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Review article

Innovative Uses of Artificial Intelligence in Special Education Practice: Opportunities and Perspectives

Katalin Mezö [a,*] & Ferenc Mezö [b]

[a] University of Debrecen, Debrecen, Hungary
[b] Eszterházy Károly Catholic University, Eger, Hungary

Abstract

Artificial intelligence (AI)–based systems, tools, and services have now permeated nearly every dimension of human life and are increasingly being integrated into educational practice. Nevertheless, their use for special needs education in Hungary remains comparatively limited. This study pursues a dual objective. First, it identifies and systematizes those areas of special education in which the effectiveness of AI applications is already supported by empirical evidence and documented practical implementations. These areas were categorized along the following dimensions: 1) personalized learning and adaptive instructional methodologies; 2) the development of communication and social competencies; 3) AI-driven assistive technologies and accessible design solutions; 4) the role of artificial intelligence in early diagnosis and intervention; and 5) opportunities for AI-supported professional guidance for teachers, including assistance in designing and implementing individualized development plans. Secondly objective of this study is to elucidate the findings of three empirical investigations conducted in Hungary, which examined the pedagogical and special education contexts of artificial intelligence (AI) utilization. The presented studies applied a quantitative, questionnaire-based, cross-sectional research design involving teachers, preservice teachers, and special education teacher students. Data were analyzed using statistical methods (descriptive statistics and chi-square tests) to explore participants' experiences, attitudes, and willingness to use AI educational tools. The results suggest that, although there is a growing interest among educators in the pedagogical applications of AI, they remain largely unfamiliar with its practical implementation and exhibit considerable uncertainty regarding its potential educational uses.

Keywords: Artificial Intelligence, Special Education, Educational Robotics, AI Applications, Personalized Learning

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* **Corresponding author:**

Katalin Mezö, University of Debrecen, Debrecen, Hungary.
Email: kata.mezo1@gmail.com

INTRODUCTION

According to the terminology of the European Commission (AI HLEG, 2018), the term artificial intelligence (AI) refers to systems that exhibit intelligent behaviour by analyzing their environment and acting—to some extent autonomously—in order to achieve specific goals. AI-based systems may take two primary forms: a) purely software-based systems, which operate exclusively within virtual environments (e.g., voice assistants, image-analysis software, search engines, speech- and face-recognition systems); and b) software embedded in hardware, such as robots, autonomous vehicles, drones, or internet-connected devices.

Researchers from different disciplines may approach artificial intelligence from at least three distinct perspectives. These include: 1. a goal-oriented approach, 2. a tool-oriented approach, and 3. an impact-oriented approach (Mező & Mező, 2019, p. 10).

In the goal-oriented approach to artificial intelligence, both basic and applied research focus on uncovering the theoretical and practical knowledge and underlying principles that contribute to the creation and understanding of AI itself. These inquiries are guided by the fundamental question: "What is artificial intelligence, and how can it be created?" Within goal-oriented AI research, two major paradigms can be distinguished—commonly referred to in the literature as "Weak AI" and "Strong AI." Weak AI denotes systems that are capable of performing only one or a limited set of specific tasks; such applications are now routinely encountered in everyday life. Strong AI, by contrast, aims to develop software or hardware capable of emulating general human cognitive functioning—and, in the case of robots or audiovisual AI entities, potentially even human-like physical appearance (AI HLEG, 2018).

The tool-oriented approach to artificial intelligence focuses on the application of AI within specific scientific, business, professional, artistic, athletic, or everyday domains. The central question guiding this perspective is: "What can artificial intelligence be used for—either in general or within a particular field?". AI research from this tool-oriented standpoint may emerge from virtually any discipline, profession, artistic practice, sport, or everyday context in which artificial intelligence can serve as a functional or innovative instrument.

The impact-oriented approach to artificial intelligence encompasses research that seeks to understand, predict, and/or influence the phenomena associated with the expanding presence of AI. This line of inquiry also examines how the prevailing physical and social environment—such as available material resources, infrastructure, human expertise, and broader socio-economic or political conditions—shapes both the development and the application of AI technologies (Yim & Su, 2025). The central question of the impact-oriented perspective is therefore: "What forms of (inter)action exist between the world and the proliferation of AI technologies, and how can these effects be influenced or regulated?" In research conducted within pedagogical or educational environments, tool-oriented, and impact-oriented approaches may all be present simultaneously.

The relationship between artificial intelligence (AI) and education has gained increasing scholarly attention in recent years, as digital transformation reshapes learning environments at all levels of education (Barnucz et al., 2025; Yim & Su, 2025; Özbilen et al., 2025). Contemporary educational systems are no longer merely consumers of technological tools; rather, they constitute complex socio-technical ecosystems in which AI stays in interaction whith pedagogical practices, institutional structures, and broader social contexts (Malikova & Bobokulov, 2024; Memarian & Doleck, 2024; UNESCO, 2019).

Education in the 21st century is increasingly shifting toward the integration of technological innovations, in wich te AI it offers complex, adaptive, learner-centered systems capable of responding to students' individual needs, learning paces, and developmental characteristics (Memarian & Doleck, 2024; Yim & Su, 2025). From this perspective, AI functions not only as a technological instrument but also as a catalyst for a broader pedagogical paradigm shift, enabling the design of learning environments that adapt dynamically to learners' performance and diverse abilities (Holmes et al., 2019). Consequently, the pedagogical use of AI should be regarded as a strategic opportunity in educational practice.

This strategic relevance becomes even more pronounced in the context of special education, where learner diversity, individualized support, and accessibility are central concerns (Dilber, 2020). Research increasingly highlights that AI-based educational systems—when developed and implemented responsibly—have the potential to support personalized learning pathways, early identification of learning difficulties, and inclusive instructional practices tailored to students with special educational needs (Hussein et al., 2025; Goldman et al., 2025; Waterfield, 2024). Therefore, examining the impact of AI within special education is not merely a technological question, but a pedagogical and ethical imperative that aligns with broader goals of equity and inclusion in education (UNESCO, 2019).

Potential Applications of Artificial Intelligence in Special Education

Special education constitutes a highly stratified system concerned with the education, developmental support, rehabilitation, and facilitation of life management for children and students with special educational needs. Special educational needs represent an exceptionally complex domain that requires individually tailored pedagogical provision and an in-depth understanding of learner diversity (Hegedűs, 2024). The implementation of these aims may be substantially supported through the integration of artificial intelligence technologies.

The potential applications of artificial intelligence within the field of special education have recently attracted increasing scholarly attention. Rakap (2024), for instance, synthesizing a broad array of international studies, identified three principal domains in which AI can be advantageously deployed in special education: 1) Lesson planning and curricular support: AI can assist teachers in developing lesson plans and adapting curricular content. 2) Individualized and differentiated instruction: AI facilitates the adaptation of instructional materials and pedagogical methods to the specific needs of individual learners. 3) Professional development for teachers: AI may contribute to the ongoing professional learning and competence development of educators. Harkins-Brown et al. (2025) further enumerate additional benefits associated with embedding AI technologies in special education. These include: 1) Reducing the workload of teachers working with students with special educational needs; 2) Overcoming accessibility barriers that persist in educational contexts for learners with disabilities; 3) Enhancing possibilities for individualization; and 4) Providing supplementary services that support teachers' instructional practice.

Alongside these advantages, several scholars highlight critical challenges associated with AI use (Diósi, 2024; Tahyné, 2024). Such challenges concern, for example, the management of transparency and informed consent as fundamental ethical requirements; the identification and mitigation of biases and hallucinations generated by AI systems (Sajid, 2023); and issues related to data protection and data security (Waterfield et al., 2024). These problems constitute persistent obstacles in the educational application of AI and demand heightened attentiveness from users. Nevertheless, it is important to recognize that many errors originate from human use itself. Through the refinement of input prompts and the continuous monitoring of AI-generated outputs—supported, when necessary, by targeted training and self-directed learning—many of the aforementioned difficulties may become substantially mitigable.

In this study building upon the insights of Rakap (2024) and Harkins-Brown et al. (2025), the potential applications of artificial intelligence in special education are further elaborated hereit identifies and systematizes those areas of special education in which the effectiveness of AI applications is already supported by empirical evidence and documented practical implementations. These areas is: 1) personalized learning and adaptive instructional methodologies; 2) the development of communication and social competencies; 3) AI-driven assistive technologies and accessible design solutions; 4) the role of artificial intelligence in early diagnosis and intervention; and 5) opportunities for AI-supported professional guidance for teachers, including assistance in designing and implementing individualized development plans.

1) *Personalized learning and adaptive instructional methodologies.* The education of the 21st century increasingly emphasizes the implementation of inclusive practices within public educational institutions, a key aspect of which is the creation of learning environments that are responsive to the individual needs of students. Personalized learning and adaptive instructional systems enable learners to progress at their own pace, in alignment with their interests and cognitive capacities. In this process, artificial intelligence can play a pivotal role, particularly for special education populations. (Note: According to Section 4, Paragraph 25 of the current Hungarian Act CXC of 2011 on National Public Education, a child or student with special educational needs is defined as "a child or student requiring special treatment who, based on the expert opinion of a professional committee, is identified as having

a physical, sensory, intellectual, or speech disability; in cases where multiple disabilities occur simultaneously, as multiply disabled; or as having an autism spectrum disorder or other psychological developmental disorder—manifesting severe learning, attention, or behavioral regulation difficulties.”).

Personalized learning (also referred to as tailored learning or learner-centered education) “refers to the diversity of learning programs, learning experiences, instructional approaches, and supporting systems that aim to address the individual learning needs, interests, aspirations, and the cultural backgrounds of each learner” (Mező, 2018, p. 12). Artificial intelligence can support this process through technologies capable of data analysis and behavior pattern recognition, enabling the dynamic adaptation of instructional content. In pedagogical practice, AI is most frequently applied to the personalization of learning materials. To this end, adaptive educational platforms—such as Knewton (https://support.knewton.com/s/), Squirrel AI (https://squirrelai.com/), Century Tech (https://www.century.tech/), DreamBox Learning (https://www.dreambox.com/), and Smart Sparrow (https://www.smartsparrow.com/)—employ artificial intelligence to continuously optimize the learning process. These platforms utilize AI-driven algorithms to continuously assess students’ reading comprehension, dynamically adjust the difficulty of lessons, and identify knowledge gaps in real time (CIO Applications, 2023). These systems continuously collect learning data from users, analyze students’ responses, and subsequently adapt instructional content to the individual learner. According to Holmes et al. (2019), AI-based learning systems have the capacity to surpass the possibilities of traditional differentiation. From the perspective of deliberate special education practice, AI represents a particularly valuable tool, as it enables detailed mapping of learners’ needs and the design of individualized learning trajectories. Rakap (2024) emphasizes that, in addition to assisting teachers in personalizing instructional materials, AI can also support educators in the timely identification of early signs of learning difficulties or points at which learners encounter obstacles. This functionality is especially critical for students with autism spectrum disorder, who require structured, predictable, and individually tailored learning environments (Rusli, 2023). One of the key advantages of adaptive systems is their ability to provide real-time feedback on learners’ progress and to automatically adjust tasks accordingly. This functionality enables the early identification and, in some cases, the prevention of learning difficulties, as well as the rapid implementation of targeted interventions. Another benefit of adaptive platforms lies in the continuous availability of feedback and progress reports, which allows educators to gain a more nuanced understanding of their students’ strengths and weaknesses, thereby supporting more effective instructional planning and differentiation. It is important to emphasize, however, that AI-supported personalized systems are designed to complement rather than replace the teacher. While these systems often provide opportunities for self-directed learning and autonomous skill development, the most effective outcomes for students with special educational needs are achieved when AI platforms are integrated into the learning environment under the guidance of educators and their professional pedagogical expertise.

2) *The development of communication and social competencies*. The development of communication and social skills plays a pivotal role in special education, particularly for learners with autism spectrum disorder, speech, language, and communication difficulties, as well as those with learning disabilities or intellectual impairments. AI-based systems designed to support communicative needs—such as speech and emotion recognition technologies—analyze facial expressions, vocal intonations, and body language to provide targeted support to students facing social and communicative challenges. These tools convert spoken words into text and deliver real-time feedback to improve pronunciation and fluency. One such platform is Voiceitt (https://www.voiceitt.com/), which employs automatic speech recognition (ASR) technology to transform non-standard speech patterns into intelligible speech in real time, enabling children and adults with severe speech impairments or disabilities to communicate effectively. Another important application area is Augmentative and Alternative Communication (AAC), where AI supports learners who are unable or have difficulty speaking. Tools such as Tobii Dynavox (https://www.tobiidynavox.com/) utilize eye-tracking interfaces and are increasingly integrated with AI components, including predictive text and automatic word selection. By compensating for missing language functions, AI fosters the development of independent communication. Systems such as CoughDrop ACC (https://www.coughdrop.com/) and the Hungarian-language accessible Avaz (https://avazapp.com/avaz-app-hungarian/) learn users' habits, suggest completions for expressions, and prioritize frequently used words, thereby accelerating and enhancing communication efficiency (Jacovsky, 2023). Furthermore, numerous AI-powered intelligent simulation systems exist to enhance communication and foreign language learning for individuals with disabilities. These systems adapt automatically to individual needs and characteristics, often employing adaptive learning, natural language processing (NLP), virtual reality (VR), augmented reality (AR), and speech recognition technologies to personalize the learning experience.

AI-based intelligent simulations can be effectively integrated into language learning, including first language acquisition (see Móser & Szűts, 2023). These systems "enable the creation of virtual linguistic environments in which learners can engage in real-time interactions with AI characters. These AI characters are capable of speaking, responding to students, and reacting to learners' communicative behaviors" (Fekete & Porkoláb, 2023, p. 8). AI platforms are also increasingly applied to the practice of social behavior. Tools such as chatbots, including Replika (https://replika.com/) and Q-chat Anonymous Messenger, provide learners with safe, guided environments to experiment with a variety of conversational situations. The primary aim of these platforms is to reduce anxiety and gradually build learners' confidence, thereby preparing them for real-world social interactions. Moreover, virtual reality simulations such as Woebot (https://woebothealth.com/) and Wysa (https://www.wysa.com/) function as therapeutic assistants, supporting users' mental health. Supportive communities, such as Koko (https://apps.apple.com/in/app/koko-ai-3d-ai-game) and Talklife (https://www.talklife.com/), allow users to share experiences and provide mutual support. Importantly, these AI-based systems do not replace human relationships but rather complement them. The social environment continues to play a leading role in the development of social competencies.

3) *AI-driven assistive technologies and accessible design solutions.* Artificial intelligence (AI) is revolutionizing the field of assistive technologies, offering significant benefits for learners with disabilities. One of the core objectives of special education is to ensure equitable access to learning environments and educational content, and AI-supported tools and systems open new possibilities in this regard. The primary aim of AI-based assistive technologies is to compensate for students' disadvantages arising from diverse abilities. Examples include text-to-speech and speech-to-text systems, which are particularly valuable for learners with dyslexia, visual impairments, or motor difficulties. AI also supports reading skill development through platforms such as Lexplore (https://lexplore.com/), which utilizes eye-tracking analysis to assess students' reading patterns. The algorithms can identify early signs of dyslexia, facilitating timely diagnosis and intervention. Another key area of accessibility is the mitigation of physical barriers. Eye-tracking and voice-controlled AI devices, such as Tobii Dynavox (https://www.tobiidynavox.com/), enable learners with severe motor impairments to use computers and participate actively in the learning process. These AI tools employ predictive algorithms that proactively respond to users' needs, even when execution is imprecise, thereby enhancing effectiveness. While AI tools do not independently resolve learning difficulties, they provide substantial support in increasing learner autonomy and promoting inclusive education. AI-supported assistive technologies can enhance learners' independence while ensuring access to educational content. AI-based translation software, now available in almost all languages (e.g., Google Lens, Google Translate, DeepL, Worce AI Translator, Bing Microsoft Translation), further supports accessibility. By improving translation accuracy, these systems facilitate learning situations and often provide text-to-speech output in the user's native language, enhancing equity for visually impaired students and those with reading difficulties.

Additionally, AI language models such as ChatGPT (developed by OpenAI) serve as assistive technologies capable of human-like communication, text generation, information provision, and a variety of other tasks (Radford et al., 2018), thereby promoting equitable access. Heidl (2024) demonstrates multiple applications of ChatGPT Advanced Voice Mode as a special education assistant.

4) The role of artificial intelligence in early diagnosis and intervention. Early diagnosis and intervention are crucial for addressing developmental disorders and skill deficits, particularly in cases of autism spectrum disorder (ASD), attention-deficit/hyperactivity disorder (ADHD), and learning difficulties. The emergence of artificial intelligence (AI) technologies has opened new possibilities for faster, more accurate, and more personalized diagnostic and intervention planning. AI systems are capable of processing and analyzing vast amounts of data, identifying correlations in medical and behavioral patterns that were previously undetectable.

These systems show particular promise in the early detection of autism spectrum disorder. Research indicates that machine learning algorithms can identify behavioral patterns characteristic of autism with over 90% accuracy, even from as early as 18 months of age (Kosmicki et al., 2020). A notable example is the Cognoa ASD Diagnosis Aid (https://cognoa.com/), an AI-based diagnostic tool available as a mobile application, which uses parent questionnaires and video analysis to support behavioral-based diagnosis. Approved by the U.S. Food and Drug Administration (FDA, 2021), the system aids physicians and other professionals involved in child assessments by accelerating decision-making while reducing the risk of underdiagnosis and delays (Knopf, 2021).

AI is also valuable for identifying learning difficulties. Specialized systems, such as Lexplore (https://lexplore.com/), utilize eye-tracking technology to map early signs of reading challenges, including dyslexia. Thus, AI enables not only earlier detection of symptoms but also the design of individualized learning pathways, diagnosing gaps and mapping developmental trajectories (Szűts, 2024, p. 29). During the diagnostic process, AI does not replace professionals but provides significant support in accelerating expert evaluations: “the advantage of programs and AI-based technologies is that they do not tire, making them an excellent partner—not a replacement—for educators in implementing personalized instruction” (Molnár, 2024, p. 59). Importantly, AI should not only detect problems but also support intervention. Adaptive learning platforms, such as Khan Academy Kids (https://learn.khanacademy.org/khan-academy-kids/) and SmartEdTech (https://www.smartedtech.com/), can recommend content based on individual profiles and adapt in real time to the child’s needs. This functionality is particularly critical for learners with learning difficulties, intellectual disabilities, or speech impairments, for whom targeted development is essential.

5) *Artificial Intelligence in Supporting Educators and the Development of Individualized Education Plans.* Special education teachers provide support to students based on Individualized Education Plans (IEPs), which are central to ensuring tailored learning experiences. An IEP is a document created by the teacher or a multidisciplinary development team, designed to address a learner’s individual abilities, potential, and needs. Its purpose is to provide opportunities for growth, successful learning, and the fullest development of the student’s personality. The design and implementation of IEPs is a time- and expertise-intensive process, requiring accurate diagnostics, differentiated instructional methods, and continuous monitoring. In recent years, artificial intelligence has emerged as a promising tool to enhance the efficiency of both creating and implementing IEPs. AI can also assist in generating educational games and exercises, which are essential components of special education practice (Bánki & Hegedűs, 2021).

One of the primary advantages of AI-based systems is their capacity to process and analyze large volumes of data. Certain platforms, such as Senso.ai (https://senso.ai/) and AI Coach by Edthena (https://www.edthena.com/ai-coach-for-teachers/), can generate predictive models from students’ behavioral, performance, and developmental data, thereby supporting targeted interventions. These algorithms can identify students' strengths and weaknesses, providing personalized recommendations aligned with the goals of individualized education plans.

As stated Rakap's (2024, p. 100) study AI tools "By rapidly analysing a vast array of educational resources, research materials, and instructional content, these systems grant educators immediate access to relevant information.This streamlined access not only saves teachers time but also empowers them to focus on adapting and personalising the curriculum to address the unique needs of their students." The time savings enabled by AI can additionally contribute to reduced stress resulting from the documentation and administrative demands placed on educators.

AI can actively assist educators in multiple stages of the development of Individualized Education Plans (IEPs), including: selecting diagnostic tools; interpreting diagnostic data; setting developmental goals; choosing instructional methods, tools, and procedures; planning interventions; monitoring progress; evaluating and reviewing developmental outcomes, and concluding the developmental process. Nonetheless, decision-making regarding students' development remains primarily the responsibility of the teacher and the professional team (Holmes et al., 2019).

Another advantage of AI is the dynamic monitoring of learner progress. Adaptive educational software, such as SmartEdTech (https://www.smartedtech.com/) and DreamBox (https://www.dreambox.com/), continuously tracks student performance and provides real-time alerts when deviations from set goals occur. This functionality enables flexible adjustments to IEPs, accurate reporting to parents and development specialists, and comprehensive evaluation of student achievement. Moreover, AI can provide professional support to educators in implementing individualized interventions and enhancing pedagogical effectiveness. Platforms such as AI Coach analyze classroom videos using artificial intelligence and offer suggestions for improving instructional practices, thereby fostering teacher self-reflection and professional growth (Edthena, 2023). It is essential, however, that the use of AI-based tools, particularly those involving video, image, or audio recording, be transparent and ethical. Data collection and analysis should occur only with the explicit consent of the student and their legal guardians. Adherence to the principle of "Nothing About Them Without Them" (Charlton, 1998; Werner, 1998) is indispensable in the context of students with special educational needs, ensuring respect for their rights and autonomy.

The use of artificial intelligence in special education holds promising potential; however, its effective implementation requires not only technological advancements but also the development of pedagogical, ethical, and critical thinking skills. Redefining the role of the educator and rethinking the learning process are essential in special education contexts to realize truly learner-centered, equitable, and effective educational systems One of the objectives of the present study was to contribute to reducing uncertainty among special education teachers regarding AI utilization by providing a comprehensive introduction to AI systems. Experimenting with the AI-based tools presented in this study can advance awareness of the pedagogical applications of AI, thereby fostering the autodidactic professional development of educators in the field.

Investigative Experiences on the Pedagogical Use of Artificial Intelligence and Educational Robotics

At the end of the 1990s, international educational assessments such as TIMSS and PISA highlighted the relatively weak academic performance of school-aged children). This finding prompted increased attention to innovative strategies and approaches aimed at improving the quality of educational systems (Kraetzschmar, 2009; Molnár, 2019). One such approach was robot-assisted education, which necessitated an expansion of previously used educational technologies and opened new avenues for educational robotics (KärnäLin et al., 2006).

Educational robotics involves pedagogical development using tangible, programmable tools and physical objects—such as programmable LEGO or ELEKIT kits—designed to support understanding and concept formation in learning. Robotics engages machines capable of executing pre-programmed sequences of tasks autonomously or semi-autonomously while interacting with the physical environment. Manipulators, defined as mechanical devices either guided by humans or executing repeated programmed motions, provide the most basic conceptualization of a robot as a reprogrammable manipulator (NAR, 2020). In classroom contexts, robotics instruction introduces students of all ages to the fundamentals of coding and programming, allowing models and functions to be concretely explored through active participation. This hands-on engagement enables learners to examine, evaluate, and develop models at both conceptual and practical levels.

Mező and Szabóné Burik (2021) investigated teacher perspectives regarding robot-assisted education in Hungary. Using a questionnaire completed by 84 teachers, the study provided insight into the status of educational robotics in Hungary and explored educators' views on its developmental potential as an experiential pedagogical method. Participating teachers reported that the robot tools were mostly available at their schools. This situation was closely related to the launch of the Digital Wellbeing Program in Hungary. The Digital Wellbeing program (2016) states that at least one computer science classroom must have one programmable robot for every 3 students, however, we have little knowledge about the educational use of these technologies. Prior to the program's implementation in 2016, only a small number of institutions (eight respondents, representing less than 10% of participating schools) utilized robotics tools in instruction. Following the program's introduction, an additional approximately 20% of schools (24 respondents) gained access to educational robotics resources. Although a positive upward trend is evident in the provision of institutions with robots., in 27.72% of institutions (n = 33) robotics instruction has only been implemented for 2–3 years, and in some cases for a year or less. Regarding classroom-based use ($\chi^2 = 10.714$, df = 1, $p \leq 0.001$) and extracurricular application ($\chi^2 = 10.714$, df = 1, $p \leq 0.001$)the number of teachers who use such devices was significantly lower than those who reported not using robots.. The survey also revealed that the majority of teachers use robotics primarily for talent development or reward purposes , while only 10 participants cited remedial applications and a single respondent identified robotics as an experiential pedagogical tool. These findings suggest that robotics has not yet been fully integrated into routine pedagogical practice or experiential learning repertoires in Hungary. This may highlight, that the educators traditionally focused on experiential pedagogy may be less familiar with robotic technologies. Consequently, the conceptual and methodological toolsets of these two fields have yet to sufficiently influence one another.

In a separate study, Demeter and Mező (2023a) examined the willingness to utilize artificial intelligence (AI) in pedagogical practice among university students in special education teacher. The study surveyed n = 157 university students in special education teacher using a structured questionnaire. Data analysis was conducted through statistical methods using SPSS software. The results indicated that only a small proportion of prospective special education teachers (18.5%) had encountered AI tools or applications during their academic studies. Moreover, respondents generally envisioned the use of AI tools primarily outside of classroom activities rather than as part of regular instruction. Regarding the willingness to use AI, no significant differences were found across age groups. Among participants under 24 years of age, 59.7% considered AI tools necessary in special education, while 65% of those over 24 shared this view. However, the study confirmed that prospective special education teachers possess limited and uncertain knowledge regarding AI applications, tools, and possibilities. This finding underscores the need for comprehensive educational initiatives to broaden understanding and competence in AI within the field of special education.

Similar to the study conducted among special education students, Demeter and Mező (2023b) also examined the experiences, tool knowledge, and willingness to utilize artificial intelligence (AI) among preservice teacher students. The study included n = 100 teacher training students from eight universities in Hungary. The results revealed that, surprisingly, 82 of the respondents had not encountered any AI tools during their studies, indicating that such tools are not yet widely integrated into the Hungarian educational context. Currently, AI-related content aimed at educational applications has not been incorporated into the teacher training curriculum. This is noteworthy, given that the European Union's recommendations explicitly emphasize the need for AI literacy in education, and a variety of free training programs have been developed around this topic (e.g., ethical guidelines for educators regarding the educational and learning use of AI and data, I16). The study further highlighted that AI-based tools remain largely unknown to preservice teachers. Consequently, due to this lack of familiarity, they would not apply these tools in practice, as they neither understand their usage nor recognize potential applications. However, a significant proportion of respondents expressed a willingness to participate in further training and professional development related to AI, demonstrating a generally positive and open attitude toward its integration.

Overall, these findings suggest that while preservice teachers currently lack experience and knowledge of AI tools, software, and educational robotics, they remain receptive to professional development opportunities and methodological resources that could facilitate the practical implementation of these technologies in educational settings.

Conclusion

The use of artificial intelligence (AI) in special education holds promising potential; however, its effective implementation is contingent not only on technological advancements but also on the parallel development of pedagogical expertise, ethical awareness, and critical thinking. At the same time, as Özbilen et al. (2025, p. 125) also formulates "that teachers' ethical concerns about the use of AI in special education must be addressed". Redefining the role of educators and re-conceptualizing the learning process are indispensable in special education contexts to establish genuinely learner-centered, equitable, and effective educational systems. Experimentation with the AI-based systems presented in this study may advance awareness of AI applications in special education and, consequently, foster the autodidactic learning of special education teachers. Empirical findings indicate that the pedagogical use of AI currently remains more of a novelty than a routine educational aid. Although participants generally approach AI with interest and openness, their limited knowledge constrains its practical usability. This underscores the responsibility of universities and training institutions that provide teacher education to assume a preparatory role in equipping educators or teachers for the effective integration of AI (Szontágh, 2025; Karap et al., 2025).

Additional Declaration

Author Contributions

In this study, the contribution of the authors was equal; both authors contributed equally to the development of the research idea, data analysis, writing and proofreading stages.

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Responsible Artificial Intelligence Statement

No artificial intelligence support was received in any part of this study.

Conflicts of Interest

The authors declare that there are no conflicts of interest related to the publication of this study.

Ethics Approval

In all processes of this study, the principles of Pen Academic Publishing Research Ethics Policy were followed. This study does not require ethics committee approval as it does not involve any direct application on human or animal subjects.

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