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Artificial Intelligence in Special Education: Metaphors Reflected in Teachers' Perceptions

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Abstract

To explore special education teachers' perceptions of using artificial intelligence (AI) as a tool in special education interventions. A phenomenological design and a qualitative research approach were employed in the study. Data were collected through a form that included demographic information about the teachers and the following statement: *"If AI were a tool in special education, I would liken it to ..... because..."* Forty-seven 46 special education teachers participated. The teachers filled in the blanks and completed the sentence appropriately. Content analysis was used to analyze the data. During analysis, the data were extracted, coded, and categorized, and the validity and reliability were assessed and interpreted. 46 metaphors were identified and classified into seven groups. The findings indicated that teachers' metaphors fell into categories such as imitating human intelligence, a rich source of data, ease of individualization and adaptation, technology and functionality, future and innovation, and mysterious and open to exploration. The study recommends further research on the use of artificial intelligence in special education. The results demonstrate that using AI in special education has both advantages and disadvantages. Teachers can view AI as an essential tool to enhance and adapt instruction. However, it is crucial to remember that AI does not replace the human touch in education. Teachers need to interpret data gathered from AI within the context of their students' emotional and social needs.

Keywords: special education, artificial intelligence, teacher, metaphor.

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Özel Eğitimde Yapay Zekâ: Öğretmenlerin Algılarına Yansıyan Metaforlar

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Özet

Bu araştırmanın amacı, özel eğitim öğretmenlerinin özel eğitim müdahalelerinde bir araç olarak yapay zekâ (YZ) kullanımına ilişkin algılarını incelemektir. Araştırma, nitel araştırma yaklaşımlarından fenomenolojik desen kullanılarak yürütülmüştür. Veriler, öğretmenlere ait demografik bilgilerin yer aldığı bir form ve "Yapay zekâ özel eğitimde bir araç olsaydı, onu ……ya/ye benzetirdim; çünkü ……" ifadesini içeren açık uçlu bir cümle aracılığıyla toplanmıştır. Çalışmaya 46 özel eğitim öğretmeni katılmıştır. Öğretmenler, bu ifadeyi kendi metaforlarını oluşturarak tamamlamıştır. Verilerin analizinde içerik analizi yöntemi kullanılmıştır. Analiz sürecinde veriler kodlanmış, temalar ve kategoriler oluşturulmuş; geçerlik ve güvenirlik çalışmaları gerçekleştirilmiştir. Analiz sonucunda toplam 46 metafor belirlenmiş ve bu metaforlar yedi kategori altında toplanmıştır. Bulgular, öğretmenlerin yapay zekâya ilişkin metaforlarının insan zekâsını taklit etme, zengin bir veri kaynağı olma, bireyselleştirme ve uyarlama kolaylığı sağlama, teknoloji ve işlevsellik, gelecek ve yenilik ile gizemli ve keşfe açık olma gibi temalar etrafında yoğunlaştığını göstermektedir. Araştırma sonuçları, yapay zekânın özel eğitimde kullanımının hem avantajlar hem de sınırlılıklar içerdiğini ortaya koymaktadır. Öğretmenler yapay zekâyı öğretimi destekleyen ve uyarlamayı kolaylaştıran önemli bir araç olarak değerlendirmektedir. Bununla birlikte, yapay zekânın eğitimde insan etkileşiminin ve öğretmenin rolünün yerini alamayacağı vurgulanmaktadır. Bu bağlamda, öğretmenlerin yapay zekâdan elde edilen verileri öğrencilerin duygusal ve sosyal gereksinimlerini dikkate alarak yorumlamaları önem taşımaktadır. Araştırma, özel eğitim alanında yapay zekâ kullanımına yönelik yapılacak yeni çalışmalara ışık tutması açısından önemlidir.

Anahtar sözcükler: özel eğitim, yapay zekâ, öğretmen, metafor.

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INTRODUCTION

Technological developments in education have the potential to transform and enrich teaching processes. Artificial intelligence (AI) has attracted attention recently with its innovative approaches to meeting individual learning needs (Chen et al., 2020). AI Technologies in education offer many opportunities for professionals from general to special education (Kaelin et al., 2021). Special education involves the use of individual differences, instructional adaptations, and unique methods, techniques, and strategies (Cook & Schirmer, 2003). From this point of view, special education is a field in which AI can be used functionally, and results can be obtained effectively. AI-based tools for preparing and implementing individualized education programs for individuals with special needs can facilitate practitioners' and students' lives, thereby increasing their independence (Habib et al., 2021). In addition, AI provides practitioners with significant convenience in integrating teaching methods, techniques, strategies, data recording, and evaluation processes (Marino et al., 2023). However, realizing this potential is closely related to practitioners' ability to use AI tools functionally. The dissemination of the use of these tools in the field of special education can be achieved to a great extent by determining practitioners' views on AI, teaching practitioners how to use these tools, and raising their awareness of them (Alsudairy & Eltantawy, 2024). Teachers' perceptions are of great importance for understanding the use of AI technologies in special education and for revealing potential contributions in this field.

In recent years, various studies on the use of AI in special education have been noteworthy (Hopcan et al., 2023). In these studies, it was revealed that artificial intelligence is effective in keeping data records and making evaluations (Anagnostopoulou et al., 2020), gaining skills and behaviors in many developmental areas, adapting teaching, and preparing individualized education plans (Marino et al., 2023; Şen & Akbay, 2023; Yang et al., 2024). In the studies above, they worked with disability groups, including intellectual disability (Almufareh et al., 2023), autism spectrum disorder (Anagnostopoulou et al., 2020), and a specific learning disability (Bhatti et al., 2024). These findings indicate that the use of AI in special education should become widespread (Harkins-Brown et al., 2025; Khazanchi & Khazanchi, 2024). When studies examining views on the use of AI in special education were discussed, only a limited number examined individuals with disabilities' opinions on AI (Smith et al., 2024). Pre-service teachers' views on the use of AI in special education were examined (Alsudairy & Eltantawy, 2024). In the national literature, no study has yet examined views on the use of AI in special education. However, the findings of these studies reveal the need for further research to understand the potential of AI in special education and the role of teachers in this field. Studies have shown that AI technologies support learning processes and the development of educational strategies appropriate to individual differences. However, for AI technologies to become widespread in practice settings, practitioners must increase their awareness. At this point, determining teachers' views on AI can be essential.

This study aims to reveal special education teachers' perceptions about using AI technologies in special education processes and their perspectives on these technologies through metaphors. In this context, the study aims to contribute to the literature to understand teachers' doubts, expectations, potential contributions, and concerns about AI technologies. The findings will shed light on the study to be carried out, to use the research's potential in special education applications more effectively in practice environments, and to adapt the strategies used to technology. In addition, this study has the potential to significantly contribute to the literature on raising awareness of the use of AI in special education and on integrating AI technology into educational policies. In this study, we aimed to examine special education teachers' views on artificial intelligence in special education through metaphors. For this purpose, we sought answers to the following questions:

1. What are special education teachers' metaphors for AI in special education?
2. How are AI metaphors obtained from special education teachers grouped into categories based on their common characteristics, and what are the logical explanations for these metaphors regarding the potential and limitations of AI?

METHOD

Research Design

In this study, we aimed to determine the metaphors that special education teachers use to describe the place of artificial intelligence in special education. For this purpose, we used a phenomenology design as a qualitative research method. Phenomenology is an approach that involves revealing and examining individuals' common perceptions and experiences of a phenomenon (Creswell, 2013). Phenomenology investigates phenomena encountered in daily life, but is not emphasized much (Yıldırım & Şimşek, 2011).

Participants

The study sample consists of special education teachers. We determined the participant group using purposive sampling. The reason for this was to conduct the research more efficiently and to reach the participants more easily (Yıldırım & Şimşek, 2008). The study's participant group consisted of 46 special education teachers. At the beginning of the study, we obtained written consent for voluntary participation from the participants. Table 1 shows demographic information about the participants.

Table 1.

Demographic Information About Participating Teachers

Features		n	%
Gender	Female	27	59
	Male	19	41
Total		*46*	*100*
Age	22-31	24	52
	32-41	18	39
	42+	4	9
Total		*46*	*100*
Professional experience	1-5	21	45.7
	6-10	13	28.3
	11+	12	26
Total		*46*	*100*
The type of student with special needs studied	Intellectual disabilities	41	89.1
	Autism spectrum disorder	41	89.1
	Learning disabilities	29	63
	Other	20	43.5
Total		*46*	*100*
Use of artificial intelligence applications in the classroom	Yes	13	50
	No	13	50
Total		*26*	*100*

According to Table 1, 27 of the participating special education teachers were female, and 19 were male. More than half of the participants (52%) were between ages 22 and 31, 18 were between 32 and 41, and four participants were over 42. Regarding their professional experience, 21 teachers had worked for 1-5 years, and 13 had 6-10 years of experience. Twelve teachers had more than 11 years of experience. When examining the disability groups the teachers had previously worked with, nearly all of them (41 teachers, 89%) reported working with students with intellectual disabilities and autism spectrum disorder. Twenty-nine teachers (63%) reported working with children with learning disabilities, while 20 teachers (43.5%) reported working with other disability groups. Thirteen teachers (28%) indicated they used artificial intelligence applications in their classrooms.

Setting

In the study, the teachers collected data by sending participants the link to the demographic information and data collection form prepared in Google Docs, with their consent. In addition, the link was shared on social media. At the beginning of the form, there is a description of the ethics committee

approval and the study's purpose. After checking the box declaring their voluntary participation, participants could see the questions on the form.

Data Collection Tools

After preparing the data collection form, we sought the opinions of five experts with experience in qualitative research in special education. We finalized the form in line with the expert opinions. The first part of the data collection form, which consisted of two parts, included descriptive information such as teachers' gender, age, professional experience, and their use of AI in their classes. In the second part of the form, to determine the teachers' metaphors about AI in special education, the statement "If artificial intelligence were a tool in special education, I would liken it to ..... because..." was included. The sentence in question is a frequently used expression in studies to assess participants' metaphorical perceptions. Before delivering the data collection form to the teachers, we gave them a short explanation of a metaphor and how to complete the sentence with different examples, independent of the research topic.

Data Collection and Analysis

Content analysis is defined as conceptualizing and organizing data from the literature, explaining these concepts through themes, and interpreting statements from people whose opinions are taken under these themes by quoting them (Yıldırım & Şimşek, 2006). In this study, we first sorted and coded the data. Then, we ensured the validity and reliability of the data we obtained by creating categories. Finally, we interpreted the data. In the sorting phase, we checked whether the forms we collected from participants were completed in full and appropriately. We excluded the forms that were filled in incorrectly or incompletely enough to affect the research data (such as failing to complete a sentence correctly, leaving the punishment blank, leaving dotted spaces empty, and inconsistencies in meaning in the metaphor and explanation sentences). As a result of our examination, we identified 46 forms, excluding one of the 47 forms collected at the beginning of the study.

We numbered the 46 forms we obtained in order. In the coding phase, we read the forms we listed and categorized the metaphors within them. We sorted the metaphors we received from the teachers and categorized the related metaphors. We gathered the categorized metaphors under the same theme and obtained six groups. We examined the metaphors we grouped, focusing on their standard, prominent, and simulated features. When using the same metaphors, we considered the expressions that follow "because" and examined whether the same thing was stated in each. We presented the themes, metaphors, categories, and justified expressions we obtained using figures and tables. We also visualized the metaphors as word clouds using WordClouds. We interpreted and discussed the meanings of the categories derived from the relevant literature.

Credibility

Validity refers to the accurate measurement of the characteristic under study in the research, while reliability refers to obtaining similar results each time it is measured (Arslan, 2022). Both validity and reliability data are the two main criteria used to guarantee research results (Yıldırım & Şimşek, 2006). At the beginning of the form, we provided detailed information to the teachers about the study, its purpose, the purpose for which the information would be obtained, that personal information should not be included, and that participation in the survey is voluntary. In the following section, we received the participants' consent to participate in the study*: "I have read and understood all of the above information, and I agree to participate voluntarily in this study."* We imposed no time limitations while the participants filled out the form. We ensured that the participants completed the form independently of one another.

For the study's reliability data, we collected inter-coder reliability data from two experts in special education who have experience in qualitative research. Both experts independently coded the data collected to determine special education teachers' perceptions of artificial intelligence and created categories. Afterwards, these categories and codes were compared, and reliability was calculated. We used the formula [same decision number/(same decision number different decision number) x 100]

(Miles & Huberman, 1994) and obtained 92% reliability data. During the study, the authors held regular meetings at every stage. The study's details were discussed in the meetings, and we moved on to the next stage when we mutually agreed. Before starting data collection, we provided participants with detailed information about the study and collected data voluntarily. We obtained written informed consent from the participants via a Google form.

Ethical Issues

Before starting the study, we applied to Eskişehir Osmangazi University Social and Human Sciences Human Research Ethics Committee with the relevant documents. We obtained permission to conduct the study, which does not pose an ethical problem (Date: 03.01.2025; Meeting no: 2025-01). During the study, we kept participants' information confidential and did not include any information that could reveal their identities. Each participant was assigned a code in the study, and we stated that these data would be used only in scientific studies. In this study, we complied with all rules specified in the "Higher Education Institutions Scientific Research and Publication Ethics Directive" applicable in Turkey. We did not perform any actions specified under the title of actions contrary to scientific research and publication ethics.

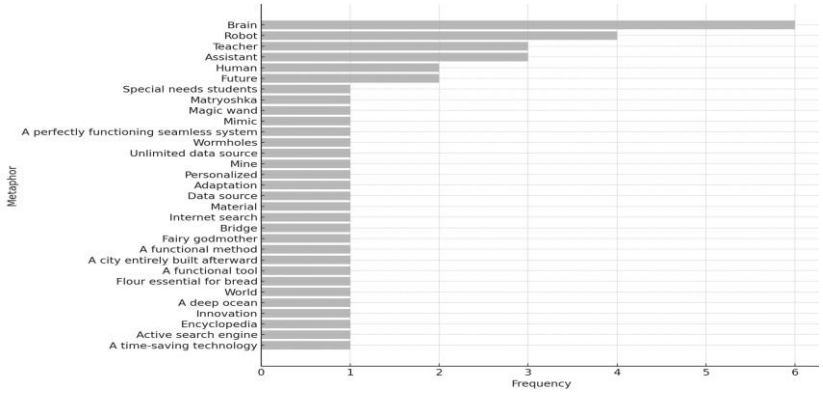
FINDINGS

We presented the metaphors produced by special education teachers about AI as a tool in special education and the categories formed from these metaphors, using figures and tables. In this context, we visualized the metaphors we developed from the data. Then, we explained the categories we identified by quoting participants' reasons for use, in line with those we identified. We presented the findings we obtained from the research questions.

Themes Related to the Metaphors Developed for Artificial Intelligence

Figure 1 shows the metaphors obtained from teachers and their frequencies. When Figure 1 is analyzed, it is understood that the most frequently used metaphor is "brain (n=6)". When the other metaphors are examined in terms of frequency, it is seen that the most commonly used metaphor is "robot (n=4)"; teacher (n=3); assistant (n=3); human (n=2); future (n=2); active search engine (n=1): encyclopedia (n=1); innovation (n=1); a deep ocean (n=1); the world (n=1); flour for bread (n=1); a functional tool (n=1); a city where everything is created later (n=1); a functional method (n=1); internet browsing (n=1); fairy godmother (n=1); bridge (n=1); mine (n=1); material (n=1); matryoshka (n=1); magic wand (n=1); mukallid (n=1); a smooth and adaptable system that works perfectly (n=1); students with special needs (n=1); unlimited data source (n=1); wormholes (n=1); personalized (n=1); adaptation (n=1); data source (n=1); a time-saving technology (n=1). When the teachers' metaphors are analyzed, it is evident that they use both concrete and abstract concepts.

Figure 1.
Frequency of Metaphors



Teachers produced 46 metaphors about AI. We visualized the teachers' metaphors according to their intensity using a word cloud. This visual is presented in Figure 2.

Figure 2.

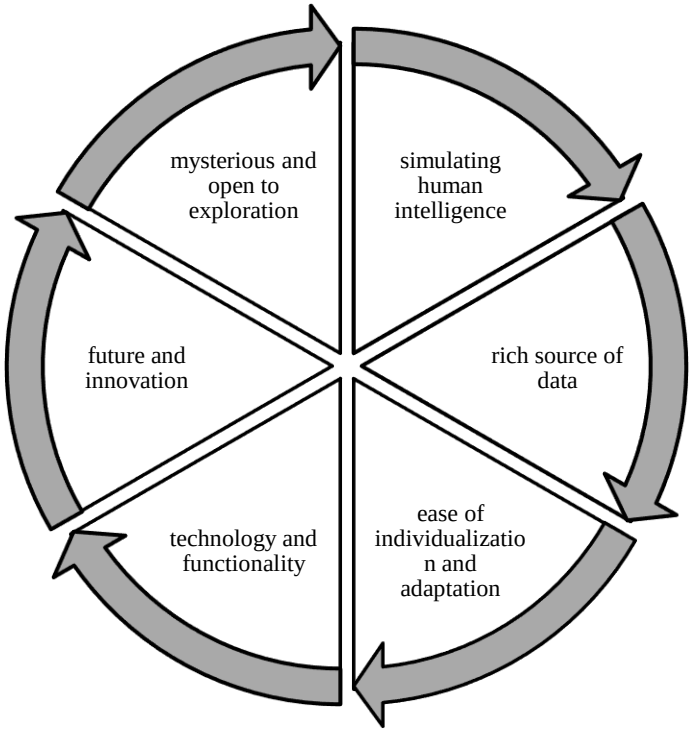
Word Cloud Created for The Metaphors Created by Teachers About AI

Categories Related to the Metaphors Produced by Teachers about Artificial Intelligence in Special Education

When the visual in Figure 2 is examined, it is seen that these categories are similar to human intelligence, rich data source, ease of individualization and adaptation, technology and functionality, future and innovation, mysterious and open to discovery. Although the emerging categories are expressed with concrete, positive concepts, when the categories are evaluated as a whole, it is apparent that teachers do not have clear thoughts about using AI as a tool in special education. It is evident that most participants associate AI only with technology and do not yet have a clear view of it.

Figure 3.

Categories Created for AI



The metaphors produced by the participants, grouped into six categories, are listed under their respective categories and shown in the tables. The tables also directly illustrate the metaphors produced by the teachers. Table 2 presents expressions that exemplify the participants' views on the “resembling human intelligence” category. This category consists of teacher statements focusing on the role of AI in providing content and support for individual learning needs. Table 5 gives examples of participants' views on the “technology and functionality” category.

Table 5.
Examples of Metaphors and Explanations for The Category of Technology and Functionality

Metaphor	Description Examples
Robot	*" ...It is an advanced technology; it gives answers with pre-coded codes." (T29)*
A functional tool technology.	*" ...It has audio, video and written response feature." (T34)*
A time-saving	*"...He can react very quickly to what I want." (T44)*

This category consists of teacher statements focusing on the future use of technology and the multifaceted function of AI. Table 6 gives examples of participants' views on the "future and innovation" category.

Table 6.
Examples of Metaphors and Explanations of The Future and Innovation Category

Metaphor	Description Examples
Future	*"...Like a preview of future technological developments." (T36)*
Innovation	*"...He can quickly combine such information with other information and finalize it." (T25)*
Wormholes	*" ...It will be a shortcut to unforeseen developments." (T32)*

This category consists of teacher statements focusing on AI's characteristics and its transformative effect on the educational process in the future. Table 7 gives examples of participants' views on the category of "mysterious and open to exploration."

Table 7.
Examples of Metaphors and Explanations for The Category of Mysterious and Open-to-Discovery

Metaphor	Description Examples
A deep ocean	*" ...There are many unknown aspects" (T28)*
Matryoshka	*"...It is not clear what will come out of it." (T45)*
Magic wand	*" ...It helps you reach what you want in the way you want." (T46)*

This category consists of student statements that reveal AI's unknown features and its mysterious, deep, and multifaceted nature.

DISCUSSION

In this study, we aimed to obtain special education teachers' views on AI through metaphors. The research findings showed that teachers expressed AI with various metaphors. In the following paragraphs, we discussed the research findings of the literature.

Most of the teachers likened AI to human intelligence. AI is also compared to the human brain in many studies conducted in many fields. The reason teachers likened AI to human intelligence may be that AI performs similarly to human intelligence in processes such as learning, decision-making, and problem-solving. However, AI lacks the emotional processes and ethical or moral values that humans have (Akgun & Greenhow, 2022; Nguyen et al., 2023). Teachers may have used this metaphor, given AI's active role in learning and teaching. In this case, *"Teacher"* and *"Assistant"* metaphors emphasize that AI is complementary to humans and its potential for collaboration. When the metaphors related to the rich data source category are analyzed, it is seen that teachers mentioned metaphors such as *"Encyclopedia," "Unlimited data source,"* and *"Internet search."* We think teachers used these metaphors to reflect on the role of AI in accessing information and processing data. AI can access more accurate information than humans to collect, contain, and analyze large amounts of data. Teachers may want to benefit from AI in processes such as data collection and record keeping, which are very important in special education. However, it is also essential to control this data mass and consider ethical issues in this process (Akgun & Greenhow, 2022; Nguyen et al., 2023). Teachers may need to be aware of this capacity and pay attention to issues such as the ethical collection and storage of data. One issue discussed in the context of AI is the accuracy and reliability of data sources or analysis. Ensuring reliable data collection and analysis may be necessary when using AI as a data source in teaching processes. The metaphors *"Personalized"* and *"Adaptation"* were produced to facilitate individualization and adaptation and show that teachers know they can use AI effectively in processes such as

individualization and instruction, as well as in methods and evaluation, which are very important in special education. However, merely being aware of AI's potential is not enough (Ghaffar et al., 2023; Jaiswal & Arun, 2021). It is essential for teachers to actively use this AI feature in these processes (Roll & Wylie, 2016). The metaphors such as "Robot," "A functional tool technology," and "Time-saving" produced for the technology and functionality category show that teachers associate AI with technology, emphasize the functionality, efficiency, and systematicity of AI, and are aware that they can use this feature of AI in special education. However, as in other categories, it is crucial to determine the extent to which this feature is used functionally in educational processes (Huang et al., 2021). The metaphors *"Future," "Innovation,"* and *"Wormholes"* produced by the teachers and included in the future-innovation category symbolize the potential effects of AI on the future. AI is known to have the capacity to transform sectors such as health, education, transportation, and many more. However, there is a need for more research findings on how these innovations can be used in special education. Finally, metaphors such as "*A deep ocean," "Matryoshka,"* and *"Magic wand"* in the category of mysterious and open to discovery reveal that there are still issues that teachers do not know and wonder about AI. In addition, it is understood that they liken AI to various abstract concepts because they do not know enough about it. However, this situation may lead teachers to believe that AI can solve all problems.

The use of AI in special education offers opportunities and challenges, as revealed by the current study and similar studies (Yang et al., 2024). Research findings underscore that AI is an essential tool for individualized learning. In the present study, teachers' perception of AI as an individualizable tool supports these findings. AI individualization can be actively used in instruction and assessment processes (Jaiswal & Arun, 2021). In the present study, teachers also saw AI as a tool to help adapt instruction. Research findings indicate that AI can be an adaptive tool according to student performance. Individualizing and adapting instruction allows teachers to intervene more effectively in providing skills and behaviors to their students with special needs. However, combining knowledge of field, pedagogy, and technology may be achieved by individualizing and adapting AI to the characteristics of individuals with special needs (Chen et al., 2020). Studies have indicated that teachers need more information and guidance in using AI tools effectively (Kharbat et al., 2021). Given that the metaphors produced by the teachers in the current study also include abstract concepts, it is reasonable to assume they have needs regarding AI. Professional development is essential for teachers to feel confident adopting new technologies in their practice when working with students with special needs. Ongoing support and training in AI technologies can help teachers develop the skills needed to use AI tools effectively and overcome technological barriers they may encounter. Furthermore, teacher education programs should include training on the ethical use of AI, especially when working with students with special needs (Akgun & Greenhow, 2022).

Viewing AI as an advanced technology tool can help teachers become practitioners who, when used effectively, provide more time to focus on direct instruction and student engagement. However, another point to discuss is that as they become proficient with AI, special education teachers need to recognize its disadvantages as a tool in their teaching.

Even if teachers describe AI as a rich source of data and an individualized, adaptive tool that facilitates teaching, it should be remembered that the successful integration of AI in special education depends on a balanced approach. Practitioners should see AI as a complementary element, not a replacement for the teacher. The literature emphasizes that AI can increase positive learning outcomes when integrated into classroom practices in a measured and controlled manner. AI can be a highly effective tool for automating routine tasks, providing individualized learning experiences, and analyzing student data. However, it should be recognized that AI cannot assume the role of teacher, facilitator, and emotional guide. At this point, the best approach may be for teachers to adopt a hybrid approach by combining their teaching skills and human characteristics with AI. It is also necessary to pay attention to ethical issues in the use of AI in education (Nguyen et al., 2023). Teachers should be sensitive about protecting student rights and privacy when using AI in teaching processes (Huang, 2023).

Finally, it is essential to emphasize that AI does not replace human touch in education. Teachers need to interpret data obtained while using AI as a teaching tool in the context of their students'

emotional and social needs. However, the "robot teacher" metaphor may raise concerns about the loss of human qualities in education. Students with special needs need support in social and emotional development and academic skills. Therefore, practitioners should consider the limitations of AI technology in promoting emotional and social development when using AI in their classrooms. In its current form, AI cannot understand and respond to students' complex emotional states as an educator can (Abid et al., 2024). In special education, as in other fields, the teacher-student relationship is essential because positive relationships can increase student motivation and participation in teaching and, thus, positive learning outcomes (Reichow et al., 2011). While AI supports learning, it cannot replace the emotional bond between teacher and student. This limitation highlights the need for careful consideration when integrating AI into special education to ensure that the technology complements rather than replaces the essential human aspects of teaching.

LIMITATIONS and FUTURE RESEARCH

While the current study has its strengths, it also has limitations. In this context, the participant group in the study was limited to a specific number of teachers in Turkey. Therefore, the findings may not fully represent the broader population of teachers in various geographies and educational settings. The participant group also predominantly consisted of special education teachers who were more experienced in AI or technology integration in education. This may have led to a bias towards more positive views of AI. Future studies should include a more diverse group of teachers, including those with less technology experience, to understand better how different educators perceive AI.

The current study's findings are cross-sectional. In other words, they provide a snapshot of teachers' perceptions at a particular time. Future research on teachers' perceptions of AI technologies can be conducted. The use of AI in education is a rapidly evolving field, and teachers' views may change over time as they gain more experience with the technology. Longitudinal studies are needed to track how teachers' attitudes and experiences evolve as AI tools integrate into classroom practice.

The current study focused primarily on teachers' perceptions of AI as a tool rather than its impact on students' learning performance and outcomes. While it is essential to understand special education teachers' views on AI, more research is needed to evaluate the effectiveness of AI tools in improving educational outcomes for students with special needs. Future studies should focus on empirical evidence of AI's impact on student performance, engagement, and outcomes.

The current study primarily focused on evaluating AI's role as a tool in special education through teachers' perspectives; however, specific AI tools and platforms may vary in effectiveness and application. Future research should investigate the impact of specific AI technologies tailored for special education, such as AI-driven assistive devices, personalized learning platforms, and behavior analysis tools.

Considering the findings and limitations of this study, and given teachers' concerns about the lack of training and support in AI integration, we recommend that educational institutions provide continuing professional development programs to support future research and applications in integrating AI into special education. These programs should focus on helping teachers understand the capabilities and limitations of AI tools, how to use them effectively in the classroom, and how to integrate them with traditional teaching practices.

Since current research shows that AI should complement human teachers, not replace them, AI tools must be developed with input from educators. AI developers should collaborate with special education teachers to ensure that AI systems are user-friendly, aligned with curricular goals, and responsive to the needs of students with disabilities. This collaborative approach will help bridge the gap between technological innovation and educational practice.

The ethical concerns surrounding AI, especially in special education settings, cannot be ignored. We recommend that policymakers and educational leaders develop clear guidelines and moral

frameworks for using AI in classrooms. These guidelines should address student privacy, data security, and the maintenance of human oversight in AI-driven learning environments.

Future research should prioritize AI systems that empower students with special needs by promoting autonomy and supporting self-determination. As special education aims to support students in developing independence, AI tools should be designed to help students set and achieve personal learning goals, monitor their progress, and engage in self-directed learning.

Further research should investigate the long-term impact of AI integration on student outcomes in special education. Longitudinal studies that track the academic, emotional, and social development of students using AI tools would be invaluable in determining the actual effectiveness of AI in improving special education practices.

To address concerns about the emotional and social aspects of teaching, researchers should focus on developing AI models that incorporate emotional intelligence and adapt to students' social needs. While AI cannot replace human connection, it can support students' emotional development by providing positive reinforcement, encouragement, and adaptive feedback based on students' behaviors and needs.

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