

The Future of Material Design: Perspectives of Future Special Educators on AI Tools

Esmanur Özdemir¹, Tahir Mete Artar²

¹Researcher, Bartın University, Center for Special Education Research and Practice

esmanurozdemir@bartin.edu.tr | ORCID: 921-928-921-928

²Assistant Professor, Bartın University, Faculty of Education

tmartar@bartin.edu.tr | ORCID: 921-928-921-928

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ABSTRACT:

This study aims to examine special education teacher candidates' views on material production processes using artificial intelligence (AI) tools. Employing a case study design within the qualitative research paradigm, semi-structured interviews were conducted with 13 teacher candidates enrolled in a special education undergraduate program. Participants were selected through purposive sampling, and the data were analyzed using content analysis. Findings revealed that teacher candidates predominantly used AI tools (ChatGPT, Gemini, Canva, NotebookLM) for educational purposes. Participants identified several benefits of AI-assisted material production for teachers, including guidance provision, workload reduction, and time efficiency. For students, benefits included individualization of instruction, acceleration of the learning process, and enhanced knowledge retention. Regarding ethical concerns, a significant portion of participants highlighted privacy violation risks, while others stated that AI-assisted material production would not pose ethical issues. The majority of teacher candidates expressed a need for foundational training in AI tool usage, with some specifically requesting training on special education-specific material production and effective prompt writing. The results underscore the need to strengthen AI literacy and technology integration in special education teacher preparation programs. Implications for curriculum development, pre-service teacher education, and ethical AI use in special education contexts are discussed.

Keywords: artificial intelligence, special education, teacher candidates, material production, qualitative study.

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1. Introduction

The rapid advances in digital technology have paved the way for artificial intelligence (AI) tools to transform many areas of social life. The field of education has also been substantially affected by this transformation, and AI applications are becoming increasingly widespread in the planning, implementation, and evaluation of

educational processes (Chiu et al., 2022; İslar & Kılıç, 2021; Wang et al., 2024). These new-generation technologies, referred to as generative AI, offer significant opportunities in education through their capacity to produce various types of content such as text, images, audio, and video. Today, AI tools such as ChatGPT, Gemini, DALL-E, and Canva are widely used by teachers and students. Moving beyond traditional

instructional materials, these tools make it possible to create interactive, personalized, and multisensory learning experiences.

The use of AI tools in educational settings offers important contributions by supporting pedagogical processes, individualizing learning experiences, and diversifying instructional materials (Armağan et al., 2024). When used appropriately by teachers and students, these tools enhance the efficiency of teaching and learning processes; and when supported by the necessary policies and regulations, they create a reliable environment for use (Chiu et al., 2022; Kutlucan & Seferoğlu, 2024). By reducing teachers' workload, AI tools make students' learning processes more practical and enjoyable (Köse et al., 2023). In addition, these tools are used effectively not only in planning instructional processes but also in accelerating school management and administrative processes. AI technologies have also begun to be used effectively in the assessment and evaluation processes of children with diverse needs (Zawacki-Richter et al., 2019). This process of change and transformation has also become clearly evident in special education practice, where assessment and instructional processes are conducted in an individualized manner (Hopcan et al., 2023; Karsenti, 2019). The use of AI tools in special education supports the individualization of instruction, contributes to assessment processes, increases students' level of independence, and strengthens teachers' teaching and learning processes (Karsenti, 2019; Vincent-Lancrin & Van der Vlies, 2020). Multimedia applications and materials created in digital environments have been found to positively affect learning (Derbissalova et al., 2024). In the field of special education, AI applications are used effectively in teaching and learning processes through chatbots, simulations, and virtual assistants (Alhaif et al., 2025). In their material preparation processes, teachers make instructional processes more efficient by using smart technologies alongside traditional methods (Singh & Ram, 2024). Ensuring the active participation of special education teacher candidates in material development processes

contributes to their development of positive attitudes toward the profession (Bayrakdar et al., 2016). Because it appeals to multiple senses simultaneously, preparing digital multimedia materials contributes to individualizing learning, accelerating learning, and developing teachers' material preparation skills. Although special education teacher candidates can use technological tools effectively, they need support to actively use digital applications employed in education (Tatlı & Akbulut, 2017).

At the center of the special education teaching process are instructional materials adapted to the developmental characteristics and needs of each individual. The learning processes of students with special needs have a structure in which individual differences are markedly prominent and which cannot be conducted with uniform materials. In line with individualized education programs (IEPs), it is important to develop materials appropriate to the student's performance level, interests, and learning style (Yıldırım, 2023). However, there is a considerable gap between the need for high-quality and diverse materials in the field and the limited nature of the existing material pool. AI tools offer considerable potential for addressing these challenges in the material development process in special education. Generative AI technologies allow materials to be rapidly personalized according to the student's individual needs, the same content to be diversified at different difficulty levels and in different modes of representation, and the material production process to be significantly accelerated (Derbissalova et al., 2024; Hopcan et al., 2023). These tools increase the number and variety of materials a teacher can produce with limited time and resources, thereby facilitating the implementation of the principle of individualization. Nevertheless, the pedagogical review of AI-generated materials and their adaptation in accordance with special education principles remains a critical stage that requires the teacher's field knowledge and professional judgment.

The place, potential, and scope of AI systems in education are quite extensive (Alwaqdani, 2025). Using AI systems ethically and appropriately in

special education is critical (Vincent-Lancrin & Van der Vlies, 2020). In this context, examining special education teacher candidates' experiences, attitudes, and perceptions of competence regarding AI tools is important. Because special education is a field in which individualized instructional approaches are mandatory, it is one of the areas in which the potential contributions of AI tools can be felt most clearly. The proliferation of AI technologies in education is also redefining the professional development processes of teacher candidates. Future teachers are expected to possess not only content and pedagogical knowledge but also the competence to effectively integrate digital and AI technologies into instructional processes. AI literacy stands out as a fundamental competence that encompasses understanding what AI is, how it works, and its affordances and limitations, as well as being able to use these tools in a purposeful and ethical manner (Alwaqadani, 2025; Chiu et al., 2022). Teacher candidates' development of competence in AI-supported instructional processes is closely related to the Technological Pedagogical Content Knowledge (TPACK) framework (Koehler & Mishra, 2009). Within the framework of the Technology Acceptance Model (TAM), it can be argued that special education teacher candidates' perceptions of AI tools as useful and easy to use for material production are likely to enhance their positive attitudes toward using these tools and their intentions to use them in the future. From a theoretical standpoint, this study can be associated with the TAM and the TPACK frameworks (Venkatesh & Davis, 2000). The original value of this study lies in its qualitative

approach to special education teacher candidates' material production processes using AI tools and its focus on participants' direct experiences. The aim of this study is to determine special education teacher candidates' views on material production processes using AI tools. Accordingly, answers to the following research questions were sought: (1) What are their general views on producing materials with AI tools? (2) How do they evaluate AI tools' contributions? (3) What ethical situations do they encounter? (4) What training content should be provided? (5) Which AI tools do they prefer?

2. Methodology

In this study, the case study design, one of the qualitative research methods, was used. A case study is a research design that allows an in-depth examination of a particular phenomenon or situation and is conducted using multiple data sources within a bounded system (Eisenhardt, 1989; Subaşı & Okumuş, 2017). In this context, the focus of the study is special education teacher candidates' views on the processes of producing materials for children with special needs using AI tools. The study group consisted of 13 teacher candidates enrolled in the special education teaching undergraduate program of a state university. Purposive sampling was used to determine the participants, referring to the deliberate selection of units that possess characteristics representative of the research topic (Tavşancıl & Aslan, 2001). No sensitive or vulnerable groups were involved, and participation was entirely voluntary.

Table 1 Demographic Characteristics of Participants

Participant Code	Gender	Grade Level	AI Experience
P1	Female	3rd Year	Yes
P2	Female	3rd Year	Yes
P3	Male	4th Year	Yes
P4	Female	3rd Year	Yes
P5	Female	4th Year	Limited
P6	Male	3rd Year	Yes

P7	Female	4th Year	Limited
P8	Female	3rd Year	Yes
P9	Male	4th Year	Yes
P10	Female	3rd Year	Limited
P11	Female	4th Year	Yes
P12	Male	3rd Year	Yes
P13	Female	4th Year	Limited

Note. AI = artificial intelligence.

Data Collection Tools

A semi-structured interview form was used as the data collection tool, consisting of open-ended questions prepared in line with themes directly related to the research problems. The interview questions were prepared by the researchers after reviewing the relevant literature and reviewed by experts in the fields of special education and technology. The interviews were conducted with audio recording, with participants' permission. Before the interviews, participants were informed through a Consent Form about the aim, scope, and duration of the study. The interviews lasted an average of 20–30 minutes.

Data Analysis

The data were analyzed using content analysis. The audio recordings were transcribed, uploaded to MAXQDA (2020) software, and thematic coding was performed. To ensure coding reliability, the data were coded independently by two researchers. Inter-coder reliability was calculated using the formula proposed by Miles and Huberman (1994): $\text{Reliability} = \frac{\text{Agreements}}{(\text{Agreements} + \text{Disagreements})} \times 100$. The data analysis process consisted of: (a) transcribing the audio recordings, (b) becoming familiar with the data, (c) identifying and coding meaningful statements, (d) categorizing the codes to form sub-themes, (e) grouping the sub-themes under main themes, and (f) interpreting the themes within the framework of the literature. An inductive approach was adopted.

Validity, Reliability and Ethics

Various strategies were employed to ensure reliability and validity. The researchers are experienced experts in special education;

interview questions were reviewed by field experts; coding was also performed by an additional expert, and inter-coder agreement was evaluated. The credibility of the findings was strengthened by including direct quotations. Scientific ethical principles were meticulously observed; participants gave written consent, and a pseudonym system was used to keep identities confidential.

3. Results

Special education teacher candidates' views on material production processes using AI tools were analyzed through content analysis, and the data were grouped under six main themes: (1) AI tools used, (2) purposes of AI tool usage, (3) contributions of producing materials with AI to teachers and students, (4) ethical situations that may be encountered, (5) teacher candidates' training needs, and (6) advantages of AI-supported material production.

AI Tools Used

When participants' views on the AI tools they used were examined, the most frequently used tool was ChatGPT, followed by Gemini. In addition, Canva and NotebookLM were also among the tools preferred. As reported by the participants, the prominence of ChatGPT can be associated with the tool's easy accessibility, broad language support, and flexibility in text-based content production. As a striking sub-finding, some participants regarded certain platforms that do not qualify as AI tools (such as interactive whiteboards, WIX, DergiPark, and Google Scholar) as AI tools, indicating that their AI literacy levels need to be developed.

Purposes of AI Tool Usage

Teacher candidates most frequently used AI tools for educational purposes, particularly to prepare assignments and develop materials for children with special needs. As P1 stated: "During my school education, I prepare things for children with special needs. I use Gemini and ChatGPT for educational purposes." This reveals that AI tools are integrated into teacher candidates' academic and professional preparation processes. In addition to educational use, participants stated that they also used these tools for acquiring information, conducting research, and creating visuals.

Contributions to Teachers and Students

Participants emphasized that AI tools guide the teacher, provide a basis for generating new ideas, reduce workload, and save time. As P4 noted: "For example, a teacher may have an idea in mind about a particular situation, and I think AI helps in generating new ideas in order to develop that idea or turn it into a concrete material." In the student dimension, participants stated that AI-generated materials individualize instruction, accelerate the learning process, attract attention, increase knowledge retention, and contribute to the development of independence.

Ethical Considerations

The ethical concern most frequently expressed by participants was the risk of privacy violation, associated with the possibility of sharing sensitive information—such as diagnostic information, individualized education programs, and performance data of students with special needs—with AI platforms. In contrast, some participants stated that materials produced with AI would not pose any ethical problem. Some noted that whether an ethical problem arises depends directly on the user's attention and responsibility.

Training Needs

A significant portion of participants primarily wished to receive training on the basic use of AI tools. As P2 stated: "I would like a simple, basic introduction to AI and to learn how to use it. Afterward, I would like to learn how we can use

it in a way appropriate to our field." Some participants expressed the view that additional training was unnecessary: "Most young people in my generation already know how to benefit from AI in this regard" (P3).

Advantages of AI-Assisted Material Production

Participants emphasized that AI-supported material production offers various advantages: innovative materials, lasting learning possibilities, acceleration of the educational process, cost reduction, and new ideas for teachers. Teacher candidates expressed the contribution of AI tools to their material preparation processes during their practicum as follows:

"When working with a student, I first entered the purpose of the activity and the student's learning needs into the AI tool. The tool provided me with several alternative material ideas. Based on these alternatives, I prepared a material that was more suitable for the student. This helped me develop a more individualized and effective activity." P8

AI tools make it possible to create interactive and multimedia materials that are difficult to produce with traditional methods, thereby increasing both material diversity and the efficiency of instructional processes. A participant expressed the contribution of AI tools to material production as follows: "Artificial intelligence helped me produce the material I had envisioned in an accurate way. I would not have been able to transform the emotions and events in the social story into animated visuals in any other way." P12

4. Discussion

This study examined special education teacher candidates' views on material production processes using AI tools. Within the scope of the first research question, the most frequently used AI tool was found to be ChatGPT, followed by Gemini. This finding is consistent with Azizoglu and Çakır (2025) who reported that ChatGPT was the most commonly used AI tool. Similarly, Rakap (2024) found that ChatGPT use in special education was effective in developing IEP goals. The widespread preference for ChatGPT can be

explained by its ease of use, broad language support, and effectiveness in producing text-based materials.

The fact that some teacher candidates regarded non-AI platforms as AI tools reveals conceptual confusion, aligning with Kutlucan and Seferoğlu's (2024) emphasis on the importance of AI literacy. This finding also parallels research emphasizing that teacher education programs for special education teachers should include content addressing different types of AI, their areas of use, and related applications (Hussein et al., 2025; Marino et al., 2023). Alwaqdani (2025) emphasized that teachers must first understand what AI is and its limitations. Findings on AI usage purposes indicate that teacher candidates used these tools most frequently for educational purposes, consistent with Singh and Ram's (2024) findings that teachers use smart technologies effectively in their material preparation processes.

The contributions provided by AI-supported material production were evaluated in terms of both teacher and student dimensions. Among contributions to teachers, providing guidance, reducing workload, and saving time were prominent, aligning with Köse et al.'s (2023) results. Among contributions to students, individualization of instruction was most frequently emphasized, demonstrating that the fundamental principle of special education overlaps with AI's personalization capacity (Hopcan et al., 2023; Karsenti, 2019; Şen & Akbay, 2023).

The ethical concern most frequently expressed was the risk of privacy violations, consistent with the literature emphasis on trustworthy and ethical AI use in education. AI systems may sometimes misinterpret the behaviors and emotional states of individuals with special needs (Hussein et al., 2025). In the literature, the use of AI in the production of special education materials and instructional processes is discussed from an ethical perspective, including protecting student data, transparency, and accountability (Marino et al., 2025; Vincent-Lancrin & Van der Vlies, 2020). The diversity of views on ethics indicates that teacher candidates need systematic

awareness-raising. When training needs were examined, the majority requested basic-level AI training, consistent with Alanazi et al.'s (2025) results. The view that additional training was unnecessary—when considered alongside conceptual confusion about AI tools—reveals that the difference between superficial familiarity and in-depth competence should not be overlooked.

5. Conclusion

This study comprehensively revealed special education teacher candidates' views on material production processes using AI tools. The findings converge on five main conclusions: (1) teacher candidates predominantly preferred ChatGPT and Gemini among AI tools; (2) AI tools provide guidance, workload reduction, and time savings for teachers, and individualized instruction, accelerated learning, and increased knowledge retention for students; (3) privacy violation risk stood out as the most important ethical concern, but ethical awareness levels differed; (4) the majority requested basic AI training, with additional needs for field-specific material production and prompt writing training; (5) AI-supported material production provides advantages such as innovation, lasting education, cost reduction, and new ideas.

Recommendations for practice: (1) AI literacy courses should be added to special education programs; (2) hands-on workshops on AI-supported material production should be organized; (3) institutional ethical frameworks concerning AI use should be established; (4) universities should develop policies for AI tools in special education; (5) the Ministry of National Education should include AI applications in in-service training programs; (6) AI tool developers should be encouraged to create customized tools for special education.

Recommendations for future research: (1) working with larger sample groups; (2) experimental studies examining AI-supported material production effects on student learning; (3) mixed-methods research on AI attitudes and self-efficacy; (4) longitudinal research tracking changes in AI usage skills; (5) comparative

examination of AI-supported material production targeting different disability groups.

Limitations: This study should be evaluated within certain limitations: (1) the study group consists of 13 teacher candidates from a single university, limiting generalizability; (2) data were

obtained solely from semi-structured interviews; (3) participants' AI experience levels varied; (4) given the rapidly evolving nature of AI technologies, findings may vary over time; (5) the quality of AI-produced materials was not evaluated.

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Author Declaration

Ethics Statement: This research was conducted in accordance with the Declaration of Helsinki and national legislation. Ethical approval for this study was granted by the Social and Human Sciences Ethics Committee of Social and Human Sciences Ethics Committee of Bartın University (Date: 11.02.2026, Protocol No: 2026-SBB-0033). Informed consent was obtained from all participants; data were stored securely. There is no conflict of interest. **Funding:** This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.