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Exploring ChatGPT in Supporting Special Education Undergraduates in Achieving CEC Standards: Students' Perception

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Abstract

As technology advances, AI, like ChatGPT, has become a pivotal tool in improving educational practices, particularly in special education (SE). These tools support the fourth Sustainable Development Goal (SDG), which concerns quality education for all, and the tenth SDG addresses reducing disparities. The purpose of this study is to explore the ChatGPT's role in achieving Council for Exceptional Children (CEC) standards among preservice special education teachers (SET) and the challenges they confront while using this tool. The study employed a descriptive quantitative approach with purposive sampling. The data were collected through an online questionnaire, and the study sample comprised 166 preservice SETs. The data analysis was conducted using descriptive statistics of means and standard deviations to understand the participants' perceptions comprehensively. The results indicated that the preservice SET assessed ChatGPT as a valuable tool that assisted them in meeting the CEC standards (M=3.39). The highest benefit was observed in achieving CEC Standard 2 (M= 3.87), highlighting meeting individual learning and developmental needs. Additionally, they face moderate challenges (M=2.7), primarily regarding concerns about the validity of generated data and a tendency to over-rely on the tool. These insights posit the vitality of integrating ChatGPT with SE programs while guiding students on its effective use.

Keywords: *ChatGPT, exceptional children, undergraduate perception, special need*

Introduction

The Chatbot-based applications within AI have attracted research attention and initiated new opportunities to enhance educational practices, substantially improve the educational processes and support students and teachers (Javaid et al., 2023; Karakose & Tülübas, 2023). ChatGPT is one of the most prominent advanced AI applications relying on natural language processing (NLP) and is trained on massive data. ChatGPT can understand written texts and reply to any quires naturally and semi-interactively, making it a powerful tool in many fields, including education (Abdullah et al., 2022; Baytak, 2024; Ogurlu & Mossholder, 2023).

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ChatGPT provides several pedagogical benefits and potentials in the educational context, such as immediate student support by addressing their inquiries, offering explanations, and correcting errors, enabling a highly personalized learning experience (First, 2023). These abilities highly enhance students' independence because students can access educational assistance anytime, anywhere, enhancing self-learning (Chauke et al., 2024; Hartley et al., 2024). Additionally, ChatGPT can help teachers prepare educational materials, create lesson plans, and develop creative ideas and virtual environments, simulations, and constant educational support outside the traditional classroom (Amri & Hisan, 2023; Dowd & Langran, 2024; ElSayary, 2024).

In SE, ChatGPT might enhance the quality of educational processes and help preserve SETs adapting to students' needs (Rakap, 2024; Rakap & Balikci, 2024; Seiradakis, 2023). This adjustment is imperative to ensure they are met effectively, thus supporting an inclusive learning environment. The SE is vital because it enables students with exceptionalities (SWE) to access equal educational opportunities, aligning with the SDGs. This alignment is especially true for SDG 4, "Quality Education," which focuses on providing inclusive and fair education, fostering continuous learning for all (SDG, 2024). It also includes preparing and qualifying SET to guarantee that students can acquire the necessary knowledge and skills to support the integration process and effectively respond to the SWE's specific needs. Achieving SDG 10, "Reduced inequalities" (SDG, 2024), by reducing educational gaps and enabling SWE to enjoy equal educational opportunities is also critical.

Institutions and agencies worldwide have been striving to upgrade the quality of SE services; for example, the CEC proposed international standards to ensure teachers and professionals of SWE possess the necessary knowledge and skills to deliver premium quality education (CEC, 2024). Furthermore, researchers and educators in the SE have investigated several tools that could support students' learning. Few SE studies have been conducted globally to investigate how to integrate ChatGPT. Conducted studies have revealed the positive role of ChatGPT in supporting new SETs in developing high-quality and efficient Individualized Education Program (IEP) goals for children with autism (Rakap, 2024; Rakap & Balikci, 2024). Research indicates the efficiency of ChatGPT in aiding (pre-in services) SET in preparing inclusive lesson plans and accommodating students with disabilities (SWD) (Dowd & Langran, 2024). Additionally, ChatGPT confirmed its positive impact on improving didactic planning among undergraduate SE (Sepúlveda-Irribarra, 2023).

Integrating ChatGPT in teaching bachelor's programs in SE could serve as an innovation to enhance learning, optimize the overall education standard, and foster more comprehensive access to knowledge. These steps support the achievement of the SDGs concerning quality education and reduce educational disparities. Despite the ChatGPT's vital role in education (Barber et al., 2021; De Zárate, 2024; Dempere et al., 2023; Elbanna & Armstrong, 2024; Hisan & Amri, 2023; Javaid et al., 2023; Li & Xing, 2021; Sallam, 2023; Sain et al., 2024; Zhang & Tur, 2023; Zawacki-Richter et al., 2019), the educational literature reveals a pressing need and a gap in studies that have addressed the advantages and obstacles of its application in SE. Therefore, researchers and educators in this field should explore the ChatGPT's educational potential in achieving the CEC standards, a pivotal tool in assessing the readiness of teachers to meet the SE's challenges and address the students' diversified needs.

Literature Review

ChatGPT in Educational Settings

ChatGPT is an AI technology developed to generate responses from user input (Ajlouni et al., 2023) and can be used for various purposes. It is an invaluable asset in education and crucially assists teachers and students. It produces texts based on prompts (the inputs it receives from the user) (Ajlouni et al., 2023; Karakose & Tülübas, 2023; Javaid et al., 2023). Many recent studies have explored ChatGPT potentiality and effectiveness across primary (K-12) and higher education (Zhang & Tur, 2023; De Zárate, 2024; Dempere et al., 2023; Ajlouni et al., 2023), and various academic fields, including medicine, counseling, mathematics, languages, and others (Ajlouni et al., 2023; Javaid et al., 2023; Hisan & Amri, 2023). ChatGPT offers many pedagogical benefits in education because it provides personalized learning and one-on-one tutoring for students, generates educational content, supports writing and research tasks, upholds the development of 21st-century skills, translates texts, yields immediate and personalized feedback, designs personalized assessments, and fosters independent learning. Moreover, it facilitates engagement, motivation and interaction by posting queries and discussing topics, also in addition to boosting productivity, efficiency, adaptive learning, scientific research, critical thinking, and problem-based learning (Barber et al., 2021; Elbanna & Armstrong, 2024; Sallam, 2023; Li & Xing, 2021; Sain et al., 2024; Zawacki-Richter et al., 2019). On top of that, it helps teachers teach and plan lessons

and assess students' performance (ElSayary, 2024; Javaid et al., 2023; Karakose & Tülübas, 2023). Despite the benefits and abilities of this AI tool, some concerns and obstacles exist for integrating ChatGPT in education, such as the validity of the produced content and ethical consequences that might occur. Previous studies highlighted these concerns and limitations, including potential bias, lack of deep understanding, security issues, problems with information accuracy, lack of human interaction, risks of misuse, and the importance of continued human oversight (Elbanna & Armstrong, 2024; ElSayary, 2024; Sain et al., 2024). AI tools are being increasingly used; consequently, it has become necessary to understand the potential benefits and the challenges they pose to integrate them effectively into the educational field.

Technology Integration in Special Education

In today's technological era, technological skills have become pivotal for SET because they effectively foster incorporating technology into education. The International Society for Technology in Education (ISTE) published standards for leaders, educators, and students, focusing on integrating technology. ISTE standards for learners are designed to ensure that learning is learner-led and concentrated on their active participation. For instance, students should utilize technology to recognize and address problems by devising creative, practical, or novel solutions (Crompton & Burke, 2024). Conversely, ISTE standards for educators should provide a roadmap to assist educators in preparing learner-driven ones (Crompton, 2023). These standards accentuate the role of using technology in personalizing the learning experiences, accommodating the diverse needs of learners, and fostering independent learning (ISTE, 2024).

Technology assists in creating innovative and equitable learning environments (Kizilcec et al., 2023; Sivrikaya et al., 2023; Santamaría Graff et al., 2023). Therefore, all students and educators in this technological era should possess the technological skills and know how to implement them effectively to create innovative solutions. In the SE field, Coflan and Kaye (2020) highlighted the crucial potential of educational technology in enhancing learning. Furthermore, the technological skills of SE candidates are necessary to meet CEC standards and ensure the success and potential of children and youth with disabilities or gifts and talents (CEC, 2024). For example, Standard 4 explicitly requires candidates to possess technological skills to meet its objective. It stipulates that candidates evaluate, analyze, understand, and communicate students' progress toward measurable goals, collaborating with peers using technology when appropriate.

Literature in SE demonstrated some challenges concerning SET, including using assistive technologies to meet students need in inclusive classrooms, modify curricula and provide individualized instruction (Khazanchi & Khazanchi, 2024, Isgett & Wang; 2021; Alsolami, 2022; Abu-Alghayth, 2022; Chukwuemeka & Samaila, 2020). Moreover, Diehm (2017) indicates that developing high-quality IEP is a challenge particularly encountered by those SETs who are new to the profession with limited experience. However, studies demonstrated the potential of technologies in SE fields, including improving students' engagement, motivation, achievements, language, and basic life skills (Barton et al, 2017; Cheng & Lai, 2020; Cumming & Draper Rodríguez, 2017; Drigas et al., 2014; Rodríguez & Cumming, 2016; Zhang, 2000). Moreover, it helps meet individuals' needs and simplify challenging ideas (Williams et al., 2006), an essential aspect of the extended core curriculum for SWE (Al-Zboon, 2015; Al-Zboon, 2016a; Al-Zboon & Ahmad, 2016), and a key skill for SE teachers (Dababneh et al., 2016; Theeb et al., 2014). More specifically, Anderson and Petch-Hogan (2001) conducted an exploratory study in Southeast Missouri State with eight preservice SETs. The study posed that involvement in a technology-enhanced environment increased SETs' perception's effect in improving their knowledge of the appropriate use of technology, fostering student learning, and using it as an instructional tool. Furthermore, they highlight the vitality of incorporating hands-on technology experiences into SETs' preparation programs to elevate their competence in using technology in education.

Recent research on SE underscores the impact of innovative tools, like ChatGPT, in supporting SET as they formulate IEP goals. ChatGPT analyzes teachers' information about students' needs and strengths to dynamically generate personalized and tailored goals for each student (Rakap & Balikci, 2024). Furthermore, Billman and Hoppin (2024) accentuate the effectiveness of writing and implementing IEPs to accommodate the needs of SWD, the core duties of SETs in schools. Furthermore, they highlight the remarkable potential of Generative AI in supporting SETs in their work. Similarly, Rakap and Balikci (2024) conclude that integrating ChatGPT can effectively improve outcomes for children in SE by fostering the process of developing individualized and comprehensive educational goals. Moreover, Goldman et al. (2024) recognize that AI tools, such as ChatGPT and Bard, may assist SET in reducing administrative (non-teaching tasks) loads and might decrease the load of SET paperwork. These tools also generate a skeleton structure for the IEP's snapshot, summarizing a whole IEP document, thus reducing documentation time and developing data collection sheets to monitor students' progress toward specific IEP goals. They

help form resource lists and handouts to support guardians and families of students with IEPs and promptly translate these documents into various languages.

Dowd and Langran (2024) recommended leveraging ChatGPT's capabilities while helping SETs create inclusive lesson plans. Their mixed-method study revealed a shift in ChatGPT's perception as a tool and collaborative partner in organizing the lesson, accentuating its growing role as a thought partner in SE. Sepúlveda-Irribarra (2023) conducted a descriptive study among ten undergraduate SE students and found that ChatGPT boosted productivity and streamlined teaching and administrative responsibilities, supporting these capabilities. The findings demonstrated that ninety percent of the students found ChatGPT's suggestions straightforward to understand, and the majority complimented its positive impact on improving didactic planning. However, only a few empirical studies addressed the benefits of AI among SE teachers. Rakap (2024) conducted a quasi-experimental study among 22 novice SETs with the findings depicting that using ChatGPT enhanced the development of IEP goals for children with autism, reduced their developing time, and made more comprehensive and specific goals. The study further depicts that ChatGPT supports SETs in efficiently developing high-quality IEP goals. Similarly, Rakap and Balikci (2024) conducted a quasi-experimental study, encompassing 30 teachers working with children with autism in preschool settings. Results revealed that teachers who used ChatGPT developed higher-quality goals that focused on communication, social, motor/sensory, and self-care skills, and ChatGPT reduced the time spent developing goals. Despite the potential role of technology in supporting special education teachers and learners few studies have addressed the preparation and knowledge of preservice SE teachers concerning integrating technology into their instructional practice (Alanazy & Alrusaiyes, 2021). Furthermore, several challenges are faced while incorporating technology into the SE field, as previous studies such as those in KSA posit.

Alanazy and Alrusaiyes (2021) conducted a descriptive study investigating 58 female preservice SE teachers. Their study demonstrated that teachers needed additional training due to inadequate equipment, practice, and maintenance. The study recommends reinforcing technology courses in SET's preparation programs and highlighting the practical aspects of integrating technology into teaching. Similarly, Al-Zboon (2022) conducted a qualitative study utilizing content analysis methodology among eight preservice SETs in Jordan. The findings demonstrated that most participants were dissatisfied with the educational programs preparing them for assistive technology. On top of that, future SETs could not adopt and use assistive technology effectively.

Additionally, Billman and Hoppin (2024) conducted a study targeting new SETs to analyze their reflections and perceptions about using artificial intelligence (AI) to devise Individualized Education Program (IEP) goals through a practice-based activity. Results illustrated that teachers preferred using traditional formats over AI, and the findings regarding AI use did not align with different prompts. The same study also accentuated pivotal ethical considerations SETs should consider when implementing AI. Even though ChatGPT has potential in SE, research underscored some concerns, including bias arising from historical and societal issues (Akgun & Greenhow, 2022), access, affordability, accountability, sustainability, and social justice (Luo et al., 2023). Therefore, further investigations must discover the potential of AI technologies like ChatGPT in supporting SETs.

The above literature suggests that integrating innovative technologies in SE is vital and beneficial for teachers and learners. However, this integration has involved several challenges requiring further research. Innovative technologies, such as ChatGPT, offer promising opportunities to help improve the preparation of preservice SETs. However, a substantial lack of research globally exploring the benefits and challenges in preparing preservice SETs highlights the need for such an investigation. Additionally, educators should prepare preservice teachers based on CEC standards to ensure that candidates master the essential knowledge and skills to deliver high-quality education to students with exceptionalities. Consequently, our study is designed to thoroughly explore and analyze the potential role of ChatGPT in supporting preservice SETs to attain CEC Standards regarding the benefits that could arise and the challenges encountered while using it learning. Our study is pivotal because it will be the first to explore this vital issue. Specifically, we aim to address the following research questions:

- RQ1: What is the preservice SETs' perception of the benefits of using ChatGPT in achieving CEC standards?
- RQ2: What challenges do preservice SETs at the University of Jordan (UOJ) encounter when using ChatGPT in their learning?

Methodology

Design

A descriptive quantitative approach with purposive sampling was employed to thoroughly investigate the role of ChatGPT in supporting pre-service SET to help them achieve the CEC standards specifically called "The 2020 Initial Practice-Based Professional Preparation Standards for Special Educators," also termed "Initial K-12 Standards." Data were collected through an electronic questionnaire carefully designed explicitly to measure students' perceptions of the benefits and challenges concerning using ChatGPT to support them in achieving CEC Initial K-12 Standards.

Population

Researchers use purposive sampling because it effectively displays a specific field by targeting knowledgeable professionals or selecting experts with experience in that field, such as undergraduate students who have practiced and used ChatGPT in their learning process (Tongco, 2007). The research's population comprises second-year, third-year, and fourth-year undergraduate SE students enrolled in the 1st semester of the 2024-2025 scholastic year, totaling 265 students (21 male and 244 female). Using established specific criteria, the researchers selected the study sample as follows: 1) undergraduate SE students registered in the 1st semester of the 2024-2025 scholastic year, 2) students in their 2nd year or beyond, and 3) those with at least 1 month of experience using ChatGPT while studying SE subjects.

After ensuring the sample criteria were met, one hundred and sixty-six students (12 males and 154 females) participated in the study. The distribution of students was as follows: 45.8 % from the second year, 40.4 % from the third year, and 13.9 % from the fourth year. The participants' GPA ranged from excellent to poor, and their digital skills spanned from beginner to expert. Using Thomson's equation calculations (Thompson, 2012), indicating the need for a sample size of 158 participants with a 95% confidence level and a 5% margin of error, the selected sample was determined as sufficient and appropriate to meet the study's objectives. Table 1 depicts the demographic profile of the participants.

Table 1

The Demographic Profile of the Study Sample (N= 166*)*

No	Characteristic		F	P
1	Gender	Male	12	7.2
		Female	154	92.8
2	GPA	Excellent	32	19.3
		Very good	70	42.2
		Good	59	35.5
		Poor	5	3.0
3	Year at school	Second	76	45.8
		Third	67	40.4
		Fourth	23	13.9
4	Digital Skills	Beginner	13	7.8
		Intermediate	97	58.4
		Advance	52	31.3
		Experts	4	2.4

Note. F: Frequencies, P: Percentage.

Study Instruments

An online, self-administered questionnaire designed to evaluate students' perceptions of using ChatGPT in SE (POU-CSP) was used. The questionnaire was developed using the insights from the literature on "CEC Initial K-12 Standards" and the students' perceptions of using AI application and ChatGPT in the learning process and their associated challenges (CEC, 2024; Ajlouni et al., 2023). The POU-CSP instrument, comprising 48 items, was employed to collect data about pre-service SET's perceptions' of using ChatGPT and encompasses three parts: part A comprises demographic information (4 items) having data on respondents' gender, GPA, academic level, and digital skills.

Part B encompasses Preservice SETs' perceptions concerning the advantages of using ChatGPT in supporting the CEC Professional Standards (PB-CEC) scale with 38 items adopted from the "Initial K-12 Standards" distributed over seven subscales. It includes 1- "Ethical Professional Learning and Practice" subscale (PB-Std1) comprising three items, 2- "Meeting Individual Learning and Developmental Needs" subscale (PB-Std2) encompassing two items, 3- "Mastering Subject Content and Specialized Curriculum" subscale (PB-Std3) with two items, 4- "Assessment for Data-Driven Decision Making" subscale (PB-Std4), 5- "Effective Instruction for Learning"

subscale (PB-Std5) including six items, 6- "Fostering Social, Emotional, and Behavioral Development" subscale (PB-Std6), 7 "Working Together with Team Members" subscale (PB-Std7) with four items.

Part C encompasses the preservice SETs' challenges scale, comprising nine items that address the difficulties encountered while using ChatGPT in learning SE subjects. The questionnaire lasted approximately 30 minutes for participants to complete and employed a 5-point Likert scale, with responses from "1: strongly disagree" to "5: strongly agree."

Establishing Study Validity and Reliability

The content validity of the questionnaire was verified by nine experts from faculty members specialized in educational technology, SE, educational psychology, counseling, mental health, measurement, and evaluation from faculties of educational sciences. The questionnaire was administered to a pilot sample of 35 undergraduate students (33 females and 2 males) from the study population but outside the study sample to verify the internal validity of the tool. Afterward, Pearson's correlation coefficient and Cronbach's alpha coefficient were determined for each subscale separately.

The correlation of the item with its subscale for the preservice SET's perceptions of the benefits scale ranged from 0.31 to 0.71, and the correlation of the item with the overall scale was between 0.28 and 0.67. Moreover, the correlation for the challenges subscale ranged from 0.41 to 0.73; all were statistically significant at the $p < 0.05$ level. Furthermore, Cronbach's alpha coefficient was 0.82 for the perceptions of benefits subscale and 0.85 for the perceived challenges subscale, as Table 2 depicts. These values confirm the instrument's high validity and reliability.

Table 2

Cronbach's Alphas for the POU-CSP Questionnaire

Scale	Subscale	Cronbach's alphas
Perception of the Benefits (PB-CEC)	1. PB-Std1: Ethical Professional Learning and Practice	0.72
	2. PB-Std2: Meeting Individual Learning and Developmental Needs	0.75
	3. PB-Std3: Mastering Subject Content and Specialized Curriculum	0.73
	4. PB-Std4: Assessment for Data-Driven Decision-Making	0.76
	5. PB-Std5: Effective Instruction for Learning	0.78
	6. PB-Std6: Fostering Social, Emotional, and Behavioral Development	0.79
	7. PB-Std7: Working Together with Team Members	0.75
PB-CEC (Total:38 items)		0.82
Challenges (9 items)		0.85

Data Collection

Data were collected through an online, self-administered questionnaire completed by pre-service SETs at the University of Jordan. The SE instructors distributed the survey URL on learning and social communication platforms, bringing SE students from Moodle, Microsoft Teams, WhatsApp, and Facebook groups, to ensure comprehensive coverage and improved accessibility. To maintain the study's integrity, students not meeting the specified criteria were excluded from the sample, including first-year students and students not using ChatGPT in their learning. This methodology ensured that the data collected were representative and accurately reflected the students' experiences. It enabled a detailed analysis of how ChatGPT contributed to achieving CEC standards and the challenges students faced during its use in their learning. Data were collected for 3 weeks at the beginning of the first semester, providing a robust timeframe to gather adequate responses. Ethical approval for the study was obtained from the participants and the Institutional Review Board (IRB number 20244358) at the UOJ. Participants were also informed about the study's objectives, the option of not participating, and the ability to withdraw unconditionally from the study at any time.

Data Analysis

The Statistical Package for the Social Sciences (SPSS) program version 26.0 was employed to analyze the data. Descriptive statistics, such as means (M), standard deviations (SD), frequencies (F), and percentages (P), were calculated, and the responses collected from preserves SET at the UOJ were interpreted. These statistical methods were chosen because they provide a comprehensive data analysis, enabling an in-depth understanding of SET's challenges concerning using ChatGPT and their perceptions of the benefits of achieving the CEC standards. Descriptive statistics are particularly appropriate for this study because they highlight patterns and insights from the collected data (Kaur et al., 2018), aligning with the study's objectives and addressing the study's questions.

Results and Discussion

RQ1: What are the preservice SETs' perceptions of the benefits of using ChatGPT in achieving CEC standards?

The study employed descriptive statistics to study participants' responses to the PB-CEC subscales. This approach enabled a comprehensive examination of the data and provided a detailed understanding of preservice SETs' perceptions across the different CEC standards assessed by these subscales.

CEC Standard 1: "Ethical Professional Learning and Practice": The PB-std1 subscale highlights how preservice SETs perceive the use of ChatGPT to support Participating in Professional Development and Conducting Practice in Alignment with Ethical Standards. The PB-std1 subscale captures these perceptions, and Table 3 depicts a detailed summary of the data analysis for this subscale.

Table 3

Descriptive Overview of Response Data for Preservice SETs on the PB-Std1 Subscale

No	Statements	SD P(F)	D P(F)	N P(F)	A P(F)	SA P(F)	M ± SD
5.	Improves my ability to follow ethical standards and legal regulations.	0.6(1)	8.4(14)	29.5(49)	39.2(65)	22.3(37)	3.74 ± 0.92
6.	Strengthens my capacity to advocate for improved outcomes for SWE and their families while considering their varied backgrounds.	5.4(9)	25.3(42)	20.5(34)	34.3(57)	14.5(24)	3.27 ± 1.15
7.	Enhances my ability to design and implement professional development grounded in student evaluations, personal reflection, and proven practices.	33.7(56)	30.7(51)	13.9(23)	17.5(29)	4.2(7)	2.28 ± 1.22
Total							3.10 ± 0.66

Note. F: frequencies, P: percentage, SD: strongly disagree, D: disagree, N: neutral, A: agree, SA: strongly agree.

Table 3 illustrates that 61% of participants agreed that ChatGPT helps them improve their ability to follow ethical standards and legal regulations. This finding could contribute to ChatGPT's explanation and resources assisting preservice SET in deepening their understanding. A previous study also found that ChatGPT enhances undergraduate knowledge of the ethical guidelines for the psychological counseling profession (Ajlouni et al., 2023), aligning with this finding, as it was further reinforced by findings of the following studies (Biswas, 2023a; Baidoo-Anu & Ansah, 2023; Chan & Hu, 2023).

Furthermore, 30.7 % of respondents did not agree that ChatGPT enriches their skills in advocating for improved outcomes for SWE and their families, considering diverse backgrounds (M=3.27). This finding could posit that ChatGPT cannot engage in real-world advocacy or adapt to the unique emotional, social, and cultural dynamics in family interactions, consistent with previous investigations revealing that ChatGPT lacked emotional intelligence (Biswas, 2023a; Kalla et al., 2023). Additionally, collaboration is typically relational and context-driven. Thus, it depends on human psychological skills, including emotional intelligence and interpersonal and communication skills, where ChatGPT cannot replicate these social dynamics. Moreover, ChatGPT cannot supplant the direct experience of working with students, families, and school personnel in real-world settings. Some aspects of special education often require a personalized, human approach, including peer relationships, self-regulation, independence, and safety, because these aspects require empathy, trust-building, and communication, which ChatGPT cannot offer. This finding aligns with the study by Ajlouni et al. (2023), reporting that ChatGPT could not perceive or interpret empathetic, emotional, and nonverbal cues such as body language. Previous studies also support this emotional limitation (Biswas, 2023a; Kalla et al., 2023).

On top of that, only 21.7 % of the respondents agree that ChatGPT supported their ability to design and implement professional development grounded in student evaluations, personal reflection, and proven practices. This situation could contribute to this analysis requiring some human skills, including observation and interpreting qualitative data (e.g., students' behavior and interaction patterns) rather than quantitative data alone (e.g., test scores). ChatGPT lacks self-reflection and cannot provide reflective prompts developed from real-life teaching experiences that require an understanding of the emotional and relational aspects of teaching. ChatGPT cannot encompass this personalized, emotional reflection (Ajlouni et al., 2023; Biswas, 2023a; Kalla et al., 2023). However, the overall mean for this subscale was 3.10, indicating that ChatGPT moderately helps students achieve first CEC standards.

CEC Standard 2: *Meeting Individual Learning and Developmental Needs.* PB-Std2 addresses how preservice SETs perceive using ChatGPT to support Meeting Individual Learning and Developmental Needs of Every Individual. Table 4 depicts a detailed summary of the data analysis for this subscale.

Table 4

Descriptive Overview of Response Data for Preservice SETs on PB-Std2 Subscale

No	Statements	SD P(F)	D P(F)	N P(F)	A P(F)	SA P(F)	M ± SD
8.	Helps me use knowledge of human development to create personalized learning for students with exceptionalities.	3.6(6)	19.9(28)	12.7(21)	40.4(67)	26.5(44)	3.69 ± 1.14
9.	Assists me in applying my understanding of diverse factors to plan learning activities and environments.	1.2(2)	7.8(13)	13.3(22)	48.8(81)	28.9(48)	3.96 ± 0.92
10.	Supports me in using developmental insights to implement effective educational experiences.	0.6(1)	8.4(14)	14.5(24)	49.4(82)	27.1(45)	3.94 ± 0.90
Total							3.87 ± 0.71

As Table 4 illustrates, 66.9% of the respondents reported that they perceived high benefits for ChatGPT in assisting them in using knowledge of human development to create personalized learning for SWE. Thus, participants perceived ChatGPT as a beneficial tool in applying theoretical knowledge to practical and personalized learning activities, as supported by previous studies in counseling mental health and medical education. This finding indicates that ChatGPT provides students with a virtual practical environment to link theory with practice (Ajlouni et al., 2023; Amri & Hisan, 2023; Eysenbach, 2023). Moreover, 67.7 % of respondents agree that ChatGPT helps them apply their understanding of diverse factors to plan learning activities and environments. Furthermore, 76.5% of respondents posit that ChatGPT supports them in using developmental insights to implement effective educational experiences. These high mean values on these items suggest that participants strongly agree or frequently find ChatGPT helpful in applying their knowledge of diverse factors, including cultural, social, and individual differences while planning learning activities and environments. Additionally, these results reveal that participants feel ChatGPT effectively supports them in utilizing developmental insights to design and implement relevant and effective educational experiences for their students' needs. Therefore, ChatGPT is reflected as a valuable tool in helping teachers create more tailored and developmentally appropriate learning experiences, as supported by the findings of Rakap and Balikci (2024) and Ajlouni et al. (2023).

Predominantly, preservice SETs at the UOJ perceived ChatGPT as supportive in achieving CEC standard 2 (M= 3.87), helping them implement theoretical knowledge, and aiding them in planning and applying learning experiences that consider the diverse factors impacting student learning.

CEC Standard 3: *Mastering Subject Content and Specialized Curriculum*. The PB-Std3 subscale demonstrates how Preservice SETs perceive their ability to exhibit expertise in subject content and specialized curriculum knowledge. Table 5 illustrates a detailed summary of the data analysis for this subscale.

Table 5

Descriptive Overview of Response Data for Preservice SETs on PB-Std3 Subscale

No	Statements	SD P(F)	D P(F)	N P(F)	A P(F)	SA P(F)	M ± SD
11.	Helps me use my curriculum knowledge to guide instructional and program decisions for students with exceptionalities.	1.2(2)	6 (10)	11.4(19)	53.6(89)	27.7(46)	4.01 ± 0.86
12.	Assists me in adapting the curriculum for Learners with exceptional needs to access core content.	0.6(1)	4.8(8)	13.9(23)	53.6(89)	27.1(45)	4.02 ± 0.81
13.	Supports me in applying strategies for student success in various settings.	3.6(6)	6.0(10)	14.5(24)	47(78)	28.9(48)	3.92 ± 1.00
14.	Ensures that specialized instruction is developed to meet standards and individual goals.	4.8(8)	18.1(30)	25.3(42)	38.6(64)	13.3(22)	3.37 ± 1.08
15.	Helps implement specialized instruction to achieve curricular and individualized targets.	1.8(3)	6.6(11)	13.9(23)	50(83)	27.7(46)	3.95 ± 0.92
Total							3.85 ± 0.67

Most respondents (83%) agreed that ChatGPT helps them use their curriculum knowledge to guide instructional and program decisions for students with exceptionalities (m=4.01). Moreover, 80.7% posited that ChatGPT assists them in "adapting the curriculum for learners with exceptional needs to access core content," demonstrating elevated perceived effectiveness in using ChatGPT to enhance and tailor the curriculum to meet the needs of SWE better. This finding reinforces the previous study that confirmed the ChatGPT's potential to support the learning process (Ajlouni et al., 2023).

Furthermore, 85.9% of respondents agreed that ChatGPT helps them implement strategies for student success in various settings. On top of that, 51.9% have a strong consensus that ChatGPT assists them in ensuring that specialized instruction is crafted to align with standards while addressing individual goals. Moreover, 77.7 % of the respondents posited that ChatGPT helps them implement specialized instructions to achieve curricular and individualized targets. These findings depict that ChatGPT assists respondents in enhancing the curriculum and applying the

necessary skills and strategies to succeed. It also ensures that their designed instructions are developed and implemented to achieve curricular standards and individualized goals, aligning with the findings by Rakap and Balikci (2024). Thus, ChatGPT can effectively improve outcomes for children in SE. Moreover, these children feel that ChatGPT assists them in mastering the skills required to achieve individualized goals for SWE.

The overall mean for the PB-Std3 scale was m=3.85, at a high level, implying that preservice SETs perceived ChatGPT as a highly effective tool. This tool helps them apply academic content to guide their instructional decisions for students with exceptionalities. This finding aligns with the result of Ajlouni et al. (2023), who found that undergraduates had a high level of perceived ChatGPT, which helped them learn counseling and mental health topics.

CEC Standard 4: *Assessment for Data-Driven Decision Making*. The PB-Std4 demonstrates how students perceive the use of ChatGPT to support their Utilizing Assessment to Analyze the Learner and Environment for Data-Driven Decisions. Table 6 presents a detailed summary of the data analysis for the PB-std4 subscale.

Table 6

Descriptive Overview of Response Data for Preservice SETs on PB-Std4 Subscale

No	Statements	SD P(F)	D P(F)	N P(F)	A P(F)	SA P(F)	M ± SD
16.	Helps me collaboratively develop and select learning, behavior, and environment measures.	12.7(21)	27.1(45)	21.1(35)	33.1(55)	6(10)	2.93 ± 1.16
17.	Improves my ability to analyze and interpret these measures together collaboratively.	10.8(18)	27.7(46)	16.9(28)	39.2(65)	5.4(9)	3.01 ± 1.15
18.	Assist in evaluating and supporting intervention systems for all students.	12(20)	30.7(51)	15.7(26)	34.9(58)	6.6(11)	2.93 ± 1.19
19.	Helps me develop multiple measures to assess student learning and behavior.	1.2(2)	7.8(13)	13.3(22)	47(78)	30.7(51)	3.98 ± 0.93
20.	Helps me select culturally and linguistically appropriate measures.	0.6(1)	4.2(7)	13.3(22)	44(73)	38(63)	4.14 ± 0.85
21.	Helps me administer procedures necessary to determine special education services eligibility.	8.4(14)	29.5(49)	13.9(23)	41(68)	7.2(12)	3.09 ± 1.15
22.	Helps me interpret results from various measures.	3.6(6)	4.2(7)	7.8(13)	41(68)	43.4(72)	4.16 ± 0.99
23.	Enhances my ability to collaboratively track measurable student outcomes, including processes such as assessment, analysis, interpretation, and communication.	36.7(61)	27.1(45)	15.1(25)	16.9(28)	4.2(7)	2.25 ± 1.23
24.	Enhances my ability to use technology to track measurable student outcomes.	0.6(1)	6(10)	13.3(22)	42.2(70)	38(63)	4.11 ± 0.89
25.	Enhances my ability to utilize measurable student outcomes to inform planning (i.e., short- and long-term).	1.2(2)	5.4(9)	15.7(26)	49.4(82)	28.9(47)	3.98 ± 0.88

26.	Helps me continuously adapt instruction based on measurable student outcomes.	1.2(2)	7.8(13)	15.7(26)	45.8(76)	29.5(49)	3.95 ± 0.94
Total							3.50 ± 0.53

Table 5 reveals interesting patterns. About 40 % of respondents did not agree that ChatGPT helps them develop and select learning, behavior, and environment measures collaboratively. Similarly, 38.5% did not acknowledge that ChatGPT enhances their ability to collaboratively analyze and interpret these measures. Furthermore, 63.8 % of respondents did not concur that ChatGPT enhances their ability to track measurable student outcomes collaboratively, including assessment, analysis, interpretation, and communication processes. These results highlight ChatGPT's limited potential in facilitating ongoing, collaborative outcomes tracking. This finding may be linked to the collaborative nature of the task, requiring human interaction, ongoing communication, context-specific judgment, and areas where ChatGPT's role is more limited than its ability to assist with interpreting and selecting assessment measures. These limitations of ChatGPT align with the findings of Ajlouni et al. (2023), revealing limitations and a low level of agreement among undergraduates regarding the benefits of ChatGPT. These benefits include reflection on interpretive skills, empathetic care, establishing boundaries with colleagues, receptiveness to feedback, authenticity, and sincerity, maintaining records and completing tasks, and developing non-verbal communication skills. Furthermore, these findings supported other studies, reporting that ChatGPT lacks emotional intelligence (Biswas, 2023a; Kalla et al., 2023) and human interaction (ElSayary, 2024), which are pivotal for communication and collaboration or observation of students as a process for assessment.

Furthermore, 41.5% of respondents agreed that ChatGPT assists them in evaluating and supporting intervention systems for all students. This assistance can be explained by classroom interventions often requiring personalized and context-specific solutions and human interaction, limiting the perceived effectiveness of ChatGPT in this area (Ajlouni et al., 2023; ElSayary, 2024). Moreover, most (77.7%) respondents reported that ChatGPT helps them develop multiple measures to assess student learning and behavior. This finding demonstrates ChatGPT's ability to generate ideas and data for evaluating students in multiple ways, including formative, summative assessments, and behavioral tracking, as confirmed by the findings of Fuller et al. (2024).

Over half of the respondents (58.2%) stated that ChatGPT assists them in administering prerequisite procedures for determining eligibility for special education services. This result

suggests that ChatGPT can provide guidance, outline procedural steps, and ensure educators understand eligibility criteria. This complicated area involves gathering data, interpreting assessments, and ensuring legal and educational standards compliance. However, it can contribute to ChatGPT's potential to explain and provide detailed data in understanding the idea or procedures (Ajlouni et al., 2023) and their potential to interpret, analyze, and evaluate data (Fuller et al., 2024).

Over 80% of respondents agree with statements 20 and 22, reading "Helps me select culturally and linguistically appropriate measures" and "Helps me interpret results from various measures," with the mean values of 4.14 and 4.16. These results demonstrate that students find ChatGPT a highly beneficial tool for interpreting diverse assessment data and ensuring that their assessments are appropriate concerning culture and linguistics. This assessment contributes to the features of ChatGPT, such as providing recourse for information related to several evaluations (Biswas, 2023c; Baidoo-Anu & Ansah, 2023; Chan & Hu, 2023) and their abilities to translate and edit them (Goldman et al., 2024), where the ChatGPT is a language model (Kasneci et al., 2023).

Furthermore, 80 % of respondents reported that ChatGPT improves their ability to use the technology to track measurable student outcomes. At least 75 % agree that ChatGPT enhances their ability to use measurable student outcomes to inform planning (i.e., short- and long-term). These examples illustrate the abilities of ChatGPT to understand, interpret, analyze, and process information rather than just recalling or retrieving it (Vij et al., 2024). Moreover, ChatGPT provides step-by-step explanations and procedures to develop and track IEP goals and offers suggestions for development and progress (Yuan et al., 2024). For instance, imagine a SET using ChatGPT to track SWE's academic progress. The SET sets individual goals for each student within their IEPs to improve reading skills; then, it provides ChatGPT with students' progress data (i.e., quiz scores, classroom observations, and skill assessments). Based on these data, ChatGPT could support SET by analyzing this data and providing detailed reports highlighting the students' progress. More specifically, ChatGPT could offer recommendations for interventions using the data, such as modifying the teaching plan or using new instructional strategies. This finding is supported by Yuan et al. (2024), who highlighted the potential of ChatGPT in assisting SET with achieving the IEP goals and ensuring that it aligns with the SMART framework and fully meets the student's needs, including the measurable track. However, with ChatGPT's ability to provide precise, data-driven analysis, the SET can make more informed decisions on adjusting their

teaching strategies for the student, resulting in more effective achievement of educational goals. Goldman et al. (2024) also accentuate the role of ChatGPT in supporting SETs to summarize a whole IEP document and develop data collection sheets to monitor student progress toward specific IEP goals. Additionally, ChatGpt assists in creating resource lists and handouts to support guardians and families of students with IEPs and offers rapid translation of these documents into various languages.

Findings in Table 5 confirmed a medium average across all items in PB-Std4, implying that preservice SET perceived ChatGPT as a helpful tool in the assessment process. However, it may not fully meet the demands of more collaborative, dynamic tasks, including outcome tracking and continuous instructional adjustments.

CEC Standard 5: *Effective Instruction for Learning*. PB-Std5 indicates how students perceive ChatGPT's use to support them in ensuring Learning through Effective Teaching Methods. Table 7 illustrates a detailed summary of the data analysis for the PB-std5 subscale.

Table 7

Descriptive Overview of Response Data for Preservice SETs on PB-Std5 Subscale

No	Statements	SD P(F)	D P(F)	N P(F)	A P(F)	SA P(F)	M ± SD
27.	Helps me use assessment results, including self-assessments, to understand students' abilities, considering cultural and linguistic diversity.	0.6(1)	7.8(13)	14.5(24)	47(78)	30.1(50)	3.98 ± 0.90
28.	Guides me in interpreting data to plan instruction that meets academic and non-academic goals.	1.2(2)	6.6(11)	12(20)	51.2(85)	28.9(48)	4.00 ± 0.89
29.	Supports me in applying strategies to boost student engagement and motivation.	1.2(2)	6(10)	13.9(23)	50(83)	28.9(48)	3.99 ± 0.88
30.	Assists me in enhancing students' self-regulation of their learning.	3(5)	12.7(21)	17.5(29)	41(68)	25.9(43)	3.74 ± 1.07
31.	Helps me use flexible grouping to adapt instruction to individual and group needs.	27.1(45)	41(68)	21.1(35)	9.6(16)	1.2(2)	2.17 ± 0.98
32.	Helps me use clear, structured teaching to ensure learners understand what to do or think.	1.2(2)	7.2(12)	13.9(23)	49.4(82)	28.3(47)	3.96 ± 0.91
33.	Improves my ability to organize focused small group instruction for individual needs.	34.3(57)	29.5(49)	16.9(28)	15.1(25)	4.2(7)	2.25 ± 1.20
34.	Enhances my skills in planning personalized instruction for each student.	6.6(11)	10.8(18)	10.2(17)	31.3(52)	41(68)	3.89 ± 1.24
35.	Strengthens my ability to deliver tailored instruction to meet individual learning needs.	33.1(55)	29.5(49)	20.5(34)	11.4(19)	5.4(9)	2.27 ± 1.19
Total							3.36 ± 0.54

At least 75 % of respondents agreed that ChatGPT helps them interpret and use findings from multiple assessments to plan and guide instruction to achieve goals for their students. This finding

depicts the ChatGPT's potential in analyzing the data (Fuller et al., 2024) and translating it from one language to another (Goldman et al., 2024), supporting the linguistics and adapting it to the appropriate culture. Additionally, ChatGPT can help teachers achieve individualized IEP goals (Rakap & Balikci, 2024), aligning with previous studies such as Yuan et al. (2024).

Moreover, 78.9% of respondents acknowledged that ChatGPT assists them in using effective strategies to encourage student engagement and motivation, whereas 66.9% confirmed that it supports self-regulation. Thus, ChatGPT can be regarded as a valuable resource for promoting a supportive and effective learning environment. It helps SET teachers implement methods supporting academic success and promote students' independence and engagement in learning. This finding posits that ChatGPT equips SETs with strategies favoring student engagement, motivation, and self-regulation by providing them with resources, explanations, and guidance to understand these strategies (Biswas, 2023c; Baidoo-Anu & Ansah, 2023; Chan & Hu, 2023).

Furthermore, over 70% of respondents agree that ChatGPT assists them in employing systematic instruction to teach content, strategies, and skills and helps plan specialized and individualized instruction. This finding implies that ChatGPT provides tailored resources, lesson plans, and strategies that assist SET in ensuring the specific learning needs of each student. This circumstance could be attributed to the ChatGPT's potential to generate personalized content, helping SETs design instructional approaches that address students' diverse abilities and challenges. Previous studies also confirm that ChatGPT supports new SET in developing high-quality and efficient IEP goals (Rakap, 2024; Rakap & Balikci, 2024). Moreover, ChatGPT assists service and in-service teachers in preparing inclusive lesson plans (Dowd & Langran, 2024) and improving didactic planning among undergraduate SE (Sepúlveda-Irribarra, 2023).

However, less than 20% of respondents agree that ChatGPT helps them use, organize, and manage flexible, focused or intensive small groups or deliver instruction to meet individual learning needs. This low percentage demonstrates that respondents do not perceive ChatGPT as highly effective in helping them apply these relevant strategies to deliver specialized instruction and small-group teaching. This finding may be due to these aspects' requiring human interaction and decision-making concerning classroom management and instructional adaptation; ChatGPT has limited abilities to direct interaction and practical implementation and lacks the required emotional intelligence and social skills to facilitate group work (Biswas, 2023a; Kalla et al., 2023). However, Table 6 demonstrates a medium mean score for the PB-Std5 subscale, revealing a moderate benefit

for ChatGPT to assist preservice teachers in achieving CEC standard 5. This finding is associated with supporting Learning Using Effective Instruction such as using an assessment to examine, adjust, guide, and improve instruction, and support SET to select and use appropriate strategies. These strategies foster both student participation and learning and help them plan specialized, individualized instruction.

CEC Standard 6: *Fostering Social, Emotional, and Behavioral Development*. PB-Std6 demonstrates how students perceive ChatGPT support to ensure their students' Social, Emotional, and Behavioral Growth. Table 8 displays a detailed summary of the data analysis for this subscale.

Table 8

Descriptive Overview of Response Data for Preservice SETs on PB-Std6 Subscale

No	Statements	SD P(F)	D P(F)	N P(F)	A P(F)	SA P(F)	M ± SD
36.	Helps me apply systematic routines to create a secure, supportive, and efficient environment for students.	0.6(1)	13.3(22)	14.5(24)	35.5(59)	36.1(60)	3.93 ± 1.05
37.	Enables me to use proven strategies to enhance students' social, emotional, and well-being.	4.2(7)	21.7(36)	20.5(34)	30.1(50)	23.5(39)	3.47 ± 1.19
38.	Guides me in using structured data to design, execute, and evaluate interventions and programs focusing on behavior and social skills across various settings	6(10)	7.8(13)	15.1(25)	45.2(75)	25.9(43)	3.77 ± 1.10
Total							3.72 ± 0.67

The results revealed that 71.6 % of respondents acknowledged that ChatGPT helps them apply systematic routines to create a secure, supportive, and efficient student environment. This figure depicts the potential for ChatGPT to provide preservice teachers with recommendations and explanations for the appropriate procedure or routine to create productive, respective, and caring learning settings and provide them with steps, guidelines, and examples (Biswas, 2023c; Biswas, 2023b Baidoo-Anu & Ansah, 2023; Chan & Hu, 2023).

Moreover, 53.6% of respondents reported that ChatGPT helps them use proven strategies to enhance students' social, emotional, and well-being. This enhancement could contribute to the features of ChatGPT in providing ideas and strategies to boost these students' psychological construct and their potential to provide explanations for preventive practice, helping them use it for their students. This finding aligns with a previous study that revealed the effectiveness of ChatGPT in supporting counseling and mental health undergraduates in achieving the required

counseling competencies, including their capacity to enhance counseling skills, therapeutic approaches, counseling dispositions, and behaviors (Ajlouni et al., 2023).

Furthermore, 71.1 % of respondents agree that ChatGPT guides them in using structured data to design, execute, and evaluate interventions and programs focusing on behavior and social skills across various settings. This finding is explained by the fact that ChatGPT assists in analyzing data from several resources and provides suggestion on using it systematically. ChatGPT is also an appropriate process tool that includes data collection, analyses, and assistance that helps teachers decide on enhancing behavioral programs and social skills (Ajlouni et al., 2023). Additionally, Johnson et al. (2023) found that ChatGPT produced reliable answers to multiple medical questions, as academic physicians and experts assessed strengthening its potential in various domains. The overall mean score for this scale attained a high mean score (m=3.72), indicating a high potential for ChatGPT in supporting preservice SETs in achieving the sixth CEC.

CEC Standard 7: *Working Together with Team Members*. PB-Std7 demonstrates how preservice SETs perceive using ChatGPT to support them in Working Together with Team Members. Table 9 illustrates a detailed summary of the data analysis for the PB-std7 subscale.

Table 9

Descriptive Overview of Response Data for Preservice SETs on PB-Std7 Subscale

No	Statements	SD P(F)	D P(F)	N P(F)	A P(F)	SA P(F)	M ± SD
39.	Improves my skills in culturally sensitive communication and problem-solving to lead meetings, share knowledge, and address students' academic and behavioral needs.	36.1(60)	30.1(50)	15.1(25)	14.5(24)	4.2(7)	2.20 ± 1.20
40.	Enhances my ability to collaborate with families, aides, and professionals to plan and implement effective programs for students and their families.	36.7(61)	27.1(45)	16.3(27)	14.5(24)	5.4(9)	2.25 ± 1.24
41.	Strengthens my collaboration with professionals and agencies to access services for individuals with exceptionalities.	36.7(61)	28.3(47)	21.7(36)	10.2(17)	3(5)	2.14 ± 1.12
42.	Develops my skills in mentoring paraprofessionals to support the education of students with exceptionalities and their families.	38.6(64)	30.1(50)	16.3(27)	10.8(18)	4.2(7)	2.12 ± 1.16
Total							2.18 ± 0.65

Less than 20% of respondents state that ChatGPT assists them in supporting the following areas: communication, group facilitation, team capacity, collaboration, and coordination with families, aide providers, professionals, agencies, and mentors to support the education of individuals with

exceptionalities. This finding reveals that these skills of networking and building a professional identity in the field often result from direct interaction with colleagues, attending conferences, or participating in workshops, requiring in-person or real-time virtual presence, which are beyond ChatGPT's abilities. This circumstance is further reinforced by ChatGPT lacking human interaction and emotional intelligence (Biswas, 2023a; Kalla et al., 2023; ElSayary, 2024). However, the preservice SETs' responses on this sub-scale yielded a low average (m= 2.18). This finding depicts ChatGPT's low potential to support the seventh CEC standard.

The overall mean of pre-service SETs at school of educational science responses on the benefits scale is in the medium range (m= 3.39 with SD= 0.39), suggesting that preservice SET find some benefits in using ChatGPT to achieve the seven CEC standards but with some limitations. Even though ChatGPT may be helpful in areas such as data analysis and supporting specialized instruction, it appears less effective in tasks requiring human interaction. These tasks involve collaborating and communicating with families and teams, making complex decisions such as observation or instruction delivery, and supporting grouping instruction. Researchers suggest helping preservice SETs master the seven CEC standards to integrate ChatGPT into other tools and educational approaches relying on human interaction and personalized planning, such as face-to-face programming. ChatGPT could be helpful for data analysis and providing ideas. However, it is essential to complement it with hands-on training and personal communication in areas requiring direct interaction and deeper social and emotional support.

RQ2: What challenges do undergraduate students encounter when using ChatGPT in Special Education at the UOJ?

The descriptive statistics for each item in the challenge scale were calculated to address the second research question regarding the challenges that preservice SET faces when using ChatGPT to support their learning. Table 10 displays these results.

Table 10

Descriptive Overview of Response Data for Preservice SETs on Challenges Scale

No	Statements	SD P(F)	D P(F)	N P(F)	A P(F)	SA P(F)	M ± SD
1.	I lack digital literacy that restricts my benefit from using ChatGPT	9.6(16)	32.5(56)	28.9(48)	21.7(36)	7.2(12)	2.84 ± 1.10
2.	I have experienced delays in ChatGPT's responses while using it.	4.2(7)	33.1(55)	15.1(25)	35.5(59)	12(20)	3.18 ± 1.15

3.	I am concerned about overly relying on ChatGPT to study special education subjects.	4.2(7)	11.4(19)	24.7(41)	30.7(51)	28.9(84)	3.69 ± 1.13
4.	Seeing the appropriate context in ChatGPT to obtain the information I need is challenging.	1.2(2)	23.5(39)	19.9(33)	34.9(58)	20.5(34)	3.50 ± 1.10
5.	I feel anxious about using new technology like ChatGPT.	15.7(26)	38.6(64)	41(68)	6(3.5)	2(1.2)	1.21± 1.17
6.	I am worried about the accuracy and reliability of the data ChatGPT produces.	3.6(6)	13.3(22)	16.3(27)	39.8(66)	27.1(45)	3.73 ± 1.11
7.	I find it difficult to understand the Arabic information ChatGPT provides for special education subjects.	34.3(57)	30.7(51)	18.7(31)	11.4(19)	4.8(8)	2.22 ± 1.18
8.	I face problems with the alignment of the information ChatGPT provides with my special education curriculum	33.1(55)	31.3(51)	17.5(29)	13.9(23)	4.2(7)	2.25 ± 1.18
9.	I encounter internet connection issues while using ChatGPT.	39.2(65)	18.7(31)	27.1(45)	12(20)	3(5)	2.21± 1.17
Total							2.7 ± 0.49

Concerning digital literacy, just 28.9 % of respondents (m=2.84) agreed that these skills hinder their benefit of using ChatGPT. This low percentage demonstrates that it does not pose a substantial challenge. However, it depicts a potential need for additional support or training to help the minority of preservice SET improve their digital literacy skills, such as providing them with enough resources (tutorials or workshops). Furthermore, 47.5 % of respondents revealed they had experienced delays in ChatGPT's responses while using it. Thus, many respondents frequently encountered slower-than-expected responses while interacting with ChatGPT. These delays may originate from technical issues or increased server load due to the elevated use of ChatGPT's free version. Nevertheless, 59.6% of respondents state concerns about overly relying on ChatGPT in their study of special education subjects. This high percentage suggests that many students are worried about depending excessively on ChatGPT for their special education learning. Their fears about the excessive use of ChatGPT could reflect their reservations about ChatGPT use because ChatGPT can impede the development of their critical thinking, problem-solving, or independent learning skills, all critical in mastering complex subjects like special education. These concerns accentuate the need for a balanced approach. Therefore, decision-makers could prompt awareness of the positive usage of ChatGPT and recommend its use as a supplementary tool rather than the primary source of learning. They could provide a training course or guide them on using AI tools properly in the learning and teaching process. Yankouskaya et al. (2024) underscore the possible

impact of users' over-reliance on ChatGPT, diminishing users' critical thinking skills and contributing to abusive patterns.

Over half of the respondents (55.4%) perceived challenges in setting ChatGPT prompts to obtain the necessary information. These difficulties impede students' ability to fully benefit from ChatGPT as a learning tool, especially when seeking specific or detailed information. One can interpret that respondents moderately perceived a benefit for ChatGPT in meeting CEC standards, suggesting that they need training or guidance on formulating prompts to improve the ChatGPT outcomes they had. Additionally, a mere 8% of respondents reported anxiety toward using new technology. This finding aligns with the study by Ajlouni et al. (2023), reporting that 66.9 % are concerned about the validity of the data ChatGPT generates. These concerns affirm that ChatGPT sometimes produces incorrect or outdated information, lacks proper citations, and has an inherent bias in the training data (Ajlouni et al., 2023). Thus, this situation underscores the importance of using ChatGPT as a complementary tool instead of the primary source of information. Users should verify the data ChatGPT produces by using authentic sources such as scientific journals or books, particularly when researching sensitive educational material, aligning with the findings of Ajlouni et al. (2023).

However, less than 19 % had difficulty understanding generated Arabic data, compared alignment of generated data with curriculum, and had internet connection issues, implying that these factors do not form substantial barriers for preservice teachers. Nevertheless, the overall mean for the challenge scale was 2.7, indicating that they face moderate challenges while using ChatGPT in their learning process. This finding aligns with the study by Ajlouni et al. (2023), which reported a moderate level of challenges in utilizing ChatGPT as a supporting tool for learning among counseling and mental health undergraduates.

These results urge instructors of the Bachelor's Program in SE at UOJ to incorporate ChatGPT into educational experience and practice and prompt their SE undergraduates to use ChatGPT during their learning as a supporting tool. Moreover, the findings encourage decision-makers at UOJ to consider SE undergraduates' concerns and challenges and support them in addressing these issues to facilitate their benefit from the beneficial AI tool and help them achieve the CEC standards. To achieve this, UOJ can implement a structured program with workshops and training sessions to raise students' awareness about the appropriate, beneficial, and ethical use of ChatGPT. Additionally, it can provide undergraduates with guidance and orientation programs to assist

students in integrating ChatGPT into their study practices and orientation. Finally, UOJ can offer counseling services for those students with concerns about their over-reliance on ChatGPT and ensure they maintain a balanced approach, boosting their overall educational experience.

Conclusion

Preparing undergraduates in the SE field on CEC standards is pivotal to improving and developing their professional skills and fostering their abilities to provide educational services to children with disabilities. These standards guide them to apply best educational practices and effectively meet students' needs through different strategies, methods, activities, and interventions. To that end, ChatGPT's role is accentuated as an innovative tool, facilitating access to information concerning the standards of CEC and providing updated and comprehensive sources of knowledge. ChatGPT can provide undergraduates in SE with advanced instruction, assisting them in understanding and applying CEC standards proficiently. Therefore, integrating AI tools, represented by ChatGPT, with academic training on CEC standards is critical to preparing undergraduates in SE.

We investigated preservice SETs' perceptions of the benefits of ChatGPT use to achieve CEC standards among undergraduates of the SE at the UOJ. The study sample comprised 155 participants. The study result presented information about the ChatGPT's potential in SE, filling the literature gap. Our results also posited that participants reported moderate benefits of using ChatGPT in achieving CEC standards and moderate challenges they faced while using it. These challenges include setting ChatGPT up, having delays in ChatGPT's responses, and the validity of the generated data, which is the primary challenge and concern about overly relying on ChatGPT. However, the prevalence of children with disabilities has substantially increased, requiring preservice teachers to use AI effectively and proficiently, including ChatGPT.

Our study has some limitations because our participants came from one university, and we had a few male SE undergraduates. The smaller number of male participants in our study is attributed to fewer numbers of enrolled male students among SE undergraduates at the UOJ. Future research should encompass a diverse and larger sample size, covering multiple universities

References

Abbad, M. M., Morris, D., & De Nahlik, C. (2009). Looking under the bonnet: Factors affecting student adoption of e-learning systems in Jordan. *International Review of Research in Open and Distance Learning, 10*(2), 1-25.

Abdullah, M., Madain, A., & Jararweh, Y. (2022, November). ChatGPT: Fundamentals, applications and social impacts. In *2022 Ninth International Conference on Social Networks Analysis, Management and Security (SNAMS)* (pp. 1-8).

Abu-Alghayth, K. (2022). Teachers' use of assistive technology in Saudi special education schools: A mixed-methods enquiry. *International Journal of Developmental Disabilities, 68*(4), 547-557.

Ajlouni, A., Almahaireh, A., & Whaba, F. (2023). Students' perception of using ChatGPT in counseling and mental health education: The benefits and challenges. *International Journal of Emerging Technologies in Learning (iJET), 18*(20), 199-218.

Akgun, S., & Greenhow, C. (2022). Artificial intelligence in education: Addressing ethical challenges in K-12 settings. *AI and Ethics, 2*(3), 431–440. https://doi.org/10.1007/s43681-021-00096-

Alanazy, M. M., & Alrusaiyes, R. F. (2021). Saudi pre-service SETs' knowledge and perceptions toward using computer technology. *International Education Studies, 14*(3), 125-137.

Al-Dababneh, K., Al-Zboon, E., & Akour, M. (2016). Competencies that teachers need for teaching children who are deaf and hard-of-hearing (DHH) in Jordan. *Deafness & Education International, 18*(4), 172-188. http://dx.doi.org/10.1080/14643154.2016.1249173

Alsolami, A. S. (2022). Teachers of special education and assistive technology: Teachers' perceptions of knowledge, competencies, and professional development. *SAGE Open, 12*(1), 21582440221079900.

Al-Zboon, E. (2015). An evaluation of the national interactive curriculum of kindergarten and general framework and general and specific outcomes for kindergarten curriculum of children with hearing impairments from perspectives of their teachers: A qualitative study. *Jordanian Journal of Educational Sciences, 11*(1), 40–51.

Al-Zboon, E. (2016a). Current state of the curriculum in Jordanian kindergartens for children with hearing impairments. *Early Child Development and Care*. doi:10.1080/03004430.2016.1230737

Al-Zboon, E. (2019). Assistive technologies as a curriculum component in Jordan: Future special education teachers' preparation and the field status. *Assistive Technology, 34*(1), 20–25. https://doi.org/10.1080/10400435.2019.1677804

Al-Zboon, E., & Ahmad, A. (2016). Pre-service SETs' professionalism and preparation in terms of child sexual abuse. *European Journal of Special Needs Education, 31*(1), 13–26. doi:10.1080/08856257.2015.1087126

Amri, M. M., & Hisan, U. K. (2023). Incorporating AI tools into medical education: Harnessing the benefits of ChatGPT and Dall-E. *Journal of Novel Engineering Science and Technology, 2*(2), 34-39. https://doi.org/10.56741/jnest.v2i02.315

Anderson, C. L., & Petch-Hogan, B. (2001). The impact of technology use in special education field experience on preservice teachers' perceived technology expertise. *Journal of Special Education Technology, 16*(3), 27-44.

Baidoo-Anu, D., & Ansah, L. O. (2023). Education in the era of generative artificial intelligence (AI): Understanding the potential benefits of ChatGPT in promoting teaching and learning. *Journal of AI, 7*(1), 52-62.

Barber, M., Bird, L., Fleming, J., Titterington-Giles, E., Edwards, E., & Leyland, C. (2021). Gravity assist: Propelling higher education towards a brighter future. *Report of the Digital Learning and Teaching Review*. Office for Students

Barton, E. E., Pustejovsky, J. E., Maggin, D. M., & Reichow, B. (2017). Technology-aided instruction and intervention for students with ASD: A meta-analysis using novel methods of estimating effect sizes for single-case research. *Remedial and Special Education, 38*(6), 371–386.

Baytak, A. (2024). The Content Analysis of the Lesson Plans Created by ChatGPT and Google Gemini. *Research in Social Sciences and Technology, 9*(1), 329-350. https://doi.org/10.46303/ressat.2024.19

Billman, R., & Hoppin, K. (2024). AI and IEPs? Reflections on practice-based experiences with preservice special education teachers. In J. Cohen & G. Solano (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference* (pp. 1912-1916). Las Vegas, Nevada, United States: Association for the Advancement of Computing in Education (AACE).

Biswas, S. (2023a). The function of ChatGPT in social media: According to ChatGPT. Available at SSRN 4405389. https://doi.org/10.2139/ssrn.4405389

Biswas, S. (2023b). Role of ChatGPT in education. *Journal of ENT Surgery Research, 1*(1), 1–9.

Biswas, S. (2023 c). ChatGPT and the future of medical writing. *Radiology,* 307(2), http://doi.org/10.1148/radiol.223312

Chan, C. K. Y., & Hu, W. (2023). Students' voices on generative AI: Perceptions, benefits, and challenges in higher education. *International Journal of Educational Technology in Higher Education, 20*(1), 43. https://doi.org/10.1186/s41239-023-00411-8

Chauke, T., Mkhize, T., Methi, L., & Dlamini, N. (2024). Postgraduate Students' Perceptions on the Benefits Associated with Artificial Intelligence Tools on Academic Success: In Case of ChatGPT AI tool. *Journal of Curriculum Studies Research, 6*(1), 44-59. https://doi.org/10.46303/jcsr.2024.4

Cheng, S. C., & Lai, C. L. (2020). Facilitating learning for students with special needs: A review of technology-supported special education studies. *Journal of Computers in Education, 7*(2), 131-153.

Chukwuemeka, E. J., & Samaila, D. (2020). Teachers' perception and factors limiting the use of high-tech assistive technology in special education schools in North-West Nigeria. *Contemporary Educational Technology, 11*(1), 99-109.

Coflan, C. M., & Kaye, T. (2020). Using education technology to support students with special educational needs and disabilities in low- and middle-income countries (EdTech Hub Helpdesk Response No. 4). *EdTech Hub*. https://doi.org/10.53832/edtechhub.0021

Crompton, H. (2023). Evidence of the ISTE standards for educators leading to learning gains. *Journal of Digital Learning in Teacher Education, 39*(4), 201–219. https://doi.org/10.1080/21532974.2023.2244089

Crompton, H., & Burke, D. (2024). The Nexus of ISTE standards and academic progress: A mapping analysis of empirical studies. *TechTrends*. https://doi.org/10.1007/s11528-024-00973-y

Cumming, T. M., & Draper Rodríguez, C. (2017). A meta-analysis of mobile technology supporting individuals with disabilities. *The Journal of Special Education, 51*(3), 164–176. https://doi.org/10.1177/0022466917713983

De Zárate, D. O., Castañeda, R., Mercade, L., Gómez, V. J., Rubio, A. D., Díaz-Fernández, F. J., ... & Pinilla-Cienfuegos, E. (2024). Enhancing K-12 students' performance in chemistry through ChatGPT-powered blended learning in Education 4.0 era. *INTED2024 Proceedings*, 3920-3929. https://doi.org/10.21125/inted.2024.1017

Dempere, J., Modugu, K., Hesham, A., & Ramasamy, L. K. (2023). The impact of ChatGPT on higher education. *Frontiers in Education, 8*, 1206936. https://doi.org/10.3389/feduc.2023.1206936

Ding, L., & Hong, Z. (2024). On the relationship between pre-service teachers' sense of self-efficacy and emotions in the integration of technology in their teacher developmental programs. *The Asia-Pacific Education Researcher, 33*(4), 869-878.

Dowd, N., & Langran, E. (2024). Enhancing special education lesson planning: Harnessing the potential of ChatGPT for in-service and pre-service teachers. In J. Cohen & G. Solano (Eds.), *Proceedings of Society for Information Technology & Teacher Education*

International Conference (pp. 728-737). Las Vegas, Nevada, United States: Association for the Advancement of Computing in Education (AACE).

Drigas, A., Ioannidou, R. E., Kokkalia, G., & Lytras, M. D. (2014). ICTs, mobile learning and social media to enhance learning for attention difficulties. *Journal of Universal Computer Science, 20*(10), 1499-1510. https://doi.org/10.3217/jucs-020-10-1499

Elbanna, S., & Armstrong, L. (2024). Exploring the integration of ChatGPT in education: Adapting for the future. *Management & Sustainability: An Arab Review, 3*(1), 16-29. https://doi.org/10.1108/MSAR-03-2023-0016

ElSayary, A. (2024). An investigation of teachers' perceptions of using ChatGPT as a supporting tool for teaching and learning in the digital era. *Journal of Computer Assisted Learning, 40*(3), 931-945.

Eysenbach, G. (2023). The role of ChatGPT, generative language models, and artificial intelligence in medical education: A conversation with ChatGPT and a call for papers. *JMIR Medical Education, 9*, e46885. https://doi.org/10.2196/46885

Firat, M. (2023). How ChatGPT can transform autodidactic experiences and open education. *Department of Distance Education, Open Education Faculty, Anadolu University*. https://doi.org/10.31219/osf.io/9ge8m

Fuller, K., Morbitzer, K. A., Zeeman, J. M., Persky, A. M., Savage, C., & McLaughlin, J. E. (2024). Exploring the use of ChatGPT to analyze student course evaluation comments. *BMC Medical Education, 24*(1), 423.

Goldman, S. R., Taylor, J., Carreon, A., & Smith, S. J. (2024). Using AI to support special education teacher workload. *Journal of Special Education Technology, 39*(3), 434-447. https://doi.org/10.1177/01626434241257240

Hartley, K., Hayak, M., & Ko, U. H. (2024). Artificial intelligence supporting independent student learning: An evaluative case study of ChatGPT and learning to code. *Education Sciences, 14*(2), 120. https://doi.org/10.3390/educsci14020120

Hisan, U. K., & Amri, M. M. (2023). ChatGPT and medical education: A double-edged sword. *Journal of Pedagogy and Education Science, 2*(1), 71-89. https://doi.org/10.13140/RG.2.2.31280.23043/1

Isgett, C., & Wang, S. (2021, December). Challenges regarding assistive technology in special education. In *2021 Tenth International Conference of Educational Innovation through Technology (EITT)* (pp. 293-298). IEEE.

ISTE. (2024). ISTE Standards: For educators. Retrieved from https://iste.org/standards/educators

Javaid, M., Haleem, A., Singh, R. P., Khan, S., & Khan, I. H. (2023). Unlocking the opportunities through ChatGPT tool towards ameliorating the education system. *BenchCouncil Transactions on Benchmarks, Standards and Evaluations, 3*(2), 100115. https://doi.org/10.1016/j.tbench.2023.100115

Johnson, D., Goodman, R., Patrinely, J., Stone, C., Zimmerman, E., Donald, R., & Wheless, L. (2023). Assessing the accuracy and reliability of AI-generated medical responses: An evaluation of the ChatGPT model. *Research Square*. https://doi.org/10.21203/rs.3.rs-2566942/v1

Kalla, D., Smith, N., Samaah, F., & Kuraku, S. (2023). Study and analysis of ChatGPT and its impact on different fields of study. *International Journal of Innovative Science and Research Technology, 8*(3).

Karakose, T., & Tülübas, T. (2023). How can ChatGPT facilitate teaching and learning: Implications for contemporary education. *Educational Process: International Journal, 12*(4), 7-16. https://doi.org/10.22521/edupij.2023.124.1

Kasneci, E., Seßler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., ... & Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences, 103*, 102274.

Kaur, P., Stoltzfus, J., & Yellapu, V. (2018). Descriptive statistics. *International Journal of Academic Medicine, 4*(1), 60-63.

Kent, A. M., & Giles, R. M. (2016). Dual certification in general and special education: What is the role of field experience in preservice teacher preparation? *Professional Educator, 40*(2).

Khazanchi, R., & Khazanchi, P. (2024). Generative AI to improve special education teacher preparation for inclusive classrooms. *Generative Artificial Intelligence and Teacher Education*, 159.

Kizilcec, R., Mason, J., McCarthy, K., Rodrigo, M. M., & Rose, C. (2023, April). Using technology to foster equitable access and diverse learning communities. In *Rapid Community Reports, Workshop Outcomes* (pp. 1-9). International Society of the Learning Sciences.

Li, C., & Xing, W. (2021). Natural language generation using deep learning to support MOOC learners. *International Journal of Artificial Intelligence in Education, 31*(2), 186-214. https://doi.org/10.1007/s40593-020-00235-x

Luo, W., He, H., Liu, J., Berson, I. R., Berson, M. J., Zhou, Y., & Li, H. (2023). Aladdin's Genie or Pandora's Box for early childhood education? Experts chat on the roles, challenges, and developments of ChatGPT. *Early Education and Development, 35*(1), 96–113. https://doi.org/10.1080/10409289.2023.2214181

Ogurlu, U., & Mossholder, J. (2023). The Perception of ChatGPT among Educators: Preliminary Findings. *Research in Social Sciences and Technology, 8*(4), 196-215. https://doi.org/10.46303/ressat.2023.39

Rakap, S. (2024). Chatting with GPT: Enhancing individualized education program goal development for novice SETs. *Journal of Special Education Technology, 39*(3), 339-348. https://doi.org/10.1177/01626434231211295

Rakap, S., & Balikci, S. (2024). Enhancing IEP goal development for preschoolers with autism: A preliminary study on ChatGPT integration. *Journal of Autism and Developmental Disorders*. https://doi.org/10.1007/s10803-024-06343-0

Rodríguez, C. D., & Cumming, T. M. (2016). Employing mobile technology to improve language skills of young students with language-based disabilities. *Assistive Technology, 29*(3), 161–169. https://doi.org/10.1080/10400435.2016.1171810

Sain, Z. H., Thelma, C. C., Baharun, H., & Pigesia, A. C. (2024). ChatGPT for positive impact? Examining the opportunities and challenges of large language models in education. *International Journal of Educational Development, 1*(3), 87–100. Retrieved from https://international.aspirasi.or.id/index.php/IJED/article/view/75

Sallam, M. (2023, March). ChatGPT utility in healthcare education, research, and practice: Systematic review on the promising perspectives and valid concerns. In *Healthcare (Vol. 11, No. 6, p. 887)*.

Santamaría Graff, C., Price, J. F., & Coomer, M. N. (2023). Technology as a bridge to co-create learning environments for equity and inclusion for students with intersectional identities. In F. E. Obiakor & J. Bakken (Eds.), *Using Technology to Enhance Special Education*. Advances in Special Education, V(37

Seiradakis, E. V. (2023, November). Unpacking experts' opinions on ChatGPT potential assistive roles and risks in early childhood special education. In *International Conference on New Media Pedagogy* (pp. 380-392).

Sepúlveda-Irribarra, C. (2023). Integration of ChatGPT into didactic planning: Perceptions and evaluations from special education students.

Sivrikaya, T., Karabulut, H. A., & Uçar, A. S. (2023). An Investigation of Specific Learning Disability Content Knowledge Competencies of Teachers In Different Branches. Theory and Practice in Child Development, 3(1), 17–36. https://doi.org/10.46303/tpicd.2023.2

Theeb, R., Mehedat, M., & Al-Zboon, E. (2014). Professional competencies among practicum students in special education and the level of their practices of these competencies from their perspectives. *Education, 134*(3), 195–205.

Thompson, S. K. (2012). *Sampling*. John Wiley & Sons. https://doi.org/10.1002/9781118162934

Tongco, M. D. C. (2007). Purposive sampling as a tool for informant selection.

Vij, O., Calver, H., Myall, N., Dey, M., & Kouranloo, K. (2024). Evaluating the competency of ChatGPT in MRCP Part 1 and a systematic literature review of its capabilities in postgraduate medical assessments. *PLOS ONE, 19*(7), Article e0307372. https://doi.org/10.1371/journal.pone.0307372

Williams, P., Jamali, H. R., & Nicholas, D. (2006). Using ICT with people with special education needs: What the literature tells us. *Aslib Proceedings, 58*(4), 330-345. https://doi.org/10.1108/00012530610687704

Yankouskaya, A., Liebherr, M., & Ali, R. (2024). ChatGPT addiction: From support to dependence in AI large language models. *Available at SSRN 4972612*. http://dx.doi.org/10.2139/ssrn.4972612

Yuan, C., & Hart Barnett, J. E. (2024). Developing quality IEP goals in the age of artificial intelligence. *Teaching Exceptional Children, 0*(0). https://doi.org/10.1177/00400599241239311

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education–Where are the educators? *International Journal of Educational Technology in Higher Education, 16*(1), 1-27. https://doi.org/10.1186/s41239-019-0171-0

Zhang, P., & Tur, G. (2023). A systematic review of ChatGPT use in K-12 education. *European Journal of Education, 59*(2). https://doi.org/10.1111/ejed.12599

Zhang, Y. (2000). Technology and the writing skills of students with learning disabilities. *Journal of Research on Computing in Education, 32*(4), 467-478.