors such as "fire," "scalpel," and "devil," perceiving it as a harmful and worrying tool that could cause serious issues if left uncontrolled. In particular, it is emphasized that ethical and privacy-related guidelines must be applied when utilizing artificial intelligence (Sayın & Orbay, 1999). Therefore, despite the potential risks of artificial intelligence, it can be argued that it needs to be perceived as a tool requiring precautionary measures and thus limited by ethical principles and safety regulations.

In the category of "Intuitive Effect" under the same theme, the metaphors developed by teacher candidates show that artificial intelligence is perceived as an unknown process. Therefore, in the metaphors included in this category, artificial intelligence is perceived as "unknown," "mysterious," and "supernatural." Altuntaş & Karabay (2024) emphasized that the metaphors produced by university students highlight the mysterious aspects of artificial intelligence that need to be discovered. When examining its areas of use, AI is seen to operate in intuitive processes and diverse applications such as information systems (Topal, 2017). Although artificial intelligence is considered a potentially powerful tool to reduce unknown risks (Beshwari, 2020), based on the metaphors of prospective teachers, it can be inferred that they perceive the concept of artificial intelligence as a technology that is difficult to understand and may lead to uncertain outcomes.

Within the theme of "Conceptual Characteristics", in the category of "Instructive", the metaphors developed by teacher candidates highlight the various ways in which artificial intelligence contributes to human learning. In this category, teacher candidates emphasized the instructive aspects of AI in different ways, and in some metaphors,

artificial intelligence was perceived as a tool that provides increasing benefits the more it is used. Artificial intelligence, particularly in higher education, offers opportunities for students to benefit effectively from learning and research (Taşçı & Çelebi, 2020). Moreover, the integration of technology into teaching activities serves as a source of motivation for both learners and instructors (Hew & Brush, 2007; Mourlam et al., 2020) and supports learning by facilitating comprehension of subjects (Loeckx, 2016). In this context, the category suggests that artificial intelligence is perceived as a tool or concept that develops through use and contributes to humanity.

Within the theme of "Conceptual Characteristics", in the category of "Vital Necessity", the metaphors developed by teacher candidates show that artificial intelligence is perceived as an indispensable tool in human life. In addition to emphasizing its importance, teacher candidates associated the concept of AI with essential elements for human survival, such as "water," "life," and "air." Therefore, these metaphors suggest that artificial intelligence is perceived not merely as a technology, but as an indispensable tool in life. Turan (2024) found that English teachers used metaphors such as "water," "sun," "rain," and "ocean," while Ağmaz & Ergüleç (2024) reported that pre-service classroom teachers used metaphors such as "light" and "brain" to define artificial intelligence as a vital necessity and need. Similarly, Gölbaşı & Okul (2024) emphasized the vital necessity of artificial intelligence through the metaphor of "water." From the perspective of the research findings, it can be concluded that artificial intelligence is perceived as an indispensable element for the continuation of life. This is explained by the fact that AI is a tool used in many areas of life (Mart & Kaya, 2024). Based on the research findings, suggestions are made to enhance the metaphorical perceptions of prospective teachers regarding artificial intelligence.

The metaphors produced by social studies teacher candidates regarding the concept of artificial intelligence demonstrate that they possess multidimensional perspectives on this technology. Based on the results of the study, several recommendations are offered to make teacher candidates' metaphorical perceptions of artificial intelligence more effective.

First, considering the evaluations of artificial intelligence in terms of harmful effects and obedience metaphors, awareness activities can be conducted that focus not only on the benefits of this technology but also on its ethical and social dimensions. Second, metaphor analysis can be supported with different qualitative data collection methods to examine teacher candidates' perceptions of artificial intelligence more comprehensively. In addition, quantitative research can be employed to increase the generalizability of the findings. Finally, by comparing the metaphors of students from different faculties or departments, interdisciplinary differences in perceptions can be investigated.

Limitations

The study was conducted with only 128 prospective social studies teachers. Therefore, the findings cannot be generalized to prospective teachers in different universities, faculties, or departments. The chosen method may be insufficient to reveal all dimensions of prospective teachers' perceptions of artificial intelligence.

Statements of Publication Ethics

As the authors of this study, we declare that the study does not contain any ethical issues and that we have adhered to research and publication ethics. Ethical approval for this research was obtained from the Bartın University Social and Human Sciences Ethics Committee, meeting number 2025-SBB-0979, dated November 12, 2025.

Author Contributions

Fatıma Betül Demir Evcimen: Literature review, Method, Data Analysis, Results, Conclusion
İsmail Davut Sarı: Data Collection, Data Analysis, Results, Conclusion

Conflict of Interest

The authors declare no conflict of interest.

Plagiarism Checks

The current article meets BUEFAD similarity standards.

Artificial Intelligence Usage Statement

Artificial intelligence tools were used solely for language editing and translation purposes during the preparation of this manuscript. No AI tools were used for data analysis, interpretation of findings, or generation of scientific content.

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