



Special Education Teachers' Perceptions of Utilizing AI in Early Childhood

**تصورات معلمي التربية الخاصة حول استخدام الذكاء الاصطناعي في
الطفولة المبكرة**

By
Rasha Mohammed Nayef Atwa

Supervisor
Professor Mohammad Tawalbeh

A Dissertation submitted in partial Fulfillment of the Requirements for A
Master's Degree in Instructional Technology

Arab Open University
Faculty of Education

July \ 2024



Special Education Teachers' Perceptions of Utilizing AI in Early Childhood

**تصورات معلمي التربية الخاصة حول استخدام الذكاء الاصطناعي في
الطفولة المبكرة**

By
Rasha Mohammed Nayef Atwa

Supervisor
Professor Mohammad Tawalbeh

A Dissertation submitted in partial Fulfillment of the Requirements for A
Master's Degree in Instructional Technology

Arab Open University
Faculty of Education

July \ 2024

Dissertation Approval

Special Education Teachers' Perceptions of Utilizing AI in Early Childhood

تصورات معلمي التربية الخاصة حول استخدام الذكاء الاصطناعي في
الطفولة المبكرة

A Dissertation submitted in partial Fulfillment of the Requirements for A
Master's Degree in Instructional Technology

This dissertation was approved on: 15 / 7 / 2024

Examination Committee:

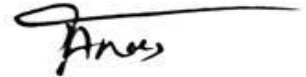
Prof Mohammad AbdelRahmanTawalbeh, Chairman



Prof Moayyad Abdalhadi Homidi, Member



Dr. Anas "Mohammad Kamal" Al-Hanandeh, Member



Authorization

I, Rasha Atwa, authorize the Arab Open University to provide copies of my dissertation, in both paper and electronic form, to libraries, organizations, or bodies concerned with scientific research and studies, upon request.

Name: Rasha Mohammed Atwa

Date: 15/7/ 2024

Signature: *Rasha Atwa*

Dedication

To my dear children, you are the light that brightened my life and made me a better person. Your influence has completely changed my life.

To my wonderful mother and father, thank you for your endless support; without you, this achievement wouldn't have been possible.

To my loving husband, you have always been there for me, encouraging me every step of the way. Your support is the reason I have achieved my goals.

To my dear sisters, your presence in my life has been my source of strength and support.

This research is a result of your love and care.

Acknowledgments

I would like to extend my gratitude to

My professor and supervisor, prof. Mohammad AbdelRahmanTawalbeh who spared no effort in guiding and advising me.

The professors who provided us with all the knowledge and expertise we needed.

The members of the examination committee, Professor Prof Moayyad Abdalhadi Homidi and Dr. Anas “Mohammad Kamal” Al-Hanandeh, for their valuable feedback that enriched this thesis.

My family who continually motivated and supported me.

And to everyone who contributed to the completion of this work.

A form for undertaking the language proofreading of theses and dissertations

I, the undersigned student: Rasha Atwa, and my student ID: (2210500)

pledge that I have subjected the master's dissertation entitled:

Special Education Teachers' Perceptions of Utilizing AI in
Early Childhood

to language scrutiny, and that it is free of any typographical, grammatical, or
linguistic errors, and I take full responsibility for any errors

Sincerely,

Signature: *Rasha Atwa*

Day: Thursday

Date: 4/7/2024

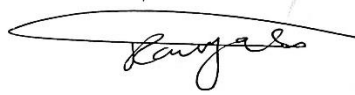
- Linguistics specialist information:
 - Linguistics specialist name: Rawya Sami
 - Phone number: 0795659037
 - Signature: 

TABLE OF CONTENT

Dissertation Approval	III
Authorization	IV
Dedication	V
Acknowledgments	VI
An acknowledgment of a commitment to scientific honesty in writing scientific theses and dissertations	VII
A form for undertaking the language proofreading of theses and dissertations	VIII
Table of Content	IX
List of Tables	XI
List of Appendices	XII
English Abstract	XIII
Arabic Abstract	XIV
Chapter 1: Background of the Study	
Introduction	1
Statement of the problem	1
Questions of the study	2
Significance of the study	3
Scope and limitations of the study	3
Operational definitions	4
Chapter 2: Literature Review	
Theoretical framework	5
Review of Related Studies	10

Critique of Related Studies	13
Chapter 3: Methodology and Procedures	
Methodology	15
Subjects of the Study	15
Instruments of the Study	16
Procedures of the Study	21
Statistical Analysis	22
Chapter 4: Results	
Results of the study	23
Chapter 5: Discussion of Results	
Discussion of the study results	34
Recommendations	46
Suggestions	47
References and Appendices	
References	48
Appendices	52

List of Tables

Table Number	Table Content	Page
1	Sample distribution	16
2	Correlation Coefficients between The Item and TTotal Score for the Benefits Scale	18
3	Correlation Coefficients between the Item and the Total Score for the Challenges Scale	19
4	Means and standard deviations of the level of benefits of utilizing AI in early childhood as perceived by Special Education Teachers - items, ranked in a descending order	23
5	Means and standard deviations of the level of challenges of utilizing AI in early childhood as perceived by Special Education Teachers items ranked in a descending order	25
6	T-test results for the effect of Qualification on the levels of benefits and challenges of utilizing AI in early childhood as perceived by Special Education Teachers	27
7	Means and standard deviations of the levels of benefits and challenges of utilizing AI in early childhood as perceived by Special Education Teachers due to years of experience	28
8	One-way ANOVA results for the effect of years of experience on the levels of benefits and challenges of utilizing AI in early childhood as perceived by Special Education Teachers	29

List of Appendices

Number	The content	Page
A	Initial Version of the Questionnaire in Arabic	52
B	Initial Version of the Questionnaire in English	57
C	List of Reviewers	62
D	Final Version of the Questionnaire in Arabic	63
E	Final Version of the Questionnaire in English	67
F	Semi-structured Interview Questions	71
G	Interview results	72

Special Education Teachers' Perceptions of Utilizing AI in Early Childhood

By

Rasha Mohammed Nayef Atwa

Supervisor

Professor Mohammad Tawalbeh

Abstract

The current study examined special education teachers' perceptions of utilizing artificial intelligence (AI) in early childhood education. Employing a mixed-method approach, the researcher used both a questionnaire and semi-structured interviews, ensuring the validity and reliability of these instruments. The sample consisted of 93 special education teachers who work in private sector schools affiliated with the Directorate of Education for Al-Jamaa District, Capital Governorate Amman, during the second semester of the 2023-2024 academic year. The findings revealed that teachers were aware of several benefits of AI, including enhanced individualized instruction and improved student engagement. However, they also highlighted challenges such as lack of training and resources. The mean score for the perceived benefits was 4.00, indicating a high level of agreement among teachers, while the mean score for challenges was slightly higher at 4.04, also reflecting a high level of agreement. Notably, there were no statistically significant differences ($\alpha=0.05$) in the perceived benefits and challenges attributed to teachers' qualifications and years of experience. The study's key recommendations include the need for comprehensive training programs for teachers and the development of user-friendly AI tools tailored to the specific needs of special education.

Keywords. Special education, artificial intelligence, early childhood, teachers' perceptions

تصورات معلمي التربية الخاصة حول استخدام الذكاء الاصطناعي في الطفولة المبكرة

إعداد الطالبة

رشا محمد نايف عطوة

إشراف

الأستاذ الدكتور محمد الطوالبة

ملخص

هدفت الدراسة الحالية إلى استقصاء تصورات معلمي التربية الخاصة حول استخدام الذكاء الاصطناعي (AI) في الطفولة المبكرة. تم الاعتماد في البحث على منهجية البحث المختلطة، باستخدام الاستبيان والمقابلات شبه المفتوحة، وقد تم التأكد من صدق وثبات هذه الأدوات. تكونت عينة الدراسة من 93 معلم تربية خاصة يعمل في مدارس القطاع الخاص التابعة لمديرية تربية لواء الجامعة، محافظة العاصمة عمان، خلال الفصل الدراسي الثاني من العام الدراسي 2023-2024. أشارت النتائج إلى أن المعلمين يدركون العديد من الفوائد لاستخدام الذكاء الاصطناعي، مثل تعزيز التعليم الفردي وتحسين تفاعل الطلاب. ومع ذلك، تم تسليط الضوء أيضًا على التحديات مثل نقص التدريب والموارد. بلغ متوسط درجة فوائد استخدام الذكاء الاصطناعي 4.00، في حين بلغ متوسط درجة التحديات 4.04. بالإضافة إلى ذلك أظهرت النتائج عدم وجود فروق ذات دلالة إحصائية عند مستوى ($\alpha = 0.05$) في مستويات الفوائد و التحديات لاستخدام الذكاء الاصطناعي في الطفولة المبكرة كما يدركها معلمو التربية الخاصة تُعزى إلى المؤهلات وسنوات الخبرة. من بين التوصيات الأكثر أهمية كانت الحاجة إلى برامج تدريب شاملة للمعلمين وتطوير أدوات ذكاء اصطناعي سهلة الاستخدام تلبي احتياجات التربية الخاصة المحددة.

الكلمات المفتاحية. التربية الخاصة، الذكاء الاصطناعي، تصورات معلمين

Chapter 1: Background of the Study

Introduction:

In recent years, educators have increasingly focused on integrating artificial intelligence (AI) into classrooms to keep pace with the digital age. Consequently, The fast-evolving AI technology holds the promise of transforming traditional teaching methods and enriching learning experiences, especially for diverse student populations. As a result, Teachers are now looking into creative ways to address the specific needs and challenges of early childhood special education, with an emphasis on inclusivity and personalized support (Hopcan et al., 2023).

This study explores the perspectives of special education teachers on the benefits and challenges of utilizing AI in early childhood. By employing a mixed-methods approach, the study aims to understand how AI can aid teachers in these settings.

Through direct engagement with special education teachers, the study seeks to uncover their views on the advantages and obstacles of implementing AI in early childhood education. The goal is to shed light on the complexities of integrating AI into early learning environments, with the ultimate aim of fostering inclusive and supportive educational spaces for all students. Moreover, this study contributes to the ongoing discussion about AI's role in education and its effects on special education. By combining insights from various sources and considering teachers' perspectives, the study provides a detailed look at the opportunities and challenges of utilizing AI in early childhood education.

The study addresses a critical gap by examining special education teachers' opinions on AI use in early childhood. It aims to provide theoretical insights into how AI can enhance teaching methods and create inclusive learning environments. Ultimately, the study seeks to gain a comprehensive understanding of special education teachers' views on AI in early childhood settings.

Statement of problem:

In early childhood education, artificial intelligence (AI) tools and technologies have demonstrated substantial potential in addressing the diverse needs of children with special education requirements. Despite the growing interest and potential benefits of AI, there exists a notable research gap concerning how special education teachers perceive and experience these technologies (Kazi, 2021). The focus on special education teachers is

particularly pertinent because, as indicated by Yi, Liu, and Lan (2024), their application of AI remains limited compared to other educational domains. This limited usage underscores an important area for investigation, given the specific advantages that AI could offer to support their unique instructional needs.

It has been observed that while AI is increasingly utilized in various educational contexts, its adoption has not been as widespread among special education teachers, despite the potential benefits AI could bring to their practices (Kharbat, Alshawabkeh, & Woolsey, 2021).

This study aims to examine the benefits and challenges associated with employing AI in early childhood special education from the perspective of the teachers themselves. The primary objective of this research is to explore how AI technologies can support special education teachers in early childhood settings, specifically within the Directorate of Education for Al-Jamaa District, Capital Governorate Amman. Understanding their perspectives on utilizing AI to address the unique needs of special education is essential for effective implementation and maximizing its benefits (Kazi, 2021). By investigating the practical implications and complexities from the teachers' perspectives, this study seeks to address the existing research gap by examining their experiences, challenges, and viewpoints regarding AI usage in early childhood special education. The aim is to provide valuable insights into the effective integration of AI in these settings, thereby addressing the specific needs and potential of this underutilized technology.

Questions of study:

- 1-What is the level of benefits of utilizing AI in early childhood as perceived by Special Education Teachers?
- 2- What is the level of challenges of utilizing AI in early childhood as perceived by Special Education Teachers?
- 3- Are there any statistically significant differences at ($\alpha = 0.05$) in the levels of benefits and challenges of utilizing AI in early childhood as perceived by Special Education Teachers attributed to qualification and years of experience?

Significance of the study

Theoretical Significance:

- The study sheds light on the use of AI in early childhood special education by capturing the experiences and insights of special education teachers, addressing a significant gap in current research.
- It offers a detailed look at how AI can enhance teaching methods, boost student engagement, and ensure fair access to education for young children with special needs.
- The study enriches our understanding of teaching theories by demonstrating how technological innovations like AI can improve instructional practices in early childhood special education.

Practical Significance:

- The study gives practical guidance for teachers and admins on how to use AI to support special education effectively, based on real-life experiences.
- It will help shape training programs for special education teachers, Ensuring they include the skills to use AI in their teaching.
- The study can guide developers in creating user-friendly AI tools that genuinely benefit students and are easy for teachers to implement.
- Policymakers can use the study's findings to support efforts to bring AI into classrooms, helping all students succeed, especially those in special education.

Scope and limitations of the study

Time Scope: The study was conducted during the second semester of the academic year 2023-2024.

Spatial Scope: Directorate of Education for Al-Jamaa District / Capital Governorate Amman, focusing on the private sector

Human Scope: This study involves talking to special education teachers in early childhood.

Subject Scope: This study focuses on discovering the perspectives of special education teachers regarding the benefits and challenges of utilizing artificial intelligence (AI) in early childhood.

Limitations:

1- The findings may be influenced by the subjective viewpoints and experiences of the participating teachers, potentially limiting the generalizability of the results to other settings or populations.

2- The study's reliance on qualitative methods may restrict the ability to quantify the impact of AI interventions or establish causal relationships between variables.

3- The study's scope may be constrained by factors such as sample size, geographic location, and access to diverse participants, potentially limiting the breadth and depth of the findings.

4- The study's focus on teachers' perspectives may overlook the viewpoints of other stakeholders, such as students, parents, and administrators, whose insights could provide valuable context and perspectives.

Operational Definitions:

Perspectives: This term refers to the views and opinions of special education teachers on utilizing artificial intelligence, in early childhood education. In the study, these perspectives were collected through interviews and surveys and were analyzed to understand their impact on teaching practices.

Special Education Teachers: This refers to the group of participants who are special education teachers working in early childhood settings. These teachers hold a bachelor's degree or higher in special education, speech and language sciences, occupational therapy, or learning disabilities.

Artificial Intelligence: This involves using advanced technology and intelligent software, such as computers, smartphones, and specialized programs, to support the education and development of young children in special education.

Early Childhood: the classrooms and programs that provide specialized educational and developmental services to children aged 2 to 6 years in the schools included in the study.

Chapter 2 Literature Review

In this dissertation, an overview of the principal theories related to the topic was initially presented. Subsequently, relevant studies conducted in this area were reviewed. Finally, a critique of these studies was provided.

Theoretical framework:

Special education teachers

Special education refers to education for individuals who require additional support and accommodations due to various disabilities or impairments (Bea Francisco, Hartman, & Wang, 2020). These individuals may face challenges in areas such as learning, communication, mobility, sensory processing, or social interaction. The term encompasses a diverse group, including those with intellectual disabilities, autism spectrum disorders, physical disabilities, sensory impairments, and emotional or behavioral disorders (Alkhateeb, Alrubaian, & Tamakloe, 2023).

In addressing the educational needs of special education, individualized approaches are often necessary. These may include personalized education plans, specialized instruction, assistive technology, and support services such as speech therapy or occupational therapy. Moreover, early intervention and education play a crucial role in the development and success of these individuals, as they can significantly improve outcomes by enhancing academic skills, socialization abilities, and overall quality of life (Hienonen, Hotulainen, & Jahnukainen, 2021).

Early intervention also fosters inclusivity and promotes understanding within educational settings and communities (Bartolo, Kyriazopoulou, Björck-Åkesson, & Giné, 2021). By integrating special education into mainstream educational environments from a young age, society can break down barriers and promote equity and access for all learners. Additionally, early exposure to diverse learning environments helps individuals develop empathy, tolerance, and respect for individuals with different abilities and backgrounds (Bricker et al., 2022).

In special education, students are qualified for services based on specific disability categories outlined by The Individuals with Disabilities Education Act (IDEA). These include Specific Learning Disability (SLD), Speech or Language Impairment, Other Health Impairment, Autism Spectrum Disorder (ASD), Intellectual Disability, Emotional

Disturbance, Developmental Delay, Deaf-Blindness, Visual Impairment, Hearing Impairment, Orthopedic or Physical Impairment, Traumatic Brain Injury, and Multiple Disabilities (Rawe, 2024).

Each category addresses distinct challenges, ranging from learning difficulties and speech impairments to physical disabilities and developmental delays. Understanding these categories helps tailor interventions and support services to meet the individual needs of students in special education, promoting their academic and social development. By prioritizing inclusive education and early intervention, society can ensure that every learner has the opportunity to thrive and contribute fully to society (Cerna et al., 2021).

In alignment with the overarching goals of inclusive education and early intervention, the pivotal role of special education teachers becomes even more evident. As architects of inclusive learning environments, special education teachers play a crucial role in identifying developmental delays and providing timely interventions to address them. By intervening early, they can mitigate challenges, build foundational skills, and pave the way for academic achievement and social integration (Bartolo, Kyriazopoulou, Björck-Åkesson, & Giné, 2021). Moreover, special education teachers contribute to promote inclusivity and understanding within educational settings and communities. By integrating students with disabilities into mainstream educational environments from a young age, they help break down barriers and promote equity and access for all learners. This inclusive approach does not only benefits students with disabilities but also fosters empathy, tolerance, and respect among their peers (Bartolo, Kyriazopoulou, Björck-Åkesson, & Giné, 2021).

Special education teachers play a vital role in shaping the educational landscape, ensuring that every student has the opportunity to learn, grow, and succeed. Their dedication, expertise, and compassion create a supportive framework that empowers students with disabilities to reach their full potential. By prioritizing inclusive education and early intervention, society can build a more equitable and inclusive future where all learners are valued and supported.

Artificial Intelligence

Artificial Intelligence (AI), as defined by Ali et al. (2023), is the development of computer systems that can perform tasks that typically require human intelligence, such as

learning, problem-solving, reasoning, perception, and decision-making. AI systems are designed to mimic human cognitive functions and exhibit intelligent behavior by analyzing data, recognizing patterns, making predictions, and providing recommendations or taking actions based on the acquired knowledge. (Hassani et al., 2020) Originating in the mid-20th century, AI has undergone rapid progress, transitioning from rudimentary systems like Theseus, a mechanical mouse developed by Claude Shannon in 1950 that navigated mazes using search algorithms, to today's sophisticated neural networks (Hamon et al., 2020).

Neural networks, a type of machine learning model inspired by the structure and function of the human brain, marked a pivotal advancement in AI. Unlike the rule-based systems of the past, neural networks can learn from data, adapt, and improve their performance over time without explicit programming. This is achieved through interconnected layers of artificial neurons that process input data and pass it through a series of nonlinear transformations to generate output. Today, AI systems powered by deep learning algorithms harness vast amounts of data to train these neural networks, allowing them to recognize intricate patterns, make nuanced predictions, and achieve remarkable levels of accuracy in various tasks (Choi et al., 2020).

Furthermore, AI plays a crucial role in enhancing safety and security measures, improving industrial processes, and driving innovation across sectors (Stone et al., 2022). Its integration into diverse industries holds the potential to revolutionize processes, enhance decision-making, and address complex challenges facing society. Moreover, AI has increasingly penetrated the education sector, offering innovative solutions to enhance learning experiences (Stone et al., 2022). From personalized tutoring systems to adaptive learning platforms, AI is reshaping how students learn and educators teach. And by analyzing student data and adapting instruction to individual learning needs, AI is revolutionizing education, making it more accessible, engaging, and effective.

Artificial Intelligence in Special Education

Artificial Intelligence (AI) holds immense promise for revolutionizing special education by offering tailored solutions to overcome diverse challenges faced by students with disabilities (Swargiary & Roy, 2024). One of the significant advancements in special education is the development of Intelligent Tutoring Systems (ITS), which provide personalized learning experiences that accommodate individual learning styles and

abilities. For instance, ITS can analyze each student's progress and preferences, adjusting the content and pace of instruction to make learning more effective and personalized. This ensures that students with special needs receive instruction that is tailored to their unique learning profiles. Additionally, Natural Language Processing (NLP) techniques have emerged as valuable tools in language teaching, enabling the analysis and comprehension of student responses to deliver targeted interventions. This technology helps special education teachers understand and address the specific language challenges faced by students, thereby enhancing their communication skills (Jadán-Guerrero et al., 2024).

AI-powered educational robots play a pivotal role in engaging students with disabilities through interactive learning experiences. These robots assist with communication, social skills development, and other educational objectives, providing a dynamic and responsive learning environment that makes education more accessible and enjoyable for students with disabilities. For example, robots can be programmed to interact with students in a way that encourages social interaction and communication, which are often challenging areas for students with autism. Furthermore, data mining techniques harness the power of AI to analyze student performance data, enabling educators to predict learning outcomes and customize interventions to meet specific needs more effectively. By identifying patterns and trends in the data, educators can develop strategies that are more aligned with the individual requirements of each student, thus promoting a more inclusive and supportive learning environment (Syriopoulou-Delli & Gkiolnta, 2021). Additional AI technologies, such as speech analysis tools and neural networks, further enhance the educational experience for students with disabilities. Speech analysis tools offer insights into students' speech patterns and communication abilities, facilitating improvements in language development and communication skills through detailed feedback. For example, these tools can identify specific speech issues and suggest targeted exercises to improve articulation and fluency. Neural networks for teaching evaluation utilize AI models to assess the effectiveness of teaching methods by analyzing student performance data, informing instructional strategies, and curriculum design. This continuous evaluation ensures that teaching methods are effective and adaptive to the needs of students. Affective computing measures students' emotional states during learning, allowing educators to tailor their approaches based on students' emotional needs, providing a supportive learning

environment that reduces anxiety and increases engagement (Bhatti, Mohi-U-din, Hayat, & Tariq, 2024).

Early Childhood

Early Childhood comprises programs and initiatives tailored for children from birth to the age of eight, as articulated by Ampartzaki (2023). This developmental period is widely recognized as the most crucial stage in an individual's life, highlighting the significance of nurturing and supporting children's growth, development, and learning. Early childhood education focuses on creating a secure, stimulating, and nurturing environment that promotes holistic development, covering cognitive, social, emotional, and physical aspects (Saracho, 2023). Its overarching goal is to establish the groundwork for lifelong learning and well-being, ensuring that children in early childhood have the requisite support and opportunities to realize their full potential (Fabry et al., 2022).

Early childhood studies involve a multidisciplinary approach to fostering children's growth and development. This comprehensive strategy addresses various dimensions, including social, emotional, cognitive, and physical needs, aiming to build a solid foundation for lifelong learning and overall well-being. This holistic approach recognizes the interconnectedness of different aspects of development and seeks to provide children with a supportive and enriching environment. (Willan, 2024). Moreover, early childhood initiatives are vital in promoting equity and social justice, contributing to inclusive economic growth, and supporting sustainable development goals. By providing quality early learning opportunities, these initiatives help reduce disparities and enhance school readiness among children from diverse backgrounds. Economic analyses highlight the high returns on investment in early childhood, underscoring its importance in fostering individual development and societal well-being (Lang et al., 2024).

From a human rights perspective, expanding access to quality early learning programs aligns with the right to education within a lifelong learning framework. Early childhood education not only prepares children for basic education but also lays the foundation for their continuous learning journey. By prioritizing early childhood education, societies uphold the fundamental rights of children and invest in their future well-being and success (Raikes et al., 2023).

Early Childhood is a holistic and comprehensive approach to nurturing children's growth and development from birth to eight years old. It encompasses various dimensions of development, promotes equity and social justice, and aligns with human rights principles and the right to education. Through quality early childhood initiatives, societies can ensure that children receive the support and opportunities they need to thrive and reach their full potential. (Sargsyan et al., 2023).

Review of Related Studies

The researcher conducted a comprehensive review of prior studies pertinent to the current investigation, systematically arranging them in chronological order from the most recent to the earliest.

The study by Yao and Wang (2024) aimed to explore the factors influencing pre-service special education teachers' intention to use artificial intelligence in education through the Technology Acceptance Model (TAM). Conducted within a university environment in China, the study sampled 274 pre-service special education teachers, including 241 females and 33 males from various academic years. Utilizing a quantitative methodology, the research used a questionnaire based on TAM to measure digital literacy, teacher self-efficacy, perceived usefulness, perceived ease of use, and behavioral intention. Data analysis using SPSS 26.0 and AMOS 24.0 revealed that digital literacy positively influenced teacher self-efficacy, perceived ease of use, and perceived usefulness. Perceived ease of use and perceived usefulness were significant predictors of behavioral intention, while teacher self-efficacy was not. The study recommends further research to enhance AI integration in special education by focusing on digital literacy and perceived usefulness.

In her study, Kim, J. (2023) shed light on the use of artificial intelligence in teaching students with special needs from the perspective of teachers. The study was conducted in China and involved a sample of 20 teachers specialized in educational technology and artificial intelligence. A mixed-methods approach was employed, combining quantitative and qualitative methods. In the quantitative phase, a questionnaire was distributed to the teachers to examine their views on the role of artificial intelligence in improving students' knowledge in various subjects. In the qualitative phase, in-depth interviews were conducted with the teachers to understand their experiences and opinions regarding the integration of artificial intelligence in education. The study aimed to explore the challenges and

opportunities associated with collaboration between teachers and artificial intelligence, as well as to identify the training needs of teachers to interact with artificial intelligence. The study utilized a questionnaire and semi-structured interviews as research tools. The results indicated that teachers aim to improve students' knowledge and build their capabilities through artificial intelligence and that data-driven learning and case-based thinking are effective methods. In conclusion, the study highlighted that collaboration between teachers and artificial intelligence can be beneficial in enhancing the learning experience, and continuous training and development for teachers are necessary to enhance their interaction with technology.

Kang et al. (2023) conducted a descriptive study to analyze the digital competency required by special education teachers for the future education of students with disabilities. The study was carried out at Kwangju Women's University and Mudung Middle School in South Korea. The research involved a survey of 25 special education teachers from the SW Research Group. Using a detailed questionnaire, the study classified digital competencies into areas such as technology utilization, AI convergence education, information utilization, computational thinking, digital ethics, collaboration and communication, and production and sharing. The findings revealed specific sub-competencies for each area, with a total of 6 competencies for technology utilization, 6 for AI convergence education, 5 for production and sharing, and 5 for information utilization. Computational thinking and digital ethics were each classified into 4 competencies, while collaboration and communication were classified into 3 competencies. The study concluded that digital competency education should be integrated into teacher training curricula to enhance the capabilities of special education teachers.

The study by Agwa and Makary (2023) aimed to explore the reality of employing AI applications in rehabilitating children with special needs, specifically those with Autism Spectrum Disorder and intellectual disabilities, from the perspective of teachers and specialists. Utilizing a descriptive survey methodology, data were collected through electronic questionnaires distributed to 118 special education teachers in intermediate schools within government integration schools in Riyadh. The survey covered several aspects, including the importance of using AI educational applications, the obstacles to their use, attitudes towards their use, and the level of knowledge and skill in using them. Results

indicated that AI applications are considered highly important in the education and rehabilitation of children with special needs, with most related aspects receiving high approval ratings from teachers. However, challenges such as human, material, and technical resources were identified. Despite these challenges, there was a positive trend towards using AI applications. The study recommends intensive training programs to enhance teachers' skills in using AI applications, providing necessary support to overcome technical and material challenges, and integrating AI skills into university curricula.

Di Battista et al. (2020) investigated Italian teachers' opinions on Educational Robotics (ER) for special needs students using a mixed-methods approach. The study involved 323 teachers who completed a 12-hour training course and were surveyed through a quantitative online questionnaire to assess ER's effectiveness for conditions such as ADHD, Autism Spectrum Disorder (ASD), and Dyspraxia. The research aimed to fill the gap in empirical studies regarding ER's application in special education and to understand teachers' perceptions based on educational level. The results showed that teachers generally had positive attitudes towards ER, with perceived benefits varying by school level: kindergarten teachers found ER useful for ASD, ADHD, Down Syndrome, and emotional distress; primary school teachers highlighted ADHD, Dyspraxia, and ASD; and junior and senior secondary teachers noted ER's advantages for ASD and Dyspraxia. The study concluded that ER has significant potential to enhance support for students with special needs, though further research is needed to explore its impact on a broader range of disabilities and educational contexts.

The study conducted by Garg and Sharma (2020) sought to explore the impact of artificial intelligence (AI) in special needs education, particularly in promoting inclusive pedagogy. Employing a mixed-methods approach, the study utilized surveys, interviews, and classroom observations. The sample consisted of ten students with disabilities and five teachers teaching children with special needs. Surveys were administered to educators, students, and parents to assess their experiences and perceptions regarding AI integration. The primary objectives were to investigate how AI tools can enhance personalized learning experiences for students with special needs, assess the effectiveness of AI-based interventions in addressing individual learning challenges, and explore the impact of AI on teacher-student interactions and overall classroom dynamics. The findings indicated that

AI-enhanced personalized learning positively impacted student engagement, motivation, and academic progress. Moreover, teachers reported improved efficiency in lesson planning and resource allocation. However, challenges such as ensuring equitable access to AI tools and addressing privacy concerns were identified. Overall, the integration of AI contributed to a more inclusive and effective learning environment.

Critique of Related Studies

A comparative analysis of previous studies was conducted, with a thorough examination of their objectives, methodologies, and instruments. The current study is positioned within this academic context to delineate its contributions and advancements relative to the existing study.

The current study aims to explore the viewpoints held by educators specializing in special education concerning the use of artificial intelligence (AI) in early childhood. This investigation stands apart from previous related studies in the field. The current study differs from Yao and Wang's (2024) study, which aimed to explore the factors influencing pre-service special education teachers' intention to use AI in education through the Technology Acceptance Model (TAM) and inclusivity in educational settings tailored for students with diverse abilities. Additionally, this study contrasts with Kim's (2023) research, which examined the deployment of AI in teaching students with special needs from an educator's perspective, offering valuable insights into instructional practices. Kang et al. (2023) focused their inquiry on analyzing the digital competencies required by special education teachers to effectively educate students with disabilities in the future, categorizing these competencies into technology utilization, AI convergence education, information utilization, computational thinking, digital ethics, collaboration and communication, and production and sharing. Similarly, this study differs from Agwa and Makary's (2023) research, which focused on employing AI applications in rehabilitating children with special needs, specifically those with Autism Spectrum Disorder and intellectual disabilities. Di Battista et al. (2020) investigated Italian teachers' opinions on Educational Robotics (ER) for special needs students. Lastly, the study by Garg and Sharma (2020) provided insights into the transformative impact of AI on special needs education, emphasizing inclusive pedagogical practices

In terms of methodology, the current study employed a mixed-methods approach, utilizing both quantitative and qualitative data collection methods. This approach aligns with several studies, including Jinhee Kim's (2023) research in China, Garg and Sharma's (2020) study on inclusive pedagogy, and Di Battista et al. (2020) investigation of Italian teachers' opinions on Educational Robotics (ER) for special needs students. Conversely, the current study's approach differs from studies such as Yao and Wang (2024) and Agwa and Makary (2023), which focused solely on quantitative surveys, and Kang et al. (2023), which employed a descriptive approach relying on qualitative data collected through a survey distributed to special education teachers.

The research tools utilized in the current study include teacher surveys and semi-structured interviews. This methodological choice is consistent with Jinhee Kim's (2023) research and the study conducted by Garg and Sharma (2020), both of which employed similar tools to explore educational practices and technology integration. In contrast, Agwa and Makary (2023) utilized electronic questionnaires distributed to 118 special education teachers in intermediate schools within government integration schools in Riyadh, focusing primarily on quantitative data. While both studies share a focus on understanding educators' perspectives on AI, the current study's use of semi-structured interviews alongside surveys provides a deeper qualitative understanding, complementing the quantitative findings with nuanced insights and personal experiences from educators. This approach also differs from Kang et al.'s (2023) study, which employed a descriptive, qualitative approach to analyze and classify the digital competencies needed by special education teachers.

The current study highlights the perspectives of special education teachers on the utilization of AI in early childhood. This sets it apart from previous studies that focused on specific aspects such as reading or communication with students with special needs. Therefore, the current study contributes to expanding the understanding of the role of artificial intelligence in educating special needs students in early childhood.

Chapter 3

Methodology and Procedures

This chapter includes a description of the study's methodology, population and sample, and the study tools used for data collection. It also explains how the tool's validity and reliability were ensured and describes the statistical analyses employed.

Methodology:

This study employed a mixed-methods approach, utilizing both quantitative and qualitative methods, including a descriptive methodology through the use of surveys and semi-structured interviews. This approach was deemed most suitable for achieving the study's objectives, as it allows for a comprehensive exploration of teachers' perspectives on utilizing artificial intelligence (AI) in early childhood to support special needs students. Moreover, descriptive research aims to provide detailed information on phenomena and explore relationships without manipulating variables, aligning with the study's goal of understanding teachers' experiences with AI in early education settings.

Subjects of the Study

The researcher distributed the questionnaire to all members of the study population through Google Forms, totaling 119 teachers. A total of 93 teachers responded to the questionnaire, making up 78% of the population. The participants were special education teachers working in private sector schools in the Al-Jamaa District of the capital, Amman. They held bachelor's degrees or higher in special education, audiology, speech therapy, occupational therapy, learning disabilities, or related fields, and worked with children with special needs in early childhood. The distribution of respondents according to their years of experience and qualifications is shown in Table 1 below. After administering the questionnaire, a subsample of 10 participants who responded to the questionnaire was selected to confirm and clarify the results.

Table (1)

Sample distribution

		Frequency	Percent
Qualification	Bachelor's	77	82.8
	Postgraduate	16	17.2
Years of experience	Less than 5 years	35	37.6
	5 years to less than 10 years	41	44.1
	10 years and above	17	18.3
	Total	93	100.0

Instruments of the Study

The study relied on both the questionnaire and interviews to achieve its current goal:

1- Teacher Survey

A teacher survey was administered to gather quantitative data. To measure the level of benefits and challenges of utilizing AI in early childhood as perceived by Special Education Teachers in the Directorate of Education for Al-Jamaa District /Capital Governorate Amman, focusing on the private sector in Jordan. After reviewing the theoretical literature and previous studies such Agwa and Makary (2023), and Kim, J. (2023), the questionnaire was divided into two parts. The first part included demographic information about the respondents (educational qualification and years of experience)

The second part consisted of 26 items divided into two domains:

The benefits of utilizing AI in early childhood as perceived by Special Education Teachers (13 items).

The challenges of utilizing AI in early childhood as perceived by Special Education Teachers (13 items).

Five point Likert scale (Strongly agree = 5, agree = 4, neutral = 3, disagree = 2, strongly disagree = 1) was employed. The following scale was adopted to analyze the results:

- 1.00–2.33 low
- 2.34–3.67 Moderate
- 3.68–5.00 High

By using the following equation:

The higher limit (5) – the lowest limit (1) / Number of categories (3)

$5-1/3 = 1.33$. Then adding (1.33) to the end of each category

Validity of the Instrument

For the study, the validity of the survey tool was ensured through content validity. Content validity was established by presenting the questionnaire to 12 experts in educational technology, Special Education, measurement and evaluation, or curricula and teaching methods (see Appendix C), who were selected by sending a letter of arbitration to them (see Appendix A). This process aimed to verify the appropriateness of the survey items for each dimension and the clarity of the dimensions included in the survey. The expert reviewers evaluated the survey items based on their relevance to the intended measurement and the clarity of the dimensions encompassed in the questionnaire.

After completing the validation process of the questionnaire through content validity, and following the revisions suggested by the experts, some items were reformulated, others revised, and some replaced (Appendix D), rendering them suitable for application to the study sample. Upon ensuring their reliability, the researcher adhered to the following considerations when formulating the questionnaire items: using simple, clear, and focused language to ensure ease of understanding, and respecting respondents' time by ensuring that answering the questionnaire items does not unnecessarily extend beyond what is necessary.

Validity of benefits scale

To extract the significance of the construct, the correlation coefficients of each item and the total score were calculated. The correlation coefficients of the items with the tool ranged between (0.59-0.89) as shown in table (2) below.

Table (2)

Correlation Coefficients between The Item and Total Score for the Benefits Scale

Item #	R With total score
1	.63(*)
2	.76(**)
3	.71(**)
4	.76(**)
5	.76(**)
6	.73(**)
7	.71(**)
8	.89(**)
9	.59(*)
10	.76(**)
11	.81(**)
12	.73(**)
13	.71(**)

* Correlation is significant at the (0.05) level

**Correlation is significant at the (0.01) level

It is clear from the previous table that all correlation coefficients were acceptable and statistically significant so none of these items were deleted.

Validity of challenges scale

To extract the significance of the construct validity of the scale of the challenge, the correlation coefficients of each item and the total score were calculated. The correlation coefficients of the items with the study tool ranged between (0.59-0.84), as shown in table (3) below.

Table (3)

Correlation Coefficients between the Item and the Total Score for the Challenges Scale

Item #	R With total score
1	.71(**)
2	.59(*)
3	.63(*)
4	.63(*)
5	.80(**)
6	.73(**)
7	.63(*)
8	.73(**)
9	.71(**)
10	.73(**)
11	.71(**)
12	.63(*)
13	.84(**)

* Correlation is significant at the (0.05) level

**Correlation is significant at the (0.01) level

It is clear from the previous table that all correlation coefficients were acceptable and statistically significant, so none of these items were deleted.

Reliability of The Benefits Scale

To ensure the stability of the study tool, it was verified by the test-retest method by applying the scale and reapplying it after two weeks on a group outside the study sample consisting of (12), and then the Pearson correlation coefficient was calculated between their estimates in the two times, it reached (0.89).

The reliability coefficient was also calculated using the internal consistency method

according to Cronbach's alpha equation, it reached (0.82). These coefficient values were considered appropriate for this study.

Reliability of the scale of the challenges

To ensure the stability of the study tool, it was verified by the test-retest method by applying the scale and reapplying it after two weeks on a group outside the study sample consisting of (12), and then the Pearson correlation coefficient was calculated between their estimates in the two times, it reached (0.90).

The Reliability coefficient was also calculated using the internal consistency method according to the Cronbach alpha equation, it reached (0.81). These values were considered appropriate for the purposes of this study.

Construct Validity

To extract the construct validity of the scales, correlation coefficients between each item and the total score were calculated. For the benefits scale, the correlation coefficients ranged from 0.59 to 0.89. For the scale of the challenges, the correlation coefficients ranged from 0.59 to 0.84. All correlation coefficients were statistically significant, indicating acceptable validity.

2- Semi-structured interviews

Qualitative data were gathered from interviews to provide a broader understanding of teachers' perspectives on AI utilization in early childhood settings. The researcher ensured the validity of the interview by presenting it to a panel of experts. Then, interviews were conducted with ten teachers who expressed their willingness to participate. The interview questions were:

1- From your perspective, What are the benefits of utilizing AI in early childhood as perceived by Special Education Teachers?

The interviewer also asked other sub-questions regarding this broad theme such as experience, successful stories, math, and linguistic skills....

2- From your perspective, What are the challenges of utilizing AI in early childhood as perceived by Special Education Teachers?

The interviewer asked other sub-questions regarding this broad theme such as training programs, cooperation of parents, regulations availability of AI tools...

Validity of the Interview

To ensure the validity of the interview, it was reviewed by a number of experts, and modified according to their feedback (Appendix C).

Reliability of the Interview

The interview questions were tested on three teachers outside the study sample, administered twice with a two-week interval between the first and second time. After analyzing the data, it was observed that the difference between the teachers' answers in the first and second interviews was minimal.

Procedures of the Study:

The researcher followed the outlined procedures to achieve the study objectives:

- 1- Reviewed the theoretical literature and previous studies.
- 2- Questionnaire Design: The initial questionnaire was designed in English based on the literature review and then translated into Arabic.
- 3- Verified the linguistic accuracy and consistency with the English version by certified linguist reviewer Rawia Sami.
- 4- Reviewed the Arabic version by specialized Arabic language reviewers, Dr. Hussein Mstrihi and Dr. Sameer Al-Sous.
- 5- Validate Questions: Both the Arabic versions of the questionnaire and interview questions were reviewed by experts.
- 6- Modification Based on Feedback: The questionnaire and interview questions were revised according to the experts' feedback.
- 7- Distribute the questionnaire: Distribute the questionnaire in Arabic to all members of the study population through Google Forms.
- 8- Translate Questionnaire: After modification Based on Feedback the questionnaire was translated back into English by the certified linguist reviewer Rawia Sami for inclusion in the study.
- 9- Develop Questions: Semi structured interview questions were created in English and translated into Arabic.
- 10- Data Collection: Quantitative data was collected from the completed questionnaires.
- 11- Conduct Interviews: Qualitative data was gathered through semi-structured interviews.
- 12- Data Analysis: Both quantitative and qualitative data were analyzed.

- 13- Data Compilation: Compile the results from questionnaires and interviews.
- 14- Descriptive Analysis: Perform a code thematic descriptive analysis of the data to identify, categorize, and provide detailed descriptions of key patterns and themes that emerge from the qualitative information.
- 15- Statistical Analysis: Conduct statistical analysis as needed.
- 16- Presentation of Results: Present the findings of the study.

Statistical Analysis:

1- Quantitative Statistical Analysis

The following statistical procedures were employed:

- Extracting Means
- Extracting Standard deviations
- Ranking the items of the study instrument.
- T- test conducted
- One-way ANOVA

2- Qualitative Analysis (Appendix G)

- Thematic analysis

Chapter 4

Results of the Study

Quantitative Data Analysis

1- Results related to the first question: "What is the level of benefits of utilizing AI in early childhood as perceived by Special Education Teachers?"

To answer the first question of the study "What is the level of benefits of utilizing AI in early childhood as perceived by Special Education Teachers?", means and standard deviations of the level of benefits of utilizing AI in early childhood as perceived by Special Education Teachers were extracted as presented in table (4).

Table (4)

Means and standard deviations of the level of benefits of utilizing AI in early childhood as perceived by Special Education Teachers - items, ranked in a descending order

Rank	N	Item	Mean	Std. Deviation	Degree of agreement
1	1	Using AI applications helps special education teachers in writing individual learning plans.	4.49	.619	high
2	2	AI applications help special education teachers adapt their teaching methods effectively.	4.42	.558	high
3	4	AI applications offer instant advice to special education teachers on how to modify activities to better meet each student's needs.	4.20	.745	high
4	3	AI applications provide immediate feedback on children's performance, enabling teachers to respond quickly and adjust the educational process.	4.15	.872	high
5	7	Using AI applications enhances the skill levels of special education teachers.	4.13	.769	high
6	10	AI applications offer a variety of educational resources, such as	4.09	.803	high

Rank	N	Item	Mean	Std. Deviation	Degree of agreement
		interactive games and customized learning materials, making it easier for teachers to personalize education for each student.			
7	6	Using AI applications helps special education teachers improve individual learning responses and provide more effective support.	3.97	.878	high
8	5	AI applications provide special education teachers with accurate analysis of children's performance and suggestions for adjusting educational activities, leading to achieving individual learning goals.	3.91	.928	high
9	11	AI applications improve natural interactions between teachers and children.	3.81	.850	high
10	8	AI applications help special education teachers improve children's daily life skills.	3.77	.849	high
11	13	AI applications help special education teachers improve children's communication skills.	3.73	.849	high
12	12	AI applications provide specialized tools and resources to help teachers foster children's independence.	3.69	.884	high
13	9	AI applications help special education teachers improve children's social skills.	3.61	1.064	moderate
		Total benefits of utilizing AI in early childhood as perceived by Special Education Teachers	4.00	.555	high

The table demonstrates that item 1 "Using AI applications helps special education teachers in writing individual learning plans" receives the highest mean of (4.49), while Item 9 "AI applications help special education teachers improve children's social skills" was ranked last with a mean of (3.61). Moreover, This table also demonstrates that the total mean level

of benefits of utilizing AI in early childhood as perceived by Special Education Teachers as a whole is (4.00) with a high degree of agreement.

2- Results related to the second question: "What is the level of challenges of utilizing AI in early childhood as perceived by Special Education Teachers? "

To answer the second question of the study, " What is the level of challenges of utilizing AI in early childhood as perceived by Special Education Teachers? ", means and standard deviations of the level of challenges of utilizing AI in early childhood as perceived by Special Education Teachers were computed as presented in tables (5) below.

Table (5)

Means and standard deviations of the level of challenges of utilizing AI in early childhood as perceived by Special Education Teachers items ranked in a descending order

Rank	N	Item	Mean	Std. Deviation	Degree of agreement
1	1	Limited training programs for special education teachers on using AI applications.	4.55	.617	high
2	6	AI applications may lead to excessive technological dependence, affecting children's social interaction and physical activity in the educational environment.	4.32	.710	high
3	9	Teachers may find that children prefer interacting with AI applications over socializing with peers, reducing social interaction and cooperation.	4.27	.739	high
4	4	Lack of resources and technical support.	4.24	.632	high
5	10	The need for continuous updates and maintenance of AI technologies.	4.19	.595	high
6	7	Ensuring the security and confidentiality of children's data from unauthorized access or breaches.	4.17	.583	high

Rank	N	Item	Mean	Std. Deviation	Degree of agreement
7	3	Teachers face difficulties in effectively customizing and adapting AI applications.	4.13	.629	high
8	2	Technical issues are one of the challenges in using AI in educating children with special needs in early childhood.	4.09	.775	high
9	8	Teachers have low proficiency in using AI applications for obtaining essential data (case studies, individual educational plans, weekly reports).	4.01	.814	high
10	12	Low confidence among special education teachers in AI technology.	3.98	.978	high
11	5	Difficulty in assessing the effectiveness of AI applications in teaching children.	3.90	.910	high
12	13	Limited AI applications that support the Arabic language.	3.83	1.167	high
13	11	Teachers fear that AI applications might replace their role in the classroom.	2.88	1.451	moderate
		Total Challenges of utilizing AI in early childhood as perceived by Special Education Teachers	4.04	.414	

Table 5 above demonstrates that Item 1 "Limited training programs for special education teachers on using AI applications" receives the highest mean of (4.55), while Item 11 "Teachers fear that AI applications might replace their role in the classroom" was ranked last with a mean of (2.88). This table also demonstrates that the total level mean of challenges of utilizing AI in early childhood as perceived by Special Education Teachers is (4.04) with a high degree of agreement.

3- The results of the third study question Are there any statistically significant differences at ($\alpha = 0.05$) in the levels of benefits and challenges of utilizing AI in childhood as perceived by Special Education Teachers attributed to qualification and years of experience?

To find out whether there are statistically significant differences ($\alpha=0.05$) between the means of the levels of benefits and challenges of utilizing AI in early childhood as perceived by Special Education Teachers due to qualification and years of experience, a t-test analysis was conducted for qualification, while One way ANOVA was conducted of years of experience of and the results are shown in tables below.

1- Qualification effect

Table (6)

T-test results for the effect of Qualification on the levels of benefits and challenges of utilizing AI in early childhood as perceived by Special Education Teachers

	qualification	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Benefits of utilizing AI in early childhood	Bachelor's	77	3.96	.567	-1.666	91	.099
	Postgraduate	16	4.21	.455			
challenges of utilizing AI in Early childhood	Bachelor's	77	4.04	.421	-.155	91	.877
	Postgraduate	16	4.06	.390			

As shown in Table (6):

- There are no statistically significant differences at ($\alpha= 0.05$) in the benefits of utilizing AI in early childhood as perceived by special education teachers due to the qualification variable.
- There are no statistically significant differences at ($\alpha= 0.05$) in the challenges of utilizing AI in early childhood as perceived by Special Education Teachers due to qualification variables.

2- Years of experience effect

Table (7)

Means and standard deviations of the levels of benefits and challenges of utilizing AI in early childhood as perceived by Special Education Teachers due to years of experience

		N	Mean	Std. Deviation
benefits of utilizing AI in early childhood	Less than 5 years	35	3.94	.611
	5 years to less than 10 years	41	4.01	.555
	10 years and above	17	4.10	.440
	Total	93	4.00	.555
challenges of utilizing AI in early childhood	Less than 5 years	35	4.05	.497
	5 years to less than 10 years	41	4.05	.371
	10 years and above	17	4.03	.339
	Total	93	4.04	.414

Table (7) shows a slight variance in students' means of the levels of benefits and challenges of utilizing AI in early childhood as perceived by Special Education Teachers due to years of experience, to find out whether there are statistically significant differences in these means, One way ANOVA was conducted and the results are shown in table (8).

Table (8)

One-way ANOVA results for the effect of years of experience on the levels of benefits and challenges of utilizing AI in early childhood as perceived by Special Education Teachers

		Sum of Squares	df	Mean Square	F	Sig.
benefits of utilizing AI in early childhood	Between Groups	.279	2	.139	.447	.641
	Within Groups	28.088	90	.312		
	Total	28.367	92			
challenges of utilizing AI in Early childhood	Between Groups	.003	2	.001	.008	.992
	Within Groups	15.742	90	.175		
	Total	15.745	92			

Table (8) demonstrates that:

- There are no statistically significant differences at ($\alpha= 0.05$) in the benefits of utilizing AI in early childhood as perceived by Special Education Teachers due to years of experience variable.
- There are no statistically significant differences at ($\alpha= 0.05$) in the challenges of utilizing AI in early childhood as perceived by Special Education Teachers due to years of experience variable.

Qualitative data analysis

Content Analysis of the first interview question: From your perspective, What are the benefits of utilizing AI in early childhood as perceived by Special Education Teachers?

The analysis of responses from ten special education teachers reveals various perceived benefits of AI in early childhood education. As 60% of teachers emphasized, AI saves time on administrative tasks, allowing for more direct interaction with students and better focus on their individual needs. Additionally, 40% of teachers highlighted that AI significantly enhances communication, especially for non-verbal children, through alternative communication methods. One such tool is "Proloquo2Go," an augmentative and alternative communication (AAC) app designed to assist individuals with speech impairments by converting symbols or pictures into spoken language (AssistiveWare, n.d.).

This tool enables non-verbal children to communicate more effectively and supports their educational engagement. Additionally, 30% of teachers noted that AI-based applications and games improve student engagement and motivation compared to traditional methods. These tools can make learning more interactive and enjoyable. Similarly, 30% of responses highlighted the potential of AI in creating personalized learning experiences and adaptive educational plans. For instance, "Duolingo" is a language-learning app that uses AI to adapt lessons based on user progress, providing a tailored learning experience (Duolingo, n.d.). Likewise, "Khan Academy Kids" employs AI to create personalized educational content and interactive activities that adjust to the learning pace of young children (Khan Academy, n.d.). Both tools leverage AI to enhance educational engagement and tailor learning experiences to individual needs. However, **20%** of teachers expressed the need for more training and knowledge to effectively utilize AI tools. Furthermore, **20%** appreciated AI for its efficiency in generating multimedia content, which helps in creating more engaging educational materials. Lastly, 20% of teachers found AI virtual assistants, like Amazon Alexa, which is a cloud-based virtual assistant that performs various tasks through voice commands, such as setting reminders, managing schedules, and providing information (Amazon, n.d.), and Google Assistant which offers functionalities such as managing tasks, answering queries, and integrating with other applications to streamline daily activities (Google, n.d.) , useful for organizing schedules and enhancing communication with parents, thereby improving the overall educational experience for children. Both virtual assistants leverage AI technology to facilitate administrative tasks and enhance communication within educational settings.

Content Analysis of the Second Interview Question: From your perspective, what are the challenges of utilizing AI in early childhood as perceived by Special Education Teachers?

The analysis of responses from ten special education teachers reveals several key challenges in using AI in early childhood education. **20%** of teachers noted that AI's effectiveness varies greatly depending on individual child needs, with some children experiencing sensory issues or behavioral problems. **20%** highlighted concerns about social isolation and over-reliance on technology, emphasizing the need for human interaction and careful supervision. **30%** faced difficulties due to a lack of training

programs and resources, especially in their native language. **20%** expressed concerns about potential negative effects on children's development, such as privacy issues, radiation exposure, and AI misinterpreting children's needs. **20%** pointed out financial and infrastructure barriers, including the high cost of AI tools and the lack of necessary technology. **10%** mentioned disparities in access to AI and challenges in accurately interpreting emotional expressions. Lastly, **10%** identified community apprehension and technical barriers as significant hurdles to effective AI adoption. Addressing these issues is crucial for the successful integration of AI in early childhood special education.

Thematic Analysis

The thematic analysis of the interviews identified several key themes related to the use of artificial intelligence (AI) in early childhood education for children with special needs. The analysis involved coding the responses and categorizing them into common patterns and themes shared by the participants. This analysis is structured around two primary themes the benefits and challenges of AI.

- Benefits of Utilizing AI in Early Childhood Education

1- Enhanced Learning and Administrative Efficiency: AI tools were noted for their significant potential to enhance learning experiences and streamline administrative tasks. Participants observed that AI applications could automate tasks such as generating reports and managing assessments, thereby saving valuable time for teachers. This allows educators to focus more on direct interaction with students, improving educational outcomes. As a teacher mentioned *“Using AI in early childhood education offers significant benefits, especially in special education. One major benefit is the time saved for teachers in completing administrative tasks. For instance, I can input assessment data into AI tools like ChatGPT, which can generate reports, allowing me to spend more time working directly with children.”*

2- Individualized Learning Experiences: AI applications were recognized for their ability to provide personalized educational experiences. Tools like interactive games and educational apps can cater to individual learning needs and adapt to varying proficiency levels, fostering engagement and skill development. This personalization enhances the effectiveness of teaching strategies and supports the diverse needs of students. As a teacher said *“Applications like 'Proloquo2Go' use AI-driven voice synthesis to assist non-verbal*

children in expressing themselves. This tool allows children to select symbols or pictures on a tablet, which the app then vocalizes into speech.”

3- Improved Communication: AI technologies, including voice synthesis and chatbots, were identified as valuable for assisting non-verbal children in expressing themselves and developing individualized education plans. AI-driven tools facilitate communication by converting speech to text and providing interactive, engaging educational content that supports language development and cognitive skills. As one teacher mentioned *“AI can be very useful in writing educational plans and adapting teaching methods to meet the needs of children. For example, voice assistants can convert speech to text and vice versa, facilitating communication between the teacher and the child.”*

- Challenges of AI in Early Childhood Education

1- Varied Effectiveness Based on Individual Needs: The effectiveness of AI tools can vary significantly depending on each child's specific needs and conditions. Some participants reported limited success with certain AI tools due to issues such as sensory sensitivity, behavioral problems, or lack of interest. This variability highlights the importance of tailoring AI applications to individual needs to ensure their effectiveness. As one teacher mentioned *“The VR experience was successful for only one child with Down syndrome out of ten students. The other children faced various issues: some had sensory problems and refused to wear the VR glasses, others exhibited behavioral problems due to dependency on technology, and some showed no interest.”*

2- Potential for Over-Reliance and Social Isolation: Concerns were raised about the risk of excessive attachment to technology, which might lead to social isolation and reduced human interaction. Educators emphasized the need to maintain a balance between AI use and direct personal interaction to prevent potential negative effects on children's social and emotional development. As a teacher stated *“AI should be used cautiously and under the supervision of specialists to avoid these issues. Some parents use technology as a means to calm their children rather than addressing behavioral problems, which can lead to long-term negative effects.”*

3- Infrastructure and Training Limitations: The lack of adequate infrastructure and training programs was identified as a significant barrier to effective AI implementation. Participants highlighted challenges such as language barriers, insufficient training resources, and the

need for specialized support as factors that impede the optimal use of AI tools in educational settings. As a teacher mentioned, *“I faced significant challenges in learning about the benefits of AI due to language issues and the lack of training programs. This limited my ability to fully utilize technology in teaching children.*

4- Privacy and Safety Concerns: Issues related to data privacy and the safety of using AI technologies were noted. Educators expressed concerns about the potential risks associated with AI applications, including the security of personal data and the potential for technology to misinterpret or inadequately address children's needs. As one teacher said *I worry about children's privacy and the safety of their data with these technologies. AI is still developing, and we can't risk potential dangers with young children.”*

Chapter 5

Discussion of Results

Introduction

This chapter discusses the findings of the quantitative and qualitative analysis conducted in the study. The main objective was to explore the perceived benefits and challenges of utilizing AI in early childhood education as viewed by special education teachers. The results from the statistical analysis of the survey data and the thematic analysis of the interview responses are synthesized to provide a comprehensive understanding of the role of AI in early childhood special education.

Discussion of the first research question: "What is the level of benefits of utilizing AI in early childhood as perceived by Special Education Teachers?"

To answer this question, the means and standard deviations of the perceived benefits of utilizing AI in early childhood were extracted.

The first question for each area will be discussed, and arranged according to means and standard deviations in descending order.

1- Using AI applications helps special education teachers create individual learning plans (Mean = 4.49, Std. Deviation = 0.619), highlighting AI's significant role in assisting with administrative tasks and allowing for detailed, customized plans tailored to each child's needs. Teachers see AI as a reliable tool for streamlining the development of individualized education programs (IEPs), making them thorough and adaptable. Key contributions of AI in early childhood special education include automating repetitive tasks like data entry and documentation, quickly analyzing large amounts of student data to design effective, personalized IEPs, providing real-time recommendations for adjusting plans based on ongoing assessments, and ensuring consistency and completeness in IEPs, thereby reducing human error. Teachers appreciate AI's reliability and precision, with one noting that *"AI is very useful for writing educational plans and adapting teaching methods to meet children's needs."*

2- The finding that AI applications help special education teachers adapt their teaching methods effectively in early childhood settings (Mean = 4.42, Std. Deviation = 0.558),

which ranks as the second highest result, underscores a strong endorsement of AI's role in enhancing educational flexibility and responsiveness for young children with special needs. This high score reflects the perception that AI can dynamically adjust instructional approaches to cater to the diverse learning needs of young students in special education.

In early childhood, teaching methods need to be highly adaptable and responsive due to the rapid developmental changes that occur during this period. For example, AI can recommend different strategies based on real-time assessments of a child's progress, such as suggesting interactive games for cognitive development or sensory activities for children with sensory processing issues. Unlike in later stages of education, early childhood education requires more immediate and frequent adjustments to teaching methods to accommodate shorter attention spans and varying developmental rates. By continuously analyzing data on each child's performance, AI helps teachers personalize their approaches, ensuring that every child receives the most effective and appropriate instruction for their developmental stage. As one teacher mentioned "*In early childhood special education, AI's role in adapting teaching methods is invaluable. It allows me to dynamically adjust approaches based on each child's unique learning needs.*"

3- In early childhood special education, AI plays a crucial role by offering immediate advice to teachers on how to modify activities to meet each student's needs (Mean = 4.20, Std. Deviation = 0.745). This capability is particularly beneficial in early childhood due to the rapid developmental changes and diverse needs of young students with disabilities or learning differences. For example, if a child needs a different approach to grasp a concept or encounters behavioral challenges, AI can quickly suggest adjustments to activities. This real-time support enables teachers to tailor their teaching in response to each child's unique learning style and developmental stage. Moreover, AI enhances the educational experience by offering personalized recommendations based on continuous assessments and interactions with students. This personalized approach is crucial in early childhood special education, where educators must constantly adapt their teaching strategies to meet the varied learning abilities and styles of young children. By integrating AI's real-time feedback into their teaching practices, teachers can enhance instructional effectiveness and create a more inclusive learning environment that supports the individual needs of every

student. As a teacher stated, *“AI can suggest modifications promptly, enhancing the learning experience.”*

4- In early childhood special education, AI's ability to provide immediate feedback on children's performance (Mean = 4.15, Std. Deviation = 0.872) plays a crucial role. This feature is essential because young children develop rapidly, and timely feedback helps teachers adjust their teaching strategies quickly to meet each child's unique needs and developmental stage. For example, AI can analyze a child's interactions with educational games or activities and instantly provide insights to the teacher. If a child with specific learning needs struggles with a task, AI can suggest adjustments or alternative approaches in real time. This capability supports teachers in creating personalized learning experiences that are responsive to each child's progress and developmental journey in early childhood special education. For example, one of the teachers stated *“AI-powered platforms can analyze children's interactions with educational activities, such as games or exercises, and provide instant insights into their comprehension and skill acquisition.”*

5- In early childhood special education, AI enhances teachers' skills (Mean = 4.13, Std. Deviation = 0.769), specifically by addressing unique challenges present at this developmental stage. Teachers in early childhood face distinct needs due to the young age and varying developmental trajectories of their students. AI helps by offering personalized strategies that adapt to each child's learning pace and style, crucial in this formative stage where foundational skills are established. This capability supports teachers in providing tailored interventions and activities that promote early childhood development effectively. By leveraging AI tools, educators in early childhood special education can better nurture children's growth and learning, setting a solid foundation for their future educational journey. For example, Beccaluva et al. (2024) investigated that in early childhood special education, AI applications can analyze a child's language development progress through speech recognition technology. By analyzing speech patterns and vocabulary acquisition, AI can provide insights into a child's linguistic development. For instance, AI might suggest interactive language exercises or recommend specific language-building activities based on a child's spoken language abilities. This personalized feedback allows teachers to tailor their language instruction to each child's specific needs, promoting more effective language development in early childhood. As a teacher stated, *“I use AI-based smartphone*

applications and find that children respond better to these than traditional methods like flashcards.”

6- AI applications in early childhood special education provide essential resources like interactive games and personalized learning materials, benefiting teachers significantly (Mean = 4.09, Std. Deviation = 0.803). These tools are crucial in addressing the diverse learning styles and abilities of young learners with disabilities. AI platforms offer interactive tools that adapt in real time based on student responses, ensuring engagement and appropriate challenge levels. For example, AI adjusts game difficulty and content presentation to match each child's learning pace, creating inclusive and supportive learning environments.

AI streamlines instructional planning by automating personalized lesson plans and recommending activities aligned with individual learning goals. This automation saves teachers time and allows for more personalized student interactions. Additionally, AI enhances access to diverse educational content, such as virtual reality simulations, which immerse children in interactive learning experiences promoting skill development in controlled settings. As a teacher mentioned, *“AI can make learning fun through gamification. For example, educational apps like "Khan Academy Kids" use AI to create personalized learning games that keep children engaged and motivated. These games can help children with learning difficulties by providing them with tailored educational experiences that suit their needs.”*

7- AI applications in early childhood special education significantly enhance individualized learning responses and support effectiveness (Mean = 3.97, Std. Deviation = 0.878). In early childhood, where children with disabilities exhibit diverse learning profiles and developmental stages, AI serves as a transformative tool. It provides insights into student progress beyond traditional assessments, offering personalized interventions based on real-time data analysis. AI adapts educational content to suit diverse learning styles and paces, ensuring tailored challenges and support that enhance engagement and effectiveness. By automating administrative tasks and providing data-driven insights, AI empowers educators to create dynamic, inclusive learning environments that meet the unique needs of each child with disabilities. As a teacher noted, *“Artificial Intelligence (AI) can be a valuable tool. AI can analyze individual student data and provide personalized*

recommendations to fit each child's needs. This helps in designing effective individualized education plans.”

8- In early childhood special education, AI applications are crucial for analyzing children's performance and providing tailored educational suggestions (Mean = 3.91, Std. Deviation = 0.928). AI rapidly processes data to assess cognitive development, skill acquisition, and learning preferences. For instance, AI analyzes how children engage with interactive tasks, providing insights that help teachers adjust lesson plans to meet individual learning needs. This personalized approach ensures that instructional strategies effectively support each child's unique developmental and learning requirements, enhancing the quality and effectiveness of special education in early childhood. As a teacher mentioned “*Artificial Intelligence (AI) can be a valuable tool. AI can analyze individual student data and provide personalized recommendations to fit each child's needs.*”

9- In early childhood special education, AI enhances children's daily life skills (Mean = 3.77, Std. Deviation = 0.849) through personalized learning experiences. AI provides tailored interventions in critical areas such as communication, and fostering skill development. Interactive AI tools, such as educational games and customized materials, simulate practical scenarios for skill practice, promoting independence and confidence. Additionally, AI supports real-time assessment and feedback, enabling educators to adjust teaching strategies promptly. For non-verbal children, AI applications facilitate communication using methods like picture-based or voice-enabled systems. For example, AI tools can help non-verbal children express themselves through images or synthesized speech, enhancing their abilities to participate and engage effectively in educational activities. As one teacher stated, “*I am unfamiliar with AI but I believe it can offer significant Interviews, especially for non-verbal children. AI can help these children communicate through alternative communication methods such as pictures, text, or voice via AI applications.*”

11- In early childhood special education, AI applications significantly enhance children's communication skills (Mean = 3.73, Std. Deviation = 0.849), focusing on language and expressive abilities. AI provides personalized learning experiences tailored to each child's communication needs. For example, AI-powered speech recognition software analyzes speech patterns and offers feedback on pronunciation, aiding in skill refinement. Interactive

language learning games engage children in practicing conversational skills and vocabulary acquisition in supportive environments. Unlike social communication, AI supports phonological awareness and grammar proficiency, crucial for effective expression. Educators use AI to track progress and guide interventions, ensuring targeted support. For instance, tools like "Proloquo2Go" use AI voice synthesis to help non-verbal children communicate by vocalizing symbols or pictures selected on a tablet, fostering communication breakthroughs in diverse learners. As a teacher noted *"AI technologies offer profound benefits that can significantly enhance the learning experiences of children, especially those with diverse communication needs. For instance, applications like "Proloquo2Go" use AI-driven voice synthesis to assist non-verbal children in expressing themselves. This tool allows children to select symbols or pictures on a tablet, which the app then vocalizes into speech. Witnessing how this technology enables communication breakthroughs among my students has been incredibly rewarding."*

12- In early childhood special education, AI applications facilitate independence among children with disabilities (Mean = 3.69, Std. Deviation = 0.884). For instance, AI-driven scheduling tools help children follow daily routines independently by providing visual prompts and reminders. These tools enhance organizational skills and empower children to manage tasks and responsibilities autonomously. Integrating AI in this way supports children's development of essential life skills, promoting self-reliance and fostering confidence in their abilities. As a teacher mentioned, *"AI can also help develop innovative educational content that stimulates children's creative thinking, such as interactive stories where children can participate in shaping events."*

13- In early childhood special education, AI tools support the development of children's social skills (Mean = 3.61, Std. Deviation = 1.064). For instance, AI facilitates social interactions through structured prompts and feedback during learning activities. These tools help children learn communication techniques and social cues in a controlled environment, boosting confidence in social interactions. However, human guidance remains crucial for teaching empathy and navigating complex social dynamics, ensuring a holistic approach to fostering social competence in children with disabilities.

The findings of the primary question in the study align with several previous studies mentioned. Yao and Wang (2024), Kim (2023), Kang et al. (2023), Agwa and Makary

(2023), Di Battista et al. (2020), and Shalini Garg and Shipra Sharma (2020) all indicate that AI technologies can positively impact educational outcomes for students with disabilities. They highlight AI's role in enhancing inclusivity, supporting personalized learning experiences, and improving educational access and outcomes for diverse student populations. These studies collectively reinforce the notion that AI holds promise in addressing educational challenges and promoting effective learning environments for students with special needs.

Discussion of the Second Research Question: "What is the level of Challenges of utilizing AI in early childhood as perceived by Special Education Teachers?"

To answer the second question of the study, "What is the level of challenges of utilizing AI in early childhood as perceived by Special Education Teachers?", means and standard deviations of the challenges were extracted and are presented in Table 5. Table 5 ranks the challenges of utilizing AI in early childhood as perceived by Special Education Teachers, based on means and standard deviations. The ranked challenges in descending order are as follows:

1- Limited Training Programs for Special Education Teachers on Using AI Applications (Mean = 4.55, Std. Deviation = 0.617)

This challenge, receiving the highest mean score, highlights a significant gap in training programs available for special education teachers on using AI applications. Special education teachers often lack the necessary training to effectively integrate AI tools into their teaching practices. This lack of training can result in the underutilization of AI technologies, which could otherwise enhance the learning experience for children with special needs. The high degree of agreement on this issue underscores the urgent need for comprehensive training programs that equip teachers with the skills to use AI effectively. The statistical analysis indicates a strong consensus among teachers regarding the importance of addressing this challenge. The relatively low standard deviation suggests that this view is widely held, emphasizing the critical need for targeted professional development initiatives in this area. As one teacher mentioned "*I faced significant*

challenges in learning about the benefits of AI due to language issues and the lack of training programs”.

2- AI applications may lead to concerns about excessive technological dependence (Mean = 4.32, Std. Deviation = 0.710). Teachers worry that heavy reliance on AI could diminish children's opportunities for face-to-face interactions and physical activities, critical for their social and physical development. For instance, children might prefer AI-based games over playing with peers, potentially hindering their social skills and physical fitness. The high mean score reflects widespread agreement among teachers, though the moderate standard deviation suggests varying degrees of concern across different educational contexts. As one teacher noted, *“Despite the benefits, I am concerned about excessive attachment to technology.”*

3- In early childhood special education, concerns arise that children may prefer interacting with AI applications over engaging with peers (Mean = 4.27, Std. Deviation = 0.739). This preference could hinder social interaction and cooperation crucial for developmental growth. Teachers emphasize the importance of balanced technology use to foster social skills effectively. As a teacher stated, *“There is a fear that children might rely too much on technology, reducing their opportunities for social and human interaction.”*

4- Lack of Resources and Technical Support (Mean = 4.24, Std. Deviation = 0.632) Implementing AI in early childhood special education requires adequate resources and technical support, which are often lacking. Many institutions lack the infrastructure and funding needed to effectively integrate AI tools into teaching practices. This challenge is more pronounced in special education settings due to unique needs and limited accessibility to advanced technology, impacting the adoption and effectiveness of AI applications. As one teacher stated, *“Integrating artificial intelligence (AI) into my early childhood special education work has been enlightening, yet comes with significant challenges. Infrastructure limitations and community apprehension about AI's complexity and usability often hinder its effective adoption.”*

5- The Need for Continuous Updates and Maintenance of AI Technologies (Mean = 4.19, Std. Deviation = 0.595). AI technologies in early childhood special education require continuous updates and maintenance, which can be challenging. These updates are essential to keep AI tools relevant and effective, demanding ongoing resources and effort. Schools

and teachers often struggle with this, leading to outdated or malfunctioning tools that can hinder learning. For example, an AI application for personalized learning may lose its effectiveness without regular updates. The high mean score and low standard deviation highlight widespread concern among teachers. Early childhood special education requires timely updates due to the rapid developmental changes in young children, making this challenge particularly significant. As a teacher mentioned, *“I hope for more resources and training courses in my native language to effectively use AI.”*

6- Ensuring the Security and Confidentiality of Children's Data (Mean = 4.17, Std. Deviation = 0.583). The security and confidentiality of children's data are critical concerns in early childhood special education. Teachers must protect sensitive student information, and AI introduces potential vulnerabilities. Ensuring data security requires robust measures to prevent unauthorized access and breaches, which can be complex and resource-intensive. For instance, schools need strict data protection policies and secure platforms to safeguard children's information. The high mean score and low standard deviation reflect a strong consensus on this issue. This is especially important for young children with disabilities, who are particularly vulnerable. As one teacher mentioned, *“I also worry about children's privacy and the safety of their data with these technologies.”*

7- Teachers Face Difficulties in Customizing and Adapting AI Applications (Mean = 4.13, Std. Deviation = 0.629). While AI applications can offer personalized learning experiences, they often require customization to meet individual student needs especially for special needs children in early childhood. Teachers may find it challenging to effectively customize and adapt these applications, limiting their usefulness. The technical complexity of AI tools can be a barrier for teachers who are not well-versed in technology. For example, a teacher might struggle to adjust the settings of an AI application to suit the specific learning pace and style of a child with special needs. The mean score of 4.13 and the standard deviation of 0.629 highlight this significant challenge. The moderate standard deviation suggests some variability in teachers' experiences with customizing AI applications, but it remains a common issue overall. As a teacher mentioned *“The VR experience was successful for only one child with Down syndrome out of ten students. The other children faced various issues: some had sensory problems and refused to wear the VR glasses, others exhibited*

behavioral problems due to dependency on technology, and some showed no interest. This highlights the importance of tailoring AI use to each child's condition.”

8- Technical Issues in Using AI in Educating Children with Special Needs (Mean = 4.09, Std. Deviation = 0.775). Technical issues, such as software glitches and hardware malfunctions, can disrupt learning and frustrate teachers and students in early childhood special education. These challenges are heightened with AI applications, requiring specialized knowledge to resolve. Reliable technical support is essential to address these problems promptly and ensure smooth AI tool operation. For instance, a malfunctioning AI application could interrupt a lesson and require immediate troubleshooting. The high mean score and significant standard deviation indicate widespread concern and varied experiences with technical issues. As one teacher noted, *integrating AI into early childhood special education has been enlightening but faces significant challenges due to infrastructure limitations and community apprehension.*

9- Low Proficiency in Using AI Applications for Obtaining Essential Data (Mean = 4.01, Std. Deviation = 0.814). In early childhood special education, teachers often struggle with using AI applications to collect essential data like case studies and educational plans. This challenge is particularly significant as it impacts the ability to create tailored educational plans for children with disabilities. Enhancing digital literacy and providing targeted training in data management with AI is crucial. The mean score and standard deviation indicate notable concern and variability in proficiency levels, emphasizing the need for widespread training. As one teacher noted, *“language barriers and a lack of training limited the effective use of AI in teaching children, highlighting the need for resources and training in native languages.”*

10- Low Confidence Among Special Education Teachers in AI Technology (Mean = 3.98, Std. Deviation = 0.978) Low confidence in AI among special education teachers, especially in early childhood settings, can hinder effective adoption. Teachers may doubt AI's reliability and effectiveness, affecting their willingness to integrate these tools into their practices. Building confidence through training and positive experiences with AI is crucial. For instance, showcasing successful AI applications in similar educational settings can alleviate concerns and build trust. The mean score and higher standard deviation indicate significant concern and variability in confidence levels. As one teacher noted, *“AI is still*

new in special education, particularly for young children, leading to caution in its use directly with students.”

11- Difficulty in Assessing the Effectiveness of AI Applications in Teaching Children (Mean = 3.90, Std. Deviation = 0.910). Teachers need reliable methods to evaluate whether AI tools are benefiting students and improving learning outcomes, especially in early childhood. This challenge highlights the need for developing assessment frameworks specific to AI use in education. For instance, standardized metrics and evaluation tools could help teachers measure the impact of AI applications on student learning and adjust their teaching strategies accordingly. The mean score of 3.90 and the standard deviation of 0.910 reflect a notable concern among teachers. The higher standard deviation suggests variability in experiences with assessing AI effectiveness, highlighting the need for consistent evaluation methodologies. As one teacher mentioned, *“AI cannot be fully relied upon for creating educational plans and assessing children, especially in early childhood, due to the specific needs and complexities of this developmental stage.”*

12- Limited AI applications that support the Arabic language (Mean = 3.83, Std. Deviation = 1.167) In early childhood special education for children with disabilities, the lack of AI applications that support Arabic is a significant barrier. This limitation affects accessibility and usability for Arabic-speaking students, making it crucial to develop inclusive AI tools. Robust Arabic language support in AI applications can enhance learning outcomes for these students. This indicates notable concern and variability in experiences with language barriers. As one teacher mentioned, most available tools are in English, posing an additional challenge. Finding or translating AI tools to support Arabic is essential for effective education. As one teacher stated, *“Most of the apps and tools available are in English, which can be another obstacle. I will need to find tools that support Arabic or work on translating the content.”*

13- Teachers fear that AI applications might replace their role in the classroom (Mean = 2.88, Std. Deviation = 1.451) Although this challenge received a moderate mean score, it reflects a significant apprehension among teachers about job security. Moreover, Some teachers fear that AI applications might replace their roles in the classroom, leading to job displacement. Addressing this fear involves emphasizing that AI is meant to support and enhance the teaching process rather than replace human educators. Highlighting the unique

and irreplaceable value of teacher-student interactions is crucial in alleviating these concerns. The mean score of 2.88 and a standard deviation of 1.451 reflect a moderate level of concern, with significant variability in responses. This indicates differing levels of apprehension about AI potentially replacing teachers, underscoring the importance of clear communication and support in integrating AI into education.

The findings from the second research question align with several previous studies. Yao and Wang (2024) highlighted challenges related to limited training for special education teachers on AI applications, indicating a significant gap that hinders effective integration into teaching practices. Kim (2023) identified concerns about excessive technological dependence due to AI applications, potentially impacting social interactions and physical activities among students. Agwa and Makary (2023) explored obstacles in using AI for rehabilitating children with special needs, emphasizing challenges such as resource limitations and inadequate technical support. Di Battista et al. (2020) addressed concerns about the complexity of integrating Educational Robotics (ER) by providing a 12-hour training course for teachers, highlighting the potential benefits of ER for various special needs, and emphasizing the importance of ongoing professional development and support to overcome perceived barriers and enhance its effectiveness in inclusive education. Shalini Garg and Shipra Sharma (2020) discussed various challenges in AI integration in special needs education, including issues related to privacy, equitable access, and the dynamics of teacher-student interactions. Together, these studies underscore the multifaceted challenges that need to be addressed for successful implementation of AI technologies in early childhood education for students with special needs.

Discussion on the third research question: "Are there any statistically significant differences at ($\alpha = 0.05$) in the levels of benefits and challenges of utilizing AI in early childhood as perceived by Special Education Teachers attributed to qualification and years of experience?"

Special Education Teachers' perceptions of AI in early childhood education reveal interesting insights based on their qualifications and experience. The study found no significant differences in how teachers with Bachelor's versus Postgraduate qualifications view the benefits and challenges of AI. This suggests that academic credentials alone don't strongly shape their opinions on AI's impact in early childhood special education. Likewise,

differences in teachers' years of experience didn't lead to notable variations in their perceptions, indicating that longevity in the field doesn't necessarily change how they see AI's potential in this crucial developmental stage.

These findings highlight a consistent perspective across diverse educational backgrounds and career stages regarding AI's benefits, such as personalized learning, and challenges, such as technical support and ethical considerations.

The study's findings align with prior research indicating that neither academic qualifications nor years of experience significantly affect how Special Education Teachers perceive AI's benefits and challenges in early childhood education. This consistency resonates with various studies emphasizing similar perceptions across different qualification levels and professional backgrounds Yao and Wang (2024), Kim (2023), Kang et al. (2023), Agwa and Makary (2023), and Shalini Garg and Shipra Sharma (2020).

Recommendations

In light of the results obtained from the study, the study recommends the following for early childhood:

- 1- Utilizing AI to help special education teachers develop and manage personalized learning plans for young children, ensuring each child's unique needs are met.
- 2- Leveraging AI to adapt teaching methods in real-time based on ongoing data analysis, catering to the diverse learning styles and developmental stages of young children in early childhood.
- 3- Employing AI tools in early childhood to provide immediate suggestions for adjusting educational activities, ensuring they remain aligned with each child's needs and progress.
- 4- Using AI to give instant feedback on children's performance, and helping teachers to quickly identify areas of improvement and weakness and celebrate achievements, thereby enhancing learning outcomes in early childhood.
- 5- Developing and providing thorough training programs for special education teachers to effectively use AI tools in early childhood, ensuring they can integrate AI seamlessly into their teaching practices.

Suggestions

The researcher suggests several proposals based on the study results:

- 1- Investigating the optimal balance between AI applications and human interaction in special education, ensuring AI enhances rather than replaces the personal touch crucial in early childhood.
- 2- Performing long-term studies to evaluate the effects of AI on special needs student outcomes over time, providing valuable insights into the sustained benefits and potential challenges of AI integration in early childhood.
- 3- Prioritizing the creation of AI tools that offer high levels of customization and personalization, enabling them to meet the unique needs of each child and support individualized learning experiences effectively.

References

- Agwa, M., & Makary, N. (2023). The reality of employing artificial intelligence applications and its challenges in the habilitation of children with special needs (autism spectrum disorder - intellectual disability) from the point of view of teachers and specialists. *Journal of Scientific Research in Education*, 24(1), 70-146.
- Ali, S., Abuhmed, T., El-Sappagh, S., Muhammad, K., Alonso-Moral, ., Confalonieri, R., ... & Herrera, F. (2023). Explainable Artificial Intelligence (XAI): What we know and what is left to attain Trustworthy Artificial Intelligence. *Information Fusion*, 99, 101805.
- Alkhateeb, N., Alrubaian, A., & Tamakloe, D. (2023). A dialogical inquiry of elementary school teachers' perspectives on inclusive education of students with special education needs and disability (SEND). *SAGE Open*, 13(2), 215824402311620.
- Ampartzaki, M. (Ed.). (2023). Early childhood education: Innovative pedagogical approaches in the post-modern era. IntechOpen.
<https://doi.org/10.5772/intechopen.98078>
- Amazon. (n.d.). Amazon Alexa. Amazon. <https://www.amazon.com/alexa>
- AssistiveWare. (n.d.). Proloquo2Go. *AssistiveWare*.
- Bartolo, P., Kyriazopoulou, M., Björck-Åkesson, E., & Giné, C. (2021). An adapted ecosystem model for inclusive early childhood education: A qualitative cross-European study. *International Journal of School & Educational Psychology*, 9(1), 3-15. <https://doi.org/10.1080/21683603.2019.1637311>
- Bea Francisco, M. P., Hartman, M., & Wang, Y. (2020). Inclusion and Special Education. *Education Sciences*, 10(9), 238. <https://doi.org/10.3390/educsci10090238>
- Beccaluva, E. A., Catania, F., Arosio, F., & Garzotto, F. (2024). Predicting developmental language disorders using artificial intelligence and a speech data analysis tool. *Human-Computer Interaction*, 39(1-2), 8-42.
- Bhatti, I., Mohi-U-din, S. F., Hayat, Y., & Tariq, M. (2024). Artificial intelligence applications for students with learning disabilities: A systematic review. *European Journal of Science, Innovation and Technology*, 4(2), 40-56.

- Bricker, D. D., Felimban, H. S., Lin, F. Y., Stegenga, S. M., & Storie, S. O. M. (2022). A proposed framework for enhancing collaboration in early intervention/early childhood special education. *Topics in Early Childhood Special Education, 41*(4), 240-252.
- Cerna, L., Mezzanotte, C., Rutigliano, A., Brussino, O., Santiago, P., Borgonovi, F., & Guthrie, C. (2021). Promoting inclusive education for diverse societies: A conceptual framework. *OECD Education Working Papers, No. 260, OECD Publishing, Paris*. <https://doi.org/10.1787/94ab68c6-en>
- Choi, R. Y., Coyner, A. S., Kalpathy-Cramer, J., Chiang, M. F., & Campbell, J. P. (2020). Introduction to machine learning, neural networks, and deep learning. *Translational Vision Science & Technology, 9*(2), 14-14.
- Di Battista, S., Pivetti, M., Moro, M., & Menegatti, E. (2020). Teachers' opinions towards educational robotics for special needs students: An exploratory Italian study. *Robotics, 9*(3), 72.
- Duolingo. (n.d.). Duolingo. *Duolingo*. <https://www.duolingo.com>
- Fabry, A., Barblett, L., & Knaus, M. (2022). The role of early childhood pedagogical leaders in schools: Leading change for ongoing improvement. *Australasian Journal of Early Childhood, 47*(4), 275-288.
- Garg, S., & Sharma, S. (2020). Impact of Artificial Intelligence in Special Need Education to Promote Inclusive Pedagogy. *International Journal of Information and Education Technology, 10*(7), 523-527.
- Google. (n.d.). Google Assistant. *Google*. <https://assistant.google.com>
- Hamon, R., Junklewitz, H., & Sanchez, I. (2020). Robustness and explainability of artificial intelligence. Luxembourg: Publications Office of the European Union.
- Hassani, H., Silva, E. S., Unger, S., TajMazinani, M., & Mac Feely, S. (2020). Artificial intelligence (AI) or intelligence augmentation (IA): What is the future? *AI, 1*(2), 8.
- Hienonen, N., Hotulainen, R., & Jahnukainen, M. (2021). Outcomes of regular and special class placement for students with special educational needs - A quasi-experimental study. *Scandinavian Journal of Educational Research, 65*(4), 646-660. <https://doi.org/10.1080/00313831.2020.1739134>

- Jadán-Guerrero, J., Tamayo-Narvaez, K., Méndez, E., & Valenzuela, M. (2024). Adaptive Learning Environments: Integrating Artificial Intelligence for Special Education Advances. In C. Stephanidis, M. Antona, S. Ntoa, & G. Salvendy (Eds.), *HCI International 2024 Posters* (Communications in Computer and Information Science, Vol. 2117). Springer. https://doi.org/10.1007/978-3-031-61953-3_10
- Kang, H., Park, H., & Jang, J. (2023). An analysis of the digital competency of special education teachers for the future education of students with disabilities. *Journal of Speech*, 32(3), 063-073.
- Kampichler, M. (2023). What is early childhood education and care for? How ECEC for children up to the age of three is (not) discussed in the Czech Republic. *Sociologický časopis*. Advance online publication. <https://doi.org/10.13060/csr.2023.048>
- Kazi, S. (2021). AI in early childhood: six things teachers need to know. *Blue Dot*, 13, 15-19.
- Khan Academy. (n.d.). Khan Academy Kids. *Khan Academy*. <https://www.khankids.org>
- Kim, J. (2023). Leading teachers' perspective on teacher-AI collaboration in education. *Education and Information Technologies*, 1-32. <https://doi.org/10.1007/s10639-023-10826-1>
- Lang, S. N., Tebben, E., Luckey, S. W., Hurns, K. M., Fox, E. G., Ford, D. Y., ... & Pasque, P. A. (2024). Early childhood teachers' dispositions, knowledge, and skills related to diversity, inclusion, equity, and justice. *Early Childhood Research Quarterly*, 67, 111-127.
- Raikes, A., Rao, N., Yoshikawa, H., Cohrssen, C., Behrman, J., Cappa, C., ... & UKRI GCRF Harnessing the power of global data to support young children's learning and development research group. (2023). Global tracking of access and quality in early childhood care and education. *International Journal of Child Care and Education Policy*, 17(1), 14.
- Rawe, J. (2024, April 9). The 13 disability categories under IDEA: How do kids qualify for special education? Learn about the 13 disability categories and other important details about Individualized Education Programs (IEPs). *Understood*. <https://www.understood.org/en/articles/conditions-covered-under-idea>

- Saracho, O. N. (2023). Theories of child development and their impact on early childhood education and care. *Early Childhood Education Journal*, 51(1), 15-30.
- Sargsyan, V., Tenorio, A., Uwera, M., Gasirikare, A., Habyarimana, J. A., Salcido, J. S., ... & Rasheed, M. A. (2023). The benefits of nurturing care interventions on early child development and care: Findings from a quasi-experimental study in a humanitarian setting. *BMC Pediatrics*, 23(1), 419.
- Swargiary, K., & Roy, K. (2024). AI Angels: Empowering Children with Special Needs through Artificial Intelligence. *Scholar Press*, 114-119.
- Syriopoulou-Delli, C., & Gkiolnta, E. (2021). Robotics and inclusion of students with disabilities in special education. *Research, Society and Development*, 10(9), e36210918238-e36210918238.
- Willan, J. (2024). Early childhood studies: A multidisciplinary approach. *Bloomsbury Publishing*.
- Yi, H., Liu, T., & Lan, G. (2024). The key artificial intelligence technologies in early childhood education: A review. *Artificial Intelligence Review*, 57(12), 1–23. <https://doi.org/10.1007/s10462-023-10637-7>
- Yao, N., & Wang, Q. (2024). Factors influencing pre-service special education teachers' intention toward AI in education: Digital literacy, teacher self-efficacy, perceived ease of use, and perceived usefulness. *International Journal of Educational Technology in Higher Education*, 21, 10. <https://doi.org/10.1186/s41239-024-00470-1>

Appendices

Appendix (A)

Initial Version of the Questionnaire in Arabic

النسخة الأولى من استبانة تحديد فوائد و تحديات استخدام الذكاء الاصطناعي في مرحلة الطفولة المبكرة وفق تصورات معلمي التربية الخاصة

الأستاذ الدكتور المحترم

الموضوع: آراء المحكمين

تحية طيبة وبعد،،،

يقوم الباحث بإعداد دراسة بعنوان، Special Education Teacher's Perspectives on Utilizing AI in Early Childhood وتتضمن الإجراءات المكملة للبحث بناءً استبيان. وقد قام الباحث بوضع عدة بنود تتعلق بمضمون البحث راجيا منكم الاطلاع عليها وبيان مقترحاتكم حولها مع التقدير .

القسم الأول: معلومات المعلم					
الجنس: <input type="checkbox"/> ذكر <input type="checkbox"/> أنثى					
المؤهل العلمي: <input type="checkbox"/> بكالوريوس <input type="checkbox"/> دبلوم عال <input type="checkbox"/> دراسات عليا (ماجستير أو دكتوراه)					
اسم التخصص:					
سنوات الخبرة:					
<input type="checkbox"/> من سنة إلى أقل من خمس سنوات					
<input type="checkbox"/> من خمس سنوات إلى أقل من عشر سنوات					
<input type="checkbox"/> من عشر سنوات فأكثر					
الدورات التدريبية في استخدام التكنولوجيا والذكاء الاصطناعي في التعليم:					
<input type="checkbox"/> لم ألتحق بأي دورة <input type="checkbox"/> من دورة واحدة إلى 3 دورات تدريبية <input type="checkbox"/> من اربع دورات تدريبية فما أكثر					
القسم الثاني: فقرات الاستبانة					
ملاحظات	الصياغة		الإنتماء		الفقرة
	غير صحيحة	صحيحة	غير منتمة	منتمة	
	صحيحة		منتمة		
المحور الأول: فوائد استخدام الذكاء الاصطناعي في مرحلة الطفولة المبكرة من وجهة نظر معلمي التربية الخاصة					
					1 استخدام التطبيقات التعليمية المعتمدة على الذكاء الاصطناعي في مرحلة الطفولة المبكرة يقدم فرصًا جديدة لتخصيص

					التعليم وتلبية الاحتياجات التعليمية للطلبة ذوي الاحتياجات الخاصة بشكل أفضل.
				2	استخدام تطبيقات الذكاء الاصطناعي يساعد في تكييف ممارسات التعليم بشكل فعال لذوي الاحتياجات الخاصة في مرحلة الطفولة المبكرة.
				3	استخدام تطبيقات الذكاء الاصطناعي في التدريس يرفع نتائج تعلم للطلبة ذوي الاحتياجات الخاصة في مرحلة الطفولة المبكرة.
				4	استخدام تطبيقات الذكاء الاصطناعي في التعليم يعزز التفاعل مع المواد التعليمية ويحسن فهم الطلبة ذوي الاحتياجات الخاصة في مرحلة الطفولة المبكرة.
				5	الاعتماد على تطبيقات الذكاء الاصطناعي في العملية التعليمية للطلبة ذوي الاحتياجات الخاصة في مرحلة الطفولة المبكرة يساعد في تحقيق أهداف التعلم الخاصة لكل طالب.
				6	استخدام التطبيقات التعليمية المعتمدة على الذكاء الاصطناعي في مرحلة الطفولة المبكرة يساعد في تحسين الاستجابة التعليمية الفردية للطلبة ذوي الاحتياجات الخاصة.
				7	استخدام تطبيقات الذكاء الاصطناعي يعزز من مستويات مهارات معلمي التربية الخاصة.
				8	استخدام التطبيقات التعليمية المعتمدة على الذكاء الاصطناعي ينمي من مهارات الحياة اليومية و المهارات الاجتماعية والتواصل للطلبة ذوي الاحتياجات الخاصة في مرحلة الطفولة المبكرة.

					9	تطبيقات الذكاء الاصطناعي توفر تجارب تعليمية تفاعلية وشخصية للطلبة ذوي الاحتياجات الخاصة في مرحلة الطفولة المبكرة.
					10	استخدام تكنولوجيا الذكاء الاصطناعي في العملية التعليمية يعزز مستوى التعلم وفهم المفاهيم بشكل أفضل للطلبة ذوي الاحتياجات الخاصة في مرحلة الطفولة المبكرة.
					11	تساعد تطبيقات الذكاء الاصطناعي في تحسين التفاعل الطبيعي بين المعلمين و بين الطلبة ذوي الاحتياجات الخاصة في مرحلة الطفولة المبكرة.
					12	تطبيقات الذكاء الاصطناعي يمكن أن تدعم الطلبة ذوي الاحتياجات الخاصة في تطوير مهاراتهم وزيادة مستوى استقلاليتهم في التعلم في مرحلة الطفولة المبكرة.
					13	استخدام التطبيقات الذكية يمكنه تحفيز الطلبة ذوي الاحتياجات الخاصة وزيادة مستوى اندماجهم الاجتماعي في بيئة التعلم في مرحلة الطفولة المبكرة.
المحور الثاني: تحديات استخدام الذكاء الاصطناعي في مرحلة الطفولة المبكرة من وجهة نظر معلمي التربية الخاصة						
					1	تدني مستوى التدريب لدى معلمي التربية الخاصة على استخدام تطبيقات الذكاء الاصطناعي يعتبر تحدياً رئيسياً في استخدامها في التعليم المبكر
					2	المشكلات التقنية تعتبر أحد التحديات التي تواجه استخدام الذكاء الاصطناعي في تعليم ذوي الاحتياجات الخاصة في مرحلة الطفولة المبكرة.

					3	يواجه المعلمون صعوبة في تخصيص وتكييف تطبيقات الذكاء الاصطناعي لتلبية احتياجات طلابهم ذوي الاحتياجات الخاصة بشكل فعال في مرحلة الطفولة المبكرة.
					4	نقص الموارد والدعم الفني والتقني يشكل تحدياً رئيسياً في استخدام الذكاء الاصطناعي في التعليم المبكر للطلبة ذوي الاحتياجات الخاصة.
					5	صعوبة تقييم فعالية استخدام تطبيقات الذكاء الاصطناعي في تعليم الأطفال ذوي الاحتياجات الخاصة تعد تحدياً لاستخدام تطبيقات الذكاء الاصطناعي في العملية التعليمية في مرحلة الطفولة المبكرة.
					6	قد يؤدي استخدام تطبيقات الذكاء الاصطناعي إلى الاعتماد المفرط على التكنولوجيا، مما يؤثر على التفاعل الاجتماعي والنشاط البدني للأطفال في البيئة التعليمية.
					7	ضمان أمان وسرية بيانات الطلبة ذوي الاحتياجات الخاصة في استخدام تكنولوجيا الذكاء الاصطناعي يمثل تحدياً لاستخدام تطبيقات الذكاء الاصطناعي في العملية التعليمية في مرحلة الطفولة المبكرة.
					8	تدني درجة امتلاك المعلمين المعرفة باستخدام تطبيقات الذكاء الاصطناعي للحصول على البيانات الأساسية للطلبة ذوي الاحتياجات الخاصة في مرحلة الطفولة المبكرة (دراسة الحالة - الخطة التربوية الفردية - التقارير الأسبوعية)

					يمثل أحد التحديات الأساسية لاستخدام تكنولوجيا الذكاء الاصطناعي في العملية التعليمية.
					9 الأثر السلبي النفسي والاجتماعي والسلوكي عند استخدام التطبيقات التعليمية المعتمدة على الذكاء الاصطناعي من قبل الطلبة ذوي الاحتياجات الخاصة أحد التحديات التي تواجه استخدام تطبيقات الذكاء الاصطناعي في العملية التعليمية في مرحلة الطفولة المبكرة.
					10 الحاجة إلى التحديث والصيانة المستمرة للتقنيات الذكاء الاصطناعي تشكل عائقًا كبيرًا في التكامل مع البرامج الدراسية للطلبة ذوي الاحتياجات الخاصة في مرحلة الطفولة المبكرة.
					11 معلمو التربية الخاصة في مرحلة الطفولة المبكرة قد يخشون أن استخدام تطبيقات الذكاء الاصطناعي يمكن أن يؤدي إلى استبدال دورهم في الفصل الدراسي.
					12 قلة الثقة لدى معلمي التربية الخاصة في تكنولوجيا الذكاء الاصطناعي تقف عائقًا أمام استخدام تكنولوجيا الذكاء الاصطناعي في عملية تعليم الطلبة ذوي الاحتياجات الخاصة في مرحلة الطفولة المبكرة.
					13 قلة تطبيقات الذكاء الاصطناعي التي تدعم اللغة العربية تمثل عائقًا كبيرًا أمام استخدام هذه التطبيقات في عملية تعليم الطلبة ذوي الاحتياجات الخاصة في مرحلة الطفولة المبكرة.

Appendix (B)
The Initial Version of the Questionnaire in English

Questioner on Benefits and Challenges of Utilizing Artificial Intelligence in Early Childhood Education According to the Perceptions of Special Education Teachers

Respected Professor

Subject: experts Opinions

Greetings,

The researcher is preparing a study entitled "Special Education Teacher's Perspectives on Utilizing AI in Early Childhood." and She has prepared several items related to the research content, aiming to construct a questionnaire and include complementary procedures for the research.

Section 1: Teacher Information						
Gender: <input type="checkbox"/> Male <input type="checkbox"/> Female						
Education: <input type="checkbox"/> Bachelor's <input type="checkbox"/> Higher Diploma <input type="checkbox"/> Graduate Studies (Master's or PhD)						
Specialization:						
Years of Experience:						
<input type="checkbox"/> Less than 5 years						
<input type="checkbox"/> 5 to less than 10 years						
<input type="checkbox"/> 10 years or more						
The number of training courses on using artificial intelligence in education:						
<input type="checkbox"/> None <input type="checkbox"/> 1-3 courses <input type="checkbox"/> 4 or more courses						
Section 2: Questionnaire Items						
	Paragraph	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Domain 1: Benefits of utilizing AI in early childhood education from special education teachers' perspectives						
1	Utilizing AI applications in early childhood offers new opportunities to					

	customize education and meet the educational needs of students with special needs better.					
2	The utilization of AI applications helps in effectively adapting teaching practices to meet the needs of students with special needs in early childhood.					
3	Utilizing AI applications in teaching improves learning outcomes for students with special needs in early childhood.					
4	Utilizing AI applications in education enhances interaction with educational materials and improves the understanding of students with special needs in early childhood.					
5	Relying on AI applications in the educational process helps in achieving the learning objectives of each student with special needs in early childhood.					
6	Utilizing AI applications in early childhood education helps improve individual educational responses for students with special needs.					
7	Using AI applications enhances the skill levels of special education teachers.					
8	Using AI applications in education develops the social skills and communication skills of students with special					

	needs in early childhood.					
9	AI applications provide interactive and personalized learning experiences for students with special needs in early childhood.					
10	Using AI technology in the educational process enhances learning and understanding of concepts for students with special needs in early childhood.					
11	AI applications usually improve the interaction between students with special needs and their teachers in early childhood.					
12	AI applications can support the development of skills and increase the independence of students with special needs in early childhood.					
13	Using applications can motivate students with special needs and increase their level of social engagement in the learning environment in early childhood.					
Domain 2: Challenges of utilizing AI in early childhood education from special education teachers' perspectives						
1	The low level of training for special education teachers on AI applications is a major challenge for its use in early education.					
2	Technical problems are one of the challenges facing the use of AI in teaching students with special needs in early childhood.					

3	Teachers face difficulty in customizing and adapting AI applications to meet the needs of their students with special needs effectively in early childhood.					
4	Lack of resources and technical support is considered a major challenge in using AI in early education for students with special needs.					
5	The difficulty in evaluating the effectiveness of using AI applications in teaching students with special needs is a challenge in early childhood education.					
6	AI applications may lead to excessive technological dependence, affecting children's social interaction and physical activity in the educational environment.					
7	Ethical and legal concerns regarding privacy and tracking represent challenges for the use of AI applications by students with special needs in early childhood.					
8	The low level of teachers' knowledge in using AI applications to obtain basic data for students with special needs in early childhood represents a challenge.					
9	The negative psychological, social, and behavioral impact of using AI-based					

	educational applications for students with special needs is a challenge in early childhood education.					
10	The need for continuous updates and maintenance of AI technologies forms a major obstacle to integration with educational programs for students with special needs in early childhood.					
11	The need for continuous updates and maintenance of AI technologies forms a major obstacle to integration with educational programs for students with special needs in early childhood.					
12	The lack of confidence among special education teachers in AI technology is an obstacle to using it in the education of students with special needs in early childhood.					
13	The lack of AI applications that support the Arabic language is a major obstacle to using these applications in the education of students with special needs in early childhood.					

Appendix (C) List of Reviewers

No.	Name	Academic Degree	Specialization	Workplace	Email/Phone
1	Dr. Fadi Bani Ahmad	Associate Professor	Educational Technology	Arab Open University	f_baniahmad@aou.edu.jo
2	Dr. Basel Fodeh	Associate Professor	Measurement and Evaluation	Arab Open University	b_abufodeh@aou.edu.jo
3	Professor Mouayyad Al-Homid	Professor	Special Education	Arab Open University	m_homidi@aou.edu.jo
4	Dr. Khalid Al-Jundi	Associate Professor	Special Education	Arab Open University	k_jundi@aou.edu.jo
5	Dr. Hamed Al-Awidi	Associate Professor	Educational Technology	Amman Al-Ahliyya University	hamedalawidi@gmail.com
6	Dr. Bilal Mansour	PhD	Special Education	Sawa Academy for Special Education	bms_se5@yahoo.com
7	Dr. Manal Al-Tawalbeh	Assistant Professor	Educational Technology	Middle East University	maltawalbeh@meu.edu.jo
8	Dr. Hussein Hikmat Mistareehi	Associate Professor	Arabic Language Curricula and Teaching Methods	Arab Open University	h_mistareehi@aou.edu.jo
9	Dr. Sameer Al-Sous	Assistant Professor	Arabic Language Curricula and Teaching Methods	Arab Open University	s_alsous@aou.edu.jo
10	Dr. Naima Husban	Associate Professor	Curricula and Teaching Methods	Arab Open University	n_husban@aou.edu.jo
11	Ms. Razan Al-Affouri	Master's Degree	Educational Technology	Modern Systems Schools	razanaffouri@yahoo.com
12	Mr. Tareq Al-Duweikat	Master's Degree	Special Education	Pioneers Education Schools	Tariq.dwaikat1985@hotmail.com

Appendix (D)
Final Version of the Questionnaire in Arabic

استبانة تحديد فوائد و تحديات استخدام الذكاء الاصطناعي
في مرحلة الطفولة المبكرة وفق تصورات معلمي التربية
الخاصة

المقدمة
بسم الله الرحمن الرحيم
المعلم/ المعلمة
السلام عليكم و رحمة الله و بركاته، و بعد :
أضع بين يديك استبانة فوائد و تحديات استخدام الذكاء الاصطناعي في مرحلة الطفولة المبكرة حسب تصورات معلمي التربية الخاصة و هي عبارة عن أداة لدراسة بعنوان " تصورات معلمي التربية الخاصة حول استخدام الذكاء الاصطناعي في الطفولة المبكرة" و ذلك للحصول على درجة الماجستير في تكنولوجيا التعليم.
أملاً منكم التكرم بالاجابة على عبارات هذه الاستبانة بموضوعية و دقة. علمًا بأن هذه الاستجابات سوف تكون سرية و لن تستخدم إلا لأغراض البحث العلمي فقط.
شاكراً لكم تعاونكم سلفاً

الباحثة : رشا محمد عطوة
بريد الباحثة الالكتروني:

Rasha.mq.1991.r@hotmail.com

القسم الأول: معلومات المعلم					
الجنس: <input type="checkbox"/> ذكر <input type="checkbox"/> أنثى					
المؤهل العلمي: <input type="checkbox"/> بكالوريوس <input type="checkbox"/> دراسات عليا					
التخصص:					
سنوات الخبرة: <input type="checkbox"/> أقل من 5 سنوات <input type="checkbox"/> من 5 سنوات إلى أقل من 10 سنوات <input type="checkbox"/> 10 سنوات فأكثر					
عدد الدورات التدريبية في استخدام الذكاء الاصطناعي في التعليم: <input type="checkbox"/> لم ألتحق بأي دورة <input type="checkbox"/> 1-3 دورات <input type="checkbox"/> 4 دورات فأكثر					
القسم الثاني: فقرات الاستبانة					
الفقرة	موافق بشدة	موافق	محايد	غير موافق	غير موافق بشدة

المحور الأول: فوائد استخدام الذكاء الاصطناعي في مرحلة الطفولة المبكرة حسب تصورات معلمي التربية الخاصة

					يساعد استخدام تطبيقات الذكاء الاصطناعي معلمي التربية الخاصة في كتابة خطط التعلم الفردية.	1
					يساعد استخدام تطبيقات الذكاء الاصطناعي معلمي التربية الخاصة في تكييف أساليبهم التعليمية بفعالية.	2
					توفر تطبيقات الذكاء الاصطناعي تغذية راجعة فورية حول أداء الأطفال، مما يمكن المعلمين من التفاعل بسرعة وضبط العملية التعليمية.	3
					تقدم تطبيقات الذكاء الاصطناعي نصائح فورية لمعلمي التربية الخاصة حول كيفية تعديل الأنشطة الدراسية لتناسب وتلبي احتياجات كل طالب بشكل أفضل.	4
					تقدم تطبيقات الذكاء الاصطناعي لمعلمي التربية الخاصة تحليلاً دقيقاً لأداء الأطفال، ونصائح لتعديل الأنشطة التعليمية مما يؤدي إلى تحقيق أهداف التعلم الفردية.	5
					يساعد استخدام تطبيقات الذكاء الاصطناعي معلمي التربية الخاصة في تحسين الاستجابة التعليمية الفردية وتقديم دعم أكثر فعالية.	6
					يساعد استخدام تطبيقات الذكاء الاصطناعي في رفع مستوى مهارات معلمي التربية الخاصة .	7
					تساعد تطبيقات الذكاء الاصطناعي معلمي التربية الخاصة في تحسين مهارات الحياة اليومية لدى الأطفال.	8
					تساعد تطبيقات الذكاء الاصطناعي معلمي التربية الخاصة على تحسين المهارات الاجتماعية لدى الأطفال.	9

					توفر تطبيقات الذكاء الاصطناعي مجموعة متنوعة من الموارد التعليمية، مثل الألعاب التفاعلية والمواد التعليمية المخصصة، مما يسهل على المعلمين تخصيص التعليم لكل طالب	10
					تساعد تطبيقات الذكاء الاصطناعي في تحسين التفاعل الطبيعي بين المعلمين و الأطفال.	11
					تقدم تطبيقات الذكاء الاصطناعي أدوات وموارد تعليمية مخصصة تساعد المعلمين في تعزيز استقلالية الأطفال.	12
					تساعد تطبيقات الذكاء الاصطناعي معلمي التربية الخاصة في تحسين مهارات التواصل لدى الأطفال.	13
المحور الثاني: تحديات استخدام الذكاء الاصطناعي في مرحلة الطفولة المبكرة حسب تصورات معلمي التربية الخاصة						
					محدودية البرامج التدريبية لمعلمي التربية الخاصة على استخدام تطبيقات الذكاء الاصطناعي.	1
					المشكلات التقنية تعتبر أحد التحديات التي تواجه استخدام الذكاء الاصطناعي في تعليم ذوي الاحتياجات الخاصة في مرحلة الطفولة المبكرة.	2
					يواجه المعلمون صعوبة في تخصيص وتكييف تطبيقات الذكاء الاصطناعي بشكل فعال.	3
					نقص الموارد والدعم الفني والتقني.	4
					صعوبة تقييم فعالية استخدام تطبيقات الذكاء الاصطناعي في تعليم الأطفال.	5
					تؤدي التطبيقات الذكاء الاصطناعي إلى تبعية تكنولوجية مفرطة، حيث يمكن أن يؤثر الاعتماد الكبير على التكنولوجيا على التفاعل	6

					الاجتماعي والنشاط البدني للأطفال في البيئة التعليمية.	
					ضمان أمان وسرية بيانات الأطفال من خطر الاختراق او الاستخدام الغير مصرح به.	7
					تدني درجة امتلاك المعلمين المعرفة باستخدام تطبيقات الذكاء الاصطناعي للحصول على البيانات الأساسية (دراسة الحالة - الخطة التربوية الفردية - التقارير الأسبوعية) .	8
					قد يواجه المعلمون تفضيل الأطفال لتطبيقات الذكاء الاصطناعي على التفاعل مع زملائهم، مما يقلل من التفاعل الاجتماعي والتعاون بينهم.	9
					الحاجة إلى التحديث والصيانة المستمرة لتقنيات الذكاء الاصطناعي.	10
					خشية المعلمين أن يؤدي استخدام تطبيقات الذكاء الاصطناعي إلى استبدال دورهم في الفصل الدراسي.	11
					قلة الثقة لدى معلمي التربية الخاصة في تكنولوجيا الذكاء الاصطناعي.	12
					قلة تطبيقات الذكاء الاصطناعي التي تدعم اللغة العربية.	13

Appendix (E)
Final Version of the Questionnaire in English

Questioner on benefits and Challenges of Utilizing Artificial Intelligence in Early Childhood Education According to the Perceptions of Special Education Teachers

Introduction

Dear Teacher

Enclosed is a questionnaire on the benefits and challenges of using artificial intelligence in early childhood education according to the perceptions of special education teachers. This tool is part of a study titled "Perceptions of Special Education Teachers on the utilizing of Artificial Intelligence in Early Childhood," conducted to obtain a Master's degree in Educational Technology.

We kindly ask you to answer the statements in this questionnaire objectively and accurately. Please note that your responses will remain confidential and will be used solely for scientific research purposes. Thank you in advance for your cooperation.

Researcher: Rasha Mohammed Atwa
 Email: Rasha.mq.1991.r@hotmail.com

Section 1: Teacher Information						
Gender: <input type="checkbox"/> Male <input type="checkbox"/> Female						
Education: <input type="checkbox"/> Bachelor's <input type="checkbox"/> Postgraduate						
Specialization:						
Years of Experience: <input type="checkbox"/> Less than 5 years <input type="checkbox"/> 5 to less than 10 years <input type="checkbox"/> 10 years and more						
Number of training courses on using artificial intelligence in education:						
<input type="checkbox"/> None <input type="checkbox"/> 1-3 courses <input type="checkbox"/> 4 or more courses						
Section 2: Questionnaire Items						
	Paragraph	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree

Domain 1: Benefits of utilizing artificial intelligence in early childhood education according to the perceptions of special education teachers						
1	Using AI applications helps special education teachers in writing individual learning plans.					
2	AI applications help special education teachers adapt their teaching methods effectively.					
3	AI applications provide immediate feedback on children's performance, enabling teachers to respond quickly and adjust the educational process.					
4	AI applications offer instant advice to special education teachers on how to modify activities to better meet each student's needs.					
5	AI applications provide special education teachers with accurate analysis of children's performance and suggestions for adjusting educational activities, leading to achieving individual learning goals.					
6	Using AI applications helps special education teachers improve individual learning responses and provide more effective support.					
7	Using AI applications enhances the skill levels of special education teachers.					
8	AI applications help special education teachers improve children's daily life skills.					
9	AI applications help special education teachers improve children's social skills.					

10	AI applications offer a variety of educational resources, such as interactive games and customized learning materials, making it easier for teachers to personalize education for each student.					
11	AI applications improve natural interactions between teachers and children.					
12	AI applications provide specialized tools and resources to help teachers foster children's independence.					
13	AI applications help special education teachers improve children's communication skills.					
Domain 2: Challenges of utilizing artificial intelligence in early childhood education according to the perceptions of special education teachers						
1	Limited training programs for special education teachers on using AI applications.					
2	Technical issues are one of the challenges in using AI in educating children with special needs in early childhood.					
3	Teachers face difficulties in effectively customizing and adapting AI applications.					
4	Lack of resources and technical support.					
5	Difficulty in assessing the effectiveness of AI applications in teaching children.					
6	AI applications may lead to excessive technological dependence, affecting children's social interaction and physical					

	activity in the educational environment.					
7	Ensuring the security and confidentiality of children's data from unauthorized access or breaches.					
8	Teachers have low proficiency in using AI applications for obtaining essential data (case studies, individual educational plans, weekly reports).					
9	Teachers may find that children prefer interacting with AI applications over socializing with peers, reducing social interaction and cooperation.					
10	The need for continuous updates and maintenance of AI technologies.					
11	Teachers fear that AI applications might replace their role in the classroom.					
12	Low confidence among special education teachers in AI technology.					
13	Limited AI applications that support the Arabic language.					

Appendix (F)

Semi-structured Interview Questions

1- From your perspective, what are the benefits of utilizing AI in early childhood as perceived by Special Education Teachers?

The interviewer asked other sub-questions regarding this broad theme such as experience, successful stories, math and linguistic skills....

2- From your perspective, what are the challenges of utilizing AI in early childhood as perceived by Special Education Teachers?

The interviewer asked other sub-questions regarding this broad theme such as training programs, cooperation of parents, regulations, availability of AI tools...

Appendix (G) Interview Results

The researcher ensured the validity of the interview tool by presenting it to a panel of judges. Then, interviews were conducted with ten teachers who expressed their willingness to participate. The interview questions were:

1. From your perspective, what are the benefits of utilizing AI in early childhood as perceived by Special Education Teachers?
2. From your perspective, what are the challenges of utilizing AI in early childhood as perceived by Special Education Teachers?

First Interview:

Response to Question 1: Using AI in early childhood education offers significant benefits, especially in special education. One major benefit is the time saved for teachers in completing administrative tasks. For instance, I can input assessment data into AI tools like ChatGPT, which can generate reports, allowing me to spend more time working directly with children. AI is a valuable tool that enhances educational experiences and outcomes but cannot replace the essential role of teachers in observing and understanding children's behaviors and needs.

Response to Question 2: The effectiveness of AI tools can vary depending on each young child's specific needs. For example, I used virtual reality (VR) as an AI tool to provide unique experiences for young children. The VR experience was successful for only one child with Down syndrome out of ten students. The other children faced various issues: some had sensory problems and refused to wear the VR glasses, others exhibited behavioral problems due to dependency on technology, and some showed no interest. This highlights the importance of tailoring AI use to each child's condition. I also advise against parents using AI at home, noting that many parents use technology to calm their young children instead of addressing behavioral issues, which can have long-term negative effects. AI should be used thoughtfully by teachers in early childhood education, not as a substitute for personal interaction and problem-solving.

Second Interview

Response to Question 1: I am unfamiliar with AI but I believe it can offer significant Interviews, especially for non-verbal children. AI can help these children communicate through alternative communication methods such as pictures, text, or voice via AI applications. Additionally, AI can be used to design educational games that enhance language skills through play and interaction, helping children learn new vocabulary and enjoyably develop language and communication skills. I emphasized the importance of having a specialist alongside the child to ensure emotional and social interaction and prevent them from becoming isolated from their surroundings.

Response to Question 2: I see significant challenges in using AI, particularly in terms of the social isolation that children with communication issues might experience. AI should be an assisting tool rather than a replacement for human interaction. Some parents use technology as a means to calm their children rather than addressing behavioral problems, which can lead to long-term negative effects. The teacher stressed that AI should be used cautiously and under the supervision of specialists to avoid these issues.

Third Interview

Response to Question 1: I use AI-based smartphone applications and find that children respond better to these than traditional methods like flashcards. She believes AI can significantly motivate children to learn and reduce the time it takes for them to respond. AI can be particularly useful in developing language and communication skills through interactive games and educational stories.

Response to Question 2: Despite the benefits, I am concerned about the excessive attachment to technology. There is a fear that children might rely too much on technology, reducing their opportunities for social and human interaction. I emphasized the need for parental supervision when children use technology to avoid excessive dependency. Also, AI cannot be fully relied upon for creating educational plans and assessing children, especially in early childhood, due to the specific needs and complexities of this developmental stage.

Fourth Interview

Response to Question 1: I'm not very knowledgeable about AI due to language barriers and the lack of available training programs. However, I believe AI could greatly improve communication and educational interaction for children through educational applications and interactive games. I need more training and courses to improve my knowledge in this field

Response to Question 2: I faced significant challenges in learning about the benefits of AI due to language issues and the lack of training programs. This limited my ability to fully utilize technology in teaching children. I hope for more resources and training courses in my native language to effectively use AI.

Fifth Interview

Response to Question 1: I believe AI can be very useful in writing educational plans and adapting teaching methods to meet the needs of children. For example, voice assistants can convert speech to text and vice versa, facilitating communication between the teacher and the child. AI can also help develop innovative educational content that stimulates children's creative thinking, such as interactive stories where children can participate in shaping events.

Response to Question 2: AI might not be suitable for all children, especially in early childhood. There are concerns about the impact of radiation and sensory effects on a child's brain. Financial challenges related to subscriptions for smart applications also pose a barrier to the widespread use of this technology. I warn against relying too much on AI, stressing the need for direct human interaction to support the child's emotional and social growth.

Sixth Interview

Response to Question 1: Reflecting on my experience as a Special Education Teacher, integrating artificial intelligence (AI) into early childhood education has been both enlightening and challenging. AI technologies offer profound benefits that can significantly enhance the learning experiences of children, especially those with diverse communication needs. For instance, applications like "Proloquo2Go" use AI-driven voice synthesis to assist non-verbal children in expressing themselves. This tool allows children to select symbols or pictures on a tablet, which the app then vocalizes into speech. Witnessing how this technology enables communication breakthroughs among my students has been incredibly rewarding. Another area where AI excels is in the development of adaptive learning tools. Educational games like "Duolingo" utilize AI to personalize language learning experiences based on individual progress and proficiency. This adaptive approach dynamically adjusts lesson difficulty and content presentation, ensuring optimal engagement and effective learning outcomes for young learners.

Response to Question 2: However, alongside these transformative benefits, challenges remain, particularly in emotional assessment and equitable access to AI technologies. AI systems, while advanced, may struggle to accurately interpret nuanced emotional expressions and non-verbal cues from young children, impacting their emotional development and support needs. Moreover, disparities in access to AI tools persist, with children from underserved communities often lacking the resources to benefit fully from these technologies.

Seventh Interview

Response to Question 1: From my experience as a Special Education Teacher, integrating AI into early childhood education can be very beneficial, especially for children with learning difficulties. AI can make learning fun through gamification. For example, educational apps like "Khan Academy Kids" use AI to create personalized learning games that keep children engaged and motivated. These games can help children with learning difficulties by providing them with tailored educational experiences that suit their needs.

Response to Question 2: Despite these benefits, there are challenges. Technology can distract children, making it hard for them to focus on learning. I also worry about children's privacy and the safety of their data with these technologies. AI is still developing, and we can't risk potential dangers with young children. For example, if an AI system misunderstands a child's needs or emotions, it could lead to incorrect responses or support, which could be harmful. Therefore, we must be cautious and not rely too heavily on AI in these early stages of its development.

Eighth Interview

Response to Question 1: Artificial Intelligence (AI) can be a valuable tool. AI can analyze individual student data and provide personalized recommendations to fit each child's needs. This helps in designing effective individualized education plans. Using chatbots, I can input my student assessments, and the chatbot will handle the rest. However, I still need more training on the available applications in this field.

Among these useful apps available, is "GoNoodle." For example, I use "GoNoodle" with a young child who has ADHD. This app uses AI to create interactive and movement-based activities that help him channel his energy productively. These activities are tailored to his needs, helping him focus better during learning sessions. AI also helps me track his progress and adjust activities based on his performance, making my job easier and more effective.

Response to Question 2: One of the challenges of using AI is the lack of available training courses on AI, which is a big problem. There is also a shortage of technology and infrastructure needed to use AI tools effectively. Most of the apps and tools available are in English, which can be another obstacle. I will need to find tools that support Arabic or work on translating the content.

Nineth Interview

Response to Question 1: Using AI has provided several benefits, particularly through generation programs that have saved me time in sourcing multimedia content like images and videos. These programs can generate, draw, or design images and videos precisely as needed. They also facilitate the creation of detailed audio clips tailored to specific requirements. This efficiency allows me to focus more effectively on teaching and supporting children without spending excessive time on content-creation tasks.

Response to Question 2: However, there are significant challenges. AI is still relatively new in special education, and its impact remains uncertain, particularly in early childhood development. There are concerns about potential negative effects on children, so I prefer using AI primarily as a planning tool rather than directly with children. Furthermore, there is a lack of training courses and accessible knowledge about AI applications in special education, especially those available in languages other than English. Additionally, implementing AI tools requires appropriate equipment, applications, and financial resources, which can be prohibitive in many educational settings.

Tenth Interview

Response to Question 1: Using AI technologies as virtual assistants such as Amazon Alexa and Google Assistant helps me as an early childhood educator in multiple ways. AI helps me organize and schedule appointments, including scheduling therapy sessions and setting reminders for personalized learning activities. It is also easier for parents to communicate with me about their child's progress, as virtual assistants can schedule meetings and discussions efficiently. That enhances my competence as an early childhood special education teacher and facilitates communication and collaboration with parents, which enhances the educational experience of children in cooperation with their families. Moreover, In early childhood special education, AI's role in adapting teaching methods is invaluable. It allows me to dynamically adjust approaches based on each child's unique learning needs. For example, AI suggests interactive games for cognitive development and sensory activities tailored to children with sensory processing challenges.

Response to Question 2: Integrating artificial intelligence (AI) into my early childhood special education work has been enlightening yet has significant challenges. Infrastructure limitations and community apprehension about AI's complexity and usability often hinder its effective adoption. Overcoming these hurdles requires addressing technical barriers, increasing awareness, and providing support to educators and families. Tailored training and simplified AI interfaces could bridge these gaps, enabling us to leverage AI's potential more effectively in enhancing educational practices for children with special needs in our community.