Teachers' Narratives on Implementing AI-Based Learning Tools for Students with Severe Disabilities

Mehdi. Rostami*[1] , Veronica. Longo[2]

[1] Department of Psychology and Counseling, KMAN Research Institute, Richmond Hill, Ontario, Canada
[2] Rehabilitation Department, York Rehab Clinic, Toronto, Canada

* Corresponding author email address: mehdirostami@kmanresce.ca

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This study aims to explore teachers' narratives on implementing AI-based learning tools for students with severe disabilities. The objective is to understand the challenges faced, the impacts on students, and the experiences of teachers using these technologies in special education settings. A qualitative research design was employed, using semi-structured interviews to gather data from 16 certified special education teachers with experience in using AI-based learning tools. Participants were selected through purposive sampling to ensure a diverse range of perspectives. Interviews were transcribed and subjected to thematic analysis to identify key themes and patterns in the data. Three main themes emerged from the analysis: implementation challenges, the impact on students, and teacher experiences. Teachers reported significant technical difficulties, inadequate training, and limited administrative support as major challenges. Despite these issues, AI tools had a positive impact on student engagement, motivation, learning outcomes, social interaction, and behavioral changes. Teachers experienced a range of emotions, from initial skepticism to eventual acceptance, and highlighted the importance of peer support and professional growth. The study underscores the transformative potential of AI in special education, while also identifying critical areas that need attention for successful implementation. The integration of AI-based learning tools in special education offers significant benefits for students with severe disabilities, including enhanced engagement, improved learning outcomes, and better social interactions. However, successful implementation requires addressing technical issues, providing comprehensive training, securing administrative support, and fostering a culture of feedback and reflection. Future research should focus on long-term impacts, comparative effectiveness of different AI tools, and the development of effective training programs. Educational institutions must prioritize these areas to maximize the positive impact of AI technologies in special education.

Keywords: AI-based learning tools, special education, severe disabilities, teacher experiences, student engagement, implementation challenges, professional development.

1. Introduction

Artificial intelligence has the potential to revolutionize education by offering new possibilities for personalized learning and enhancing student engagement. AI technologies can analyze vast amounts of data to tailor educational content to individual learners, thereby improving educational outcomes (Sarwar, 2024). In the context of special education, AI tools can provide significant support by addressing the unique needs of students with disabilities. These tools can assist in creating customized learning experiences that are both engaging and effective (Barua et al., 2022).

The role of AI in education extends beyond simple content delivery. AI can facilitate the development of inclusive educational practices, ensuring that all students, regardless of their abilities, have access to quality education (Adeleye, 2024). For students with severe disabilities, AI-based tools can offer personalized assistive technologies that enhance their learning experiences. These tools can adapt to the specific needs of each student, providing targeted interventions that support their educational progress (Almufareh, 2023).

Despite the potential benefits, the implementation of AI-based learning tools in special education settings is not without challenges. Technical difficulties, such as software glitches and hardware issues, can hinder the effective use of these tools (Sarwar, 2024). Additionally, teachers often face a lack of adequate training and professional development opportunities, which can limit their ability to effectively integrate AI technologies into their teaching practices (Adeleye, 2024). Administrative support, including funding and resource allocation, is also critical for the successful implementation of AI tools in special education (Grunhut et al., 2022).

The impact of AI-based learning tools on students with severe disabilities is multifaceted. These tools can significantly enhance student engagement and motivation by providing interactive and engaging learning experiences (Barua et al., 2022). Moreover, AI technologies can improve learning outcomes by offering personalized educational content that is tailored to the individual needs of each student (Fichten et al., 2022). In addition to academic benefits, AI tools can also support social interaction and communication skills, fostering a more inclusive learning environment (Lawrence, 2023).

Teachers' experiences and perceptions of AI-based learning tools are crucial for understanding the effectiveness and feasibility of these technologies in special education. Teachers play a key role in implementing AI tools and adapting them to meet the needs of their students (Nganji & Brayshaw, 2017). Their insights can provide valuable information on the practical challenges and benefits of using AI in special education settings. Additionally, teachers' feedback and reflections can inform the development of more effective and user-friendly AI tools (Wu, 2024).

In recent years, there has been growing interest in the use of AI to support students with intellectual disabilities. AI technologies can provide personalized learning experiences that address the unique needs of these students, enhancing their educational outcomes and supporting their development (Almufareh, 2023). However, the implementation of AI tools in special education requires careful consideration of ethical and practical issues, including data privacy, accessibility, and the potential for bias in AI algorithms (Grunhut et al., 2022).

The use of AI in education also raises important questions about the future of teaching and learning. As AI technologies become more advanced, there is a need to reconsider the role of teachers and the nature of educational interactions (Sarwar, 2024). AI can support teachers by automating routine tasks and providing data-driven insights into student learning. However, it is essential to ensure that AI tools are used in ways that complement and enhance the role of teachers, rather than replacing them (Lawrence, 2023).

The potential of AI to create more inclusive educational environments is particularly significant for students with severe disabilities. AI tools can provide personalized support that helps these students overcome barriers to learning and achieve their educational goals (Barua et al., 2022). For example, AI-enabled assistive technologies can support communication and social interaction, enabling students with disabilities to participate more fully in classroom activities (Adeleye, 2024).

However, the successful implementation of AI in special education requires addressing several key challenges. Technical issues, such as software glitches and the need for reliable internet connectivity, can impede the effective use of AI tools (Sarwar, 2024). Additionally, teachers need adequate training and professional development to effectively integrate AI technologies into their teaching practices (Adeleye, 2024). Administrative support, including funding and resource allocation, is also critical for the successful implementation of AI tools in special education (Grunhut et al., 2022).

This study aims to explore the experiences and perceptions of teachers who use AI-based learning tools for students with severe disabilities. By examining teachers' narratives, we can gain insights into the practical challenges and benefits of using AI in special education settings.

2. Methods and Materials

2.1. Study Design and Participants

This qualitative research aims to explore teachers' narratives on implementing AI-based learning tools for students with severe disabilities. The study adopts a phenomenological approach to understand the lived experiences and perspectives of educators who integrate AI technologies in special education settings.

Participants were selected using purposive sampling to ensure a rich diversity of experiences and insights. The inclusion criteria required that participants be certified special education teachers with at least one year of experience using AI-based learning tools for students with severe disabilities. A total of 16 participants from various educational institutions, including public schools, private schools, and specialized centers, were recruited for this study. The participants' demographics varied in terms of age, years of teaching experience, and types of disabilities they typically manage in their classrooms.

2.2. Measure

2.2.1. Semi-Structured Interview

Data were collected through semi-structured interviews, which allowed for flexibility in exploring the participants' experiences while ensuring that key topics were covered consistently. An interview guide was developed, focusing on the following areas:

Teachers' initial perceptions and attitudes towards AI-based learning tools.

The process and challenges of implementing these tools in the classroom.

The perceived impact of AI-based tools on students' learning outcomes and engagement.

Teachers' professional development and support related to AI integration.

Suggestions for improving the implementation and effectiveness of AI-based learning tools.

Interviews were conducted either in person or via video conferencing platforms, depending on the participants' preferences and availability. Each interview lasted between 45 to 60 minutes and was audio-recorded with the participants' consent. To ensure data richness and depth, interviews continued until theoretical saturation was achieved, meaning no new significant insights were emerging from the data.

2.3. Data Analysis

The audio recordings of the interviews were transcribed verbatim, and the transcripts were subjected to thematic analysis. This method was chosen to identify, analyze, and report patterns (themes) within the data. The analysis followed these steps:

Familiarization: Researchers read and re-read the transcripts to immerse themselves in the data.

Initial Coding: Open coding was performed to identify meaningful units of text relevant to the research questions. Codes were assigned to segments of data that appeared significant or interesting.

Theme Development: Codes were reviewed and grouped into potential themes. Themes were refined through constant comparison, ensuring that they accurately reflected the participants' narratives and the data set as a whole.

Review and Refinement: Themes were reviewed in relation to the coded data and the entire data set. This step involved checking for coherence and distinctiveness among themes.

Defining and Naming Themes: Each theme was clearly defined and named to capture the essence of the teachers' experiences. Detailed descriptions and examples from the data were used to illustrate each theme.

Throughout the analysis, multiple researchers independently coded portions of the data and met regularly to discuss discrepancies and reach consensus, enhancing the credibility and trustworthiness of the findings. The final themes were presented in a coherent narrative to provide a comprehensive understanding of teachers' experiences with AI-based learning tools for students with severe disabilities.

3. Findings and Results

The study involved 16 certified special education teachers who had at least one year of experience using AI-based learning tools for students with severe disabilities. The participants varied widely in terms of age, years of teaching experience, and the types of disabilities they typically managed in their classrooms. The age of the participants ranged from 28 to 55 years, with a mean age of 41 years. The

teaching experience of the participants ranged from 2 to 25 years, with an average of 13 years.

Regarding the types of disabilities, the participants worked with students who had a variety of severe disabilities, including autism spectrum disorder (8 participants), cerebral palsy (5 participants), Down syndrome (3 participants), and multiple disabilities (4 participants). The participants were employed in diverse educational settings, including public schools (10 participants), private schools (4 participants), and specialized centers (2 participants).

Table 1

The Results of Qualitative Analysis

Category (Main Theme)	Subcategory (Subtheme)	Concepts (Open Codes)
1. Implementation Challenges	1.1 Technical Difficulties	Software glitches, Hardware issues, Internet connectivity, Technical support availability
	1.2 Training and Professional Development	Lack of training, Need for ongoing support, Self-learning, Peer collaboration
	1.3 Adaptation to Classroom Needs	Customization of tools, Integration with curriculum, Differentiated instruction, Student engagement
	1.4 Administrative Support	Administrative approval, Funding, Resource allocation, Policy guidelines
	1.5 Time Management	Time for setup, Balancing with other tasks, Time for student interaction, Planning time
2. Impact on Students	2.1 Engagement and Motivation	Increased participation, Enthusiasm, Positive feedback from students, Sustained attention
	2.2 Learning Outcomes	Improved academic performance, Skill development, Individual progress tracking, Goal achievement
	2.3 Social Interaction and Communication	Peer collaboration, Communication skills, Social integration, Increased interaction
	2.4 Behavioral Changes	Reduction in disruptive behavior, Positive behavior reinforcement, Self-regulation, Emotional expression
	2.5 Accessibility	Ease of use, Adaptability for different disabilities, User-friendly interfaces, Inclusivity
	2.6 Independence	Autonomy in learning, Self-paced learning, Confidence building, Reduced teacher dependence
3. Teacher Experiences	3.1 Perceptions and Attitudes	Initial skepticism, Enthusiasm, Adaptability, Long-term views
	3.2 Professional Growth	Skill enhancement, Knowledge acquisition, Career development, Reflective practice
	3.3 Peer and Community Support	Collaboration with colleagues, Sharing best practices, Support networks, Mentoring
	3.4 Emotional Responses	Stress, Satisfaction, Frustration, Rewarding experiences
	3.5 Impact on Teaching Practices	Innovative strategies, Changes in lesson planning, Classroom management, Teaching philosophy
	3.6 Feedback and Reflection	Constructive feedback, Self-assessment, Reflective discussions, Continuous improvement

3.1. Implementation Challenges

Technical Difficulties: Teachers reported several technical issues while implementing AI-based tools. Common challenges included software glitches, hardware issues, and unreliable internet connectivity. Additionally, the availability of technical support was often limited. One teacher noted, "The software crashes frequently, and it's hard to get immediate tech support."

Training and Professional Development: A significant challenge was the lack of adequate training and ongoing professional development. Many teachers had to resort to self-learning or collaborate with peers to understand the tools. As one teacher mentioned, "We didn't get much training; it was more of learning on the job and helping each other out."

Adaptation to Classroom Needs: Customizing AI tools to meet the specific needs of students was another challenge. Teachers highlighted the difficulties in integrating these tools with the existing curriculum and creating differentiated instruction plans. "It takes a lot of time to tweak the tools so that they fit into our lesson plans and cater to each student's needs," explained one participant.

Administrative Support: The level of administrative support varied, affecting the implementation process. Teachers faced issues such as getting administrative approval, securing funding, and resource allocation. One teacher shared, "We need more backing from the

administration, especially when it comes to funding and policy support."

Time Management: Managing time effectively while using AI tools was a recurring issue. Teachers found it challenging to balance the time needed for setting up and troubleshooting the tools with other teaching responsibilities. "It feels like there's never enough time to plan, set up the AI tools, and still give students the attention they need," one teacher remarked.

3.2.   Impact on Students

Engagement and Motivation: Teachers observed a noticeable increase in student engagement and motivation. Students showed more enthusiasm and participated more actively in lessons involving AI tools. "The students are excited to use the AI tools; it keeps them engaged and motivated," said one teacher.

Learning Outcomes: The impact on learning outcomes was largely positive, with improvements in academic performance and skill development. Teachers could track individual progress and set specific goals. A participant noted, "I've seen significant improvements in their reading and math skills since we started using AI."

Social Interaction and Communication: The use of AI tools facilitated better social interaction and communication among students. Teachers reported that students collaborated more with peers and improved their communication skills. "The tools encourage them to interact more, which has been great for their social skills," shared a teacher.

Behavioral Changes: Positive behavioral changes were also noted, with reductions in disruptive behavior and increased self-regulation. Teachers used AI tools to reinforce positive behavior and help students express their emotions. One teacher mentioned, "I've seen fewer outbursts and more self-control in my students."

Accessibility: The adaptability of AI tools made them accessible to students with various disabilities. Teachers appreciated the user-friendly interfaces and the inclusivity of these tools. "The AI tools are so adaptable; they make learning easier for all my students, regardless of their disabilities," a teacher explained.

Independence: AI tools promoted greater independence among students, allowing them to learn at their own pace and build confidence. "Students are more autonomous and less reliant on my constant assistance," observed one teacher.

3.3.   Teacher Experiences

Perceptions and Attitudes: Teachers' perceptions and attitudes towards AI tools varied, with some initially skeptical but gradually becoming enthusiastic as they saw the benefits. "I was unsure at first, but now I can't imagine teaching without these tools," said a participant.

Professional Growth: Implementing AI tools contributed to teachers' professional growth, enhancing their skills and knowledge. Teachers felt that they had developed new competencies that were valuable for their careers. "This experience has really expanded my skill set and made me a better teacher," one teacher reflected.

Peer and Community Support: Collaboration with colleagues and support from the teaching community played a crucial role. Teachers often shared best practices and supported each other through networks and mentoring. "We have a great support system among the teachers; we learn a lot from each other," noted a teacher.

Emotional Responses: Teachers experienced a range of emotional responses, from stress and frustration due to technical issues to satisfaction and reward from seeing positive student outcomes. One teacher expressed, "It's stressful at times, but seeing the students thrive makes it all worth it."

Impact on Teaching Practices: AI tools prompted changes in teaching practices, encouraging innovative strategies and modifications in lesson planning and classroom management. "These tools have changed the way I plan and deliver my lessons; it's a more dynamic and interactive process now," observed a participant.

Feedback and Reflection: Teachers engaged in continuous feedback and reflection, using insights from their experiences to improve their use of AI tools. They valued constructive feedback and reflective discussions. "We regularly discuss what's working and what's not, and it's a continuous learning process," shared a teacher.

4.   Discussion and Conclusion

The implementation of AI-based learning tools for students with severe disabilities reveals a multifaceted landscape of challenges and benefits. This study identified three main themes: implementation challenges, the impact on students, and teacher experiences. Each theme encompassed several subcategories, providing a comprehensive understanding of the intricacies involved in integrating AI into special education.

Implementation Challenges: The most significant challenges reported by teachers included technical difficulties, inadequate training and professional development, and limited administrative support. Technical issues such as software glitches, hardware failures, and unreliable internet connectivity were common obstacles. Teachers also highlighted a substantial gap in training and ongoing professional development, which hindered their ability to effectively utilize AI tools. Additionally, securing administrative support, including funding and resources, was a persistent challenge.

Impact on Students: The use of AI-based learning tools had a notable positive impact on student engagement, motivation, and learning outcomes. Teachers observed increased participation and enthusiasm among students, as well as improvements in academic performance and skill development. AI tools also facilitated better social interaction and communication, contributing to positive behavioral changes and greater independence among students.

Teacher Experiences: Teachers' experiences with AI tools were marked by a range of emotions and attitudes. While some initially expressed skepticism, many eventually embraced the technology, recognizing its potential to enhance their teaching practices. The implementation of AI tools contributed to professional growth, enabling teachers to develop new skills and competencies. Peer and community support played a crucial role in overcoming challenges, and teachers valued the opportunities for feedback and reflection that AI tools provided.

The findings of this study align with previous research on the integration of AI in education. The technical difficulties reported by teachers are consistent with the challenges identified in other studies. For example, Sarwar (2024) highlights similar issues related to software reliability and the need for robust technical infrastructure to support AI tools (Sarwar, 2024). The lack of adequate training and professional development is also a common theme in the literature, emphasizing the necessity for ongoing support to maximize the benefits of AI technologies in education (Adeleye, 2024).

The positive impact of AI on student engagement and learning outcomes corroborates findings from previous research. Barua et al. (2022) found that AI-enabled personalized assistive tools significantly enhance the educational experiences of children with neurodevelopmental disorders (Barua et al., 2022). These tools provide customized learning experiences that cater to individual needs, thereby improving academic performance and skill development. Similarly, Fichten et al. (2022) reported that AI-based apps positively affect post-secondary students with disabilities by providing personalized support and enhancing their academic success (Fichten et al., 2022).

The observed improvements in social interaction and communication skills align with Lawrence's (2023) study, which found that AI tools can facilitate better peer collaboration and communication among students (Lawrence, 2023). The positive behavioral changes and increased independence reported by teachers in this study are supported by the work of Almufareh (2023), who noted that AI technologies can promote self-regulation and autonomy among students with intellectual disabilities (Almufareh, 2023).

Teachers' experiences and perceptions of AI tools highlight the importance of addressing the practical and emotional aspects of technology integration. The initial skepticism and eventual acceptance of AI tools reflect the findings of Heng and Tabunshchyk (2021), who observed that teachers' attitudes towards AI evolve as they become more familiar with the technology (Heng & Tabunshchyk, 2021). The professional growth reported by teachers in this study is consistent with the findings of Grunhut, Marques, and Wyatt (2022), who emphasized the role of AI in enhancing teachers' skills and knowledge (Grunhut et al., 2022).

This study has several limitations that should be considered when interpreting the findings. First, the sample size was relatively small, with only 16 participants, which may limit the generalizability of the results. While the sample included a diverse range of teachers, the findings may not fully represent the experiences of all special education teachers using AI tools. Additionally, the study relied on self-reported data from interviews, which may be subject to biases such as social desirability bias or recall bias. Future research could address these limitations by including a larger and more representative sample and using a mixed-methods approach to triangulate data from multiple sources.

Future research should explore the long-term impact of AI-based learning tools on students with severe disabilities. Longitudinal studies could provide valuable insights into how these tools affect students' academic and social development over time. Additionally, research should investigate the effectiveness of different types of AI tools and their specific features to identify which are most beneficial for students with various types of disabilities. Comparative studies could also examine the implementation

of AI tools in different educational settings, such as public schools, private schools, and specialized centers, to identify best practices and potential areas for improvement.

Another important area for future research is the development of comprehensive training programs for teachers. Studies could evaluate the effectiveness of various training models and identify the key components of successful professional development programs. Research could also explore the role of peer and community support in enhancing teachers' ability to use AI tools effectively. Investigating the impact of administrative support and policy changes on the implementation of AI technologies in special education could provide valuable insights for educational leaders and policymakers.

Based on the findings of this study, several practical recommendations can be made to support the effective implementation of AI-based learning tools for students with severe disabilities. First, addressing technical challenges is crucial. Educational institutions should ensure that robust technical infrastructure is in place, including reliable internet connectivity and technical support. Regular maintenance and updates of AI tools can help minimize software glitches and hardware failures.

Second, comprehensive training and ongoing professional development are essential for teachers to effectively use AI tools. Training programs should be designed to address the specific needs of special education teachers and include hands-on practice with AI technologies. Providing opportunities for peer collaboration and sharing best practices can enhance the learning experience and build a supportive community of practice.

Third, administrative support is critical for the successful integration of AI tools. Educational leaders should prioritize funding and resource allocation for AI technologies and advocate for policies that support their use in special education. Creating a supportive policy environment can help address some of the barriers identified in this study, such as the need for administrative approval and funding.

Finally, fostering a culture of feedback and reflection can help teachers continuously improve their use of AI tools. Encouraging regular discussions about what works and what doesn't can promote a culture of continuous learning and improvement. Providing opportunities for teachers to share their experiences and insights can help build a collective knowledge base and support the ongoing development of effective AI-based learning tools.

In conclusion, the integration of AI-based learning tools in special education offers significant potential to enhance the learning experiences of students with severe disabilities. While there are challenges to be addressed, the benefits observed in this study highlight the transformative potential of AI technologies. By addressing technical issues, providing comprehensive training, securing administrative support, and fostering a culture of feedback and reflection, educational institutions can maximize the positive impact of AI tools and create more inclusive and effective educational environments for all students.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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