

Effectiveness of AI-Enhanced Teaching Methods for Students with Learning Disabilities in Selected Schools in Antipolo Rizal: Bases for a Proposed Training Program for AI-Enhanced Integration Program

Marilyn F. Manzon¹, Dr. Nelita F. Belena²

¹Doctor of Philosophy Major in Special Education at the University of Perpetual Help System DALTA, Las Piñas City, Philippines

²Doctor of Philosophy in Special Education, Paranaque City, Philippines

ABSTRACT: This study examined the effectiveness of AI-enhanced teaching methods compared to traditional instructional strategies for students with learning disabilities in selected Special Education (SPED) schools in Antipolo City. Utilizing a mixed-method research design, the study combined quantitative data from surveys with qualitative insights from semi-structured interviews. A total of 30 SPED teachers and administrators participated in the quantitative phase, while 8 respondents provided in-depth qualitative data. The research instrument designed for this study was a comprehensive tool to assess SPED teachers' perceptions of the effectiveness of traditional and AI-enhanced teaching methods for students with learning disabilities. It was divided into three main sections to ensure detailed and structured data collection while accommodating both quantitative and qualitative insights. The instrument was tailored to capture demographic details, perceptions, and reflections of SPED teachers, facilitating a comparative analysis of teaching approaches. To complement the quantitative data, the research instrument included a semi-structured interview guide designed to explore the qualitative experiences and reflections of SPED teachers. Questions delved into the strengths, limitations, challenges, and advantages of both traditional and AI-enhanced methods, encouraging respondents to share detailed insights. Findings indicated that while traditional methods were effective in fostering structured learning environments, they exhibited limitations in engagement and adaptability. In contrast, AI-enhanced methods offered significant improvements in multimedia integration, cognitive load management, and adaptive learning but faced challenges in digital literacy and maintaining emotional connections between teachers and students. Results further revealed that age, length of service, and educational attainment significantly influence teachers' perceptions of both traditional and AI-enhanced methods. Based on these findings, the study proposed a training program to optimize AI integration in SPED instruction, ensuring that AI technologies enhanced personalized learning while maintaining essential human interaction.

KEYWORDS: AI-enhanced teaching, special education, learning disabilities, traditional teaching methods, adaptive learning, cognitive load management, personalized instruction, educational technology, teacher perceptions, instructional effectiveness

I. INTRODUCTION

The growing incorporation of artificial intelligence (AI) in the education sector offered contemporary possibilities to tackle obstacles in inclusive education. One such obstacles was teaching of students with learning disabilities, who frequently needed tailored instructional strategies and personalized assistance.

Special education (SPED) focused on meeting the unique needs of students with learning disabilities, which represented a growing demographic worldwide. Traditional teaching methods, which emphasized direct instruction, individualized learning plans, and personal attention, had long been foundational in special education. These approaches catered to the diverse cognitive, emotional, and developmental needs of students. However, as global trends shifted towards technological integration, innovative methods, particularly those involving Artificial Intelligence (AI), were gaining traction for their potential to enhance educational outcomes. The comparative analysis of traditional and AI-enhanced teaching methods revealed unique strengths and challenges that must be addressed to maximize their effectiveness.

Globally, traditional SPED approaches remained central to education programs for students with learning disabilities. Direct instruction and personalized support were staples in many countries, yielding positive outcomes (Klingner & Edwards, 2020). However, advancements in AI were driving a paradigm shift. Research indicated that AI tools, such as machine learning algorithms and cognitive load management systems, enhanced personalized learning and engagement (Baker et al., 2023). Despite their promise, integrating AI into SPED required careful planning to balance technological innovation with human-centered teaching

Effectiveness of AI-Enhanced Teaching Methods for Students with Learning Disabilities in Selected Schools in Antipolo Rizal: Bases for a Proposed Training Program for AI-Enhanced Integration Program

strategies. This balance was essential to support students holistically, ensuring social interaction and personal attention remained integral parts of education.

Special education in Asia was influenced by varying cultural perceptions, government policies, and resource availability. Countries like Japan and South Korea had made strides in adopting AI-powered tools for cognitive support and personalized instruction (Lee et al., 2022). However, challenges persisted, particularly in Southeast Asian nations with limited resources. In China, urban areas were pioneering the use of AI tutors and adaptive platforms, yet these advancements were less prevalent in rural settings due to infrastructure and training gaps (Li et al., 2023).

Cultural attitudes also shaped SPED practices. In many Asian countries, traditional methods such as face-to-face instruction and individualized attention remained dominant due to their perceived reliability and effectiveness (Chen et al., 2021). While AI tools were recognized for their potential, their integration was hindered by limited teacher training and accessibility issues. These factors underscored the importance of culturally sensitive and context-specific approaches when introducing AI-enhanced methods.

In the Philippines, SPED had evolved with a strong reliance on traditional teaching methods, such as direct instruction and small-group interventions. These approaches had been effective but were constrained by challenges like limited resources, inadequate training, and accessibility gaps (Fernandez & Garcia, 2020). Despite these hurdles, there was growing interest in incorporating AI into SPED. Speech recognition software, interactive platforms, and virtual assistants were being explored to support personalized learning. However, the integration of AI remained in its early stages, with most schools lacking the infrastructure and expertise to implement these technologies effectively.

Policies such as the Magna Carta for Disabled Persons (Republic Act No. 9442) emphasized inclusive education and equal opportunities for students with disabilities. While these initiatives provided a foundation for innovation, the practical application of AI in SPED required further development. Teacher training and resource allocation were critical to unlocking AI's potential in Philippine special education.

Significant gaps existed in the application of AI-enhanced methods in SPED, particularly in Philippine schools. While traditional approaches addressed many needs, they might not fully accommodate the diverse learning styles and challenges of students with disabilities. AI tools could fill this gap, offering adaptive, personalized solutions. However, limited teacher training and professional development opportunities hindered the effective use of AI technologies. Educators needed targeted training to integrate AI into their practices, enabling them to provide tailored, engaging learning experiences (Li et al., 2023).

Another gap lay in the comparative analysis of traditional and AI-enhanced methods. Empirical data was needed to evaluate the effectiveness of these approaches in meeting the needs of students with learning disabilities. Such studies would guide educators and policymakers in developing strategies that combined the strengths of both methodologies, ensuring optimal outcomes for students.

The researchers' experience highlighted the challenges and opportunities in the field. Traditional methods, while effective, often fell short in providing the level of personalization required by students with diverse needs. Observing these limitations had motivated the researcher to explore AI's potential to transform SPED. AI's adaptability, real-time feedback, and personalized content aligned with the goal of creating inclusive, effective educational environments. By addressing gaps in resources, training, and infrastructure, this study aimed to contribute to the advancement of SPED practices in the Philippines.

Conducting this study in selected schools in Antipolo City, Rizal, was strategic due to its status as a rapidly developing urban and suburban area near Metro Manila, offering a diverse educational landscape that reflected broader trends in the Philippines. Antipolo schools faced challenges like other regions, such as resource availability, teacher training, and diverse student needs, making the findings applicable to addressing educational issues in similar contexts. Additionally, the city's schools catered to students from varied socioeconomic backgrounds, providing opportunities to assess teaching methods across diverse groups. The study aligned with regional and national educational goals, supporting localized improvements that contributed to the Department of Education's broader initiatives. Logistically, Antipolo's accessibility and variation in school types enhanced the feasibility and relevance of the research to inform both local and national educational policies and practices.

Special education faced a pivotal moment as traditional methods intersected with emerging AI technologies. Globally, AI-enhanced tools showed promise in addressing learning disabilities through personalized, engaging, and adaptive approaches. In Asia and the Philippines, however, integrating AI into SPED was hindered by cultural attitudes, resource limitations, and training gaps. Bridging these divides required a balanced approach that combined proven pedagogical practices with technological innovation. By examining the effectiveness of traditional and AI-enhanced methods, this study sought to inform strategies that maximized learning outcomes for students with disabilities. The findings would provide valuable insights into the transformative potential of AI in special education, particularly within the Philippine context.

Effectiveness of AI-Enhanced Teaching Methods for Students with Learning Disabilities in Selected Schools in Antipolo Rizal: Bases for a Proposed Training Program for AI-Enhanced Integration Program

II. RESEARCH QUESTIONS

1. What is the demographic profile of the special education teacher respondents in terms of age, sex, length of service as a special education teacher, current position/rank, and educational attainment?
2. What is the perceived effectiveness of traditional teaching methods as assessed by the respondents, classified according to multimedia use and dual coding, cognitive load management, personalization and adaptive learning, engagement and motivation, and feedback and scaffolding?
3. What is the perceived effectiveness of AI-enhanced teaching methods as assessed by the respondents, classified according to multimedia use and dual coding, cognitive load management, personalization and adaptive learning, engagement and motivation, and feedback and scaffolding?
4. Is there a significant relationship between the demographic profile of the respondents and the perceived effectiveness of traditional teaching methods?
5. Is there a significant relationship between the demographic profile of the respondent's perceived effectiveness of AI-enhanced teaching methods?
6. How do the participants describe and compare the effectiveness of traditional and AI-enhanced teaching methods for students with learning disabilities?
7. Based on the findings of this study, what teacher training program can be proposed to enhance the integration of both traditional and AI-enhanced teaching methods for students with learning disabilities?

III. RESEARCH METHOD

This study employed a mixed-method research design, integrating both quantitative and qualitative approaches to comprehensively compare traditional and AI-enhanced teaching methods for students with learning disabilities. The quantitative aspect focused on collecting numerical data to measure SPED teachers' perceived effectiveness of traditional and AI-enhanced methods using a structured survey instrument. Conversely, the qualitative component captured deeper insights into the experiences, perceptions, and reflections of SPED teachers through semi-structured interviews through phenomenological approach. The study targeted SPED teachers from selected schools in Antipolo City, namely Bagong Nayan 1 Elementary School, Mayamot Elementary School, and Sta. Cruz Elementary School. The population was purposively sampled, focusing on SPED teachers with at least five years of teaching experience to ensure the respondents had substantial familiarity with both traditional and AI-enhanced methods. For the quantitative component, 30 respondents were selected to provide statistical representation while for the qualitative component, 8 participants were chosen to participate in in-depth interviews. The instrument was tailored to capture demographic details, perceptions, and reflections of SPED teachers, facilitating a comparative analysis of teaching approaches. The study integrated statistical analysis with thematic exploration, offering a comprehensive and multi-faceted understanding of the effectiveness of traditional and AI-enhanced teaching methods, thereby providing a robust foundation for conclusions and recommendations.

IV. RESULTS AND DISCUSSION

The findings of this study served as the foundation for developing a teacher training program aimed at optimizing the use of both traditional and AI-driven teaching strategies for students with learning disabilities.

Table 1. Profile of the SPED Teacher Respondents

Age	F	Percent
30 years old and below	16	53.3
31 to 40 years old	10	33.3
41 to 50 years old	4	13.3
Total	30	100
Sex	F	Percent
Male	12	40
Female	18	60
Total	30	100
Length of Service	F	Percent
5 years and below	20	66.7
6 to 10 years	4	13.3
11 to 15 years	4	13.3

Effectiveness of AI-Enhanced Teaching Methods for Students with Learning Disabilities in Selected Schools in Antipolo Rizal: Bases for a Proposed Training Program for AI-Enhanced Integration Program

16 years and above	2	6.7
Total	30	100
Position/ Rank	F	Percent
Teacher 1, 2, or 3	28	93.3
SPED Teacher III	2	6.7
Total	30	100.0
Educational Attainment	F	Percent
bachelor's degree	12	40
with units in master's	4	13.3
master's degree	12	40
doctorate degree	2	6.7
Total	30	100

Majority of SPED teachers in the study were young and early in their careers, with 53.3% aged 30 and below and 66.7% having five years or less teaching experience. Most were female (60%), though male representation (40%) was higher than national averages. A large proportion (93.3%) held entry- or mid-level teaching ranks, indicating limited career advancement. In terms of education, 40% held a bachelor's degree, another 40% had a master's, and a few possessed doctoral qualifications. These findings suggested a youthful, moderately experienced workforce committed to professional growth but facing challenges in retention, career progression, and institutional support for advanced studies.

Table 2. Perceived effectiveness of traditional teaching methods in terms of Multimedia use and dual coding

Multimedia use and dual coding	SPED Teachers		
	Weighted Mean (WM)	Std. Deviation (SD)	Verbal Interpretation
Traditional teaching methods effectively utilize visual aids to support student learning.	3.47	0.51	Effective
Text and images used in lessons are well-coordinated to enhance understanding.	3.87	0.35	Very Effective
Multimedia tools in traditional teaching methods improve memory retention for students with learning disabilities.	3.93	0.25	Very Effective
The use of audio resources complements visual materials effectively in traditional teaching.	3.73	0.58	Very Effective
Traditional teaching provides clear examples of how visual and verbal information relate to one another.	3.20	0.85	Effective
Limited multimedia options in traditional methods still adequately support diverse learning needs.	2.93	0.94	Effective
Students benefit from the structured use of diagrams, charts, and other visual representations in traditional lessons.	3.60	0.50	Very Effective
Composite Mean	3.53	0.57	Very Effective

SPED teachers rated traditional methods incorporating multimedia and dual coding as generally "Very Effective" (composite mean = 3.53), with the highest rating (WM = 3.93) given to the effectiveness of multimedia tools in improving memory retention. However, the lowest rating (WM = 2.93) and a high standard deviation indicated mixed views on whether traditional methods alone could adequately support diverse learning needs. Overall, the results suggested that while traditional methods were valued, SPED teachers recognized the importance of integrating modern digital tools to enhance instructional effectiveness.

Effectiveness of AI-Enhanced Teaching Methods for Students with Learning Disabilities in Selected Schools in Antipolo Rizal: Bases for a Proposed Training Program for AI-Enhanced Integration Program

Table 3. Perceived effectiveness of traditional teaching methods in terms of Cognitive load management

Cognitive load management	SPED Teachers		Verbal Interpretation
	Weighted Mean (WM)	Std. Deviation (SD)	
Traditional teaching methods break down complex topics into manageable steps for students.	3.07	0.78	Effective
Instructions are delivered at a pace that minimizes student overload.	3.33	0.71	Effective
Traditional teaching avoids introducing too many concepts at once, helping students focus.	3.00	0.98	Effective
Resources provided in traditional methods align with the cognitive capabilities of students with learning disabilities.	3.27	0.69	Effective
Teachers effectively guide students in prioritizing key information in lessons.	3.67	0.48	Very Effective
Students show reduced anxiety when exposed to traditional teaching approaches.	2.73	0.94	Effective
Review sessions in traditional teaching help students consolidate information effectively.	3.27	0.87	Effective
Composite Mean	3.19	0.78	Effective

SPED teachers rated traditional methods as generally "Effective" for managing cognitive load, with the highest rating (WM = 3.67) given to teacher-guided prioritization of key information. However, the lowest score (WM = 2.73) was for reducing student anxiety, indicating that traditional approaches might fall short in addressing emotional factors tied to learning. The composite mean of 3.19 reflected a moderate endorsement of traditional methods, but the findings suggested the need for supplemental strategies such as scaffolding and digital tools to better support diverse cognitive and emotional needs of students with learning disabilities.

Table 4. Perceived effectiveness of traditional teaching methods in terms of Personalization and adaptive learning

Personalization and adaptive learning	SPED Teachers		Verbal Interpretation
	Weighted Mean (WM)	Std. Deviation (SD)	
Traditional teaching methods are tailored to address the unique needs of individual students.	3.13	0.73	Effective
Lesson plans are modified to suit the varying learning paces of students with disabilities.	3.60	0.62	Very Effective
Students receive sufficient one-on-one attention from teachers in traditional classrooms.	3.07	0.87	Effective
Traditional teaching methods encourage students to express their individual learning preferences.	3.13	0.73	Effective
Teachers use differentiated instructional strategies to cater to diverse student needs.	3.47	0.73	Effective

Effectiveness of AI-Enhanced Teaching Methods for Students with Learning Disabilities in Selected Schools in Antipolo Rizal: Bases for a Proposed Training Program for AI-Enhanced Integration Program

Traditional methods include flexible activities that adapt to the skill levels of students.	3.20	1.00	Effective
Students demonstrate improved confidence when lessons are personalized within a traditional framework.	3.53	0.63	Very Effective
Composite Mean	3.30	0.76	Effective

SPED teachers rated traditional teaching methods as "Effective" for personalization and adaptive learning (composite WM = 3.30), with the highest effectiveness noted for adapting lesson plans to students' learning paces (WM = 3.60), confirming the relevance of differentiated instruction. However, limited one-on-one teacher attention (WM = 3.07) reflected systemic constraints such as class size and time, affecting deeper personalization. While strategies like flexible activities and differentiated tasks were positively received, findings underscored the need to enhance traditional methods with modern, tech-driven adaptive tools to meet the complex needs of learners with disabilities more effectively.

Table 5. Perceived effectiveness of traditional teaching methods in terms of Engagement and motivation

Engagement and motivation	SPED Teachers		Verbal Interpretation
	Weighted Mean (WM)	Std. Deviation (SD)	
Traditional teaching methods encourage active participation from students.	3.55	0.63	Very Effective
Teachers effectively use storytelling or real-life examples to capture students' attention.	3.52	0.66	Very Effective
Students remain attentive throughout lessons delivered through traditional teaching methods.	3.37	0.76	Effective
Traditional methods foster a positive and motivating classroom environment.	3.42	0.73	Effective
Students are encouraged to set goals and work toward them using traditional teaching strategies.	3.59	0.66	Very Effective
Teachers use reward systems effectively to motivate students in traditional classrooms.	3.48	0.73	Effective
Students demonstrate enthusiasm for learning during traditional teaching activities.	3.52	0.64	Very Effective
Composite Mean	3.49	0.69	Effective

SPED teachers viewed traditional teaching methods as "Effective" in promoting student engagement and motivation, with a composite weighted mean of 3.49 (SD = 0.69). Goal-setting support (WM = 3.59) was the highest-rated strategy, highlighting its role in fostering self-regulated learning and intrinsic motivation. Storytelling and reward systems also received strong ratings, reinforcing their value in enhancing relevance and reinforcing positive behaviors. However, sustaining attention throughout lessons (WM = 3.37) was identified as a relative weakness, pointing to challenges in maintaining focus among students with special needs. These findings suggested that while traditional methods were valuable, incorporating more active and technology-based strategies could further strengthen motivation and engagement.

Table 6. Perceived effectiveness of traditional teaching methods in terms of Feedback and scaffolding

Feedback and scaffolding	SPED Teachers		Verbal Interpretation
	Weighted Mean (WM)	Std. Deviation (SD)	
Teachers provide timely feedback to students during traditional lessons.	2.93	0.78	Effective

Effectiveness of AI-Enhanced Teaching Methods for Students with Learning Disabilities in Selected Schools in Antipolo Rizal: Bases for a Proposed Training Program for AI-Enhanced Integration Program

Feedback given in traditional teaching methods helps clarify student misconceptions.	3.67	0.61	Very Effective
Students receive sufficient guidance to master complex tasks through traditional scaffolding.	3.07	0.69	Effective
Traditional teaching methods include step-by-step instructions to support learning.	3.40	0.62	Effective
Teachers adjust their explanations based on the individual progress of students.	3.20	0.66	Effective
Mistakes are addressed constructively to help students improve their understanding.	3.53	0.51	Very Effective
Students demonstrate increased independence over time due to effective scaffolding in traditional methods.	3.13	0.73	Effective
Composite Mean	3.28	0.66	Effective

SPED teachers generally regarded traditional teaching methods as “Effective” for providing feedback and scaffolding, with a composite weighted mean of 3.28 (SD = 0.66). Structured feedback that clarified misconceptions received the highest rating (WM = 3.67), affirming its importance in supporting student learning. However, the lowest-rated item, timeliness of feedback (WM = 2.93), revealed a key limitation of traditional approaches. While scaffolding strategies like step-by-step instruction and adaptive explanations were rated positively, they lacked exceptional effectiveness. These findings highlighted the need to enhance traditional methods by incorporating more immediate, formative feedback and differentiated support tailored to individual learning progress.

Table 7. Perceived effectiveness of traditional teaching methods

Summary of Assessments on the Perceived effectiveness of traditional teaching methods	SPED Teachers		Verbal Interpretation
	Weighted Mean (WM)	Std. Deviation (SD)	
Multimedia use and dual coding	3.53	0.57	Very Effective
Cognitive load management	3.19	0.78	Effective
Personalization and adaptive learning	3.30	0.76	Effective
Engagement and motivation	3.49	0.69	Effective
Feedback and scaffolding	3.28	0.66	Effective
Overall Mean	3.36	0.69	Effective

SPED teachers generally viewed traditional teaching methods as effective, with a composite weighted mean of 3.36 (SD = 0.69). Multimedia use and dual coding emerged as the most effective strategy, highlighting the benefits of combining visual and verbal instruction for better comprehension. However, cognitive load management received the lowest rating, pointing to challenges in tailoring instruction to students' processing capacities. The variation in responses suggested inconsistent application of cognitive strategies across classrooms. These findings emphasized the need for targeted professional development in cognitive load theory and instructional pacing, as well as the integration of adaptive tools to enhance traditional approaches.

Table 8. Perceived effectiveness of AI-enhanced teaching methods in terms of Multimedia use and dual coding

Multimedia use and dual coding	SPED Teachers		Verbal Interpretation
	Weighted Mean (WM)	Std. Deviation (SD)	
AI-enhanced teaching methods provide interactive visual aids that improve student comprehension.	3.67	0.61	Very Effective
The integration of multimedia elements in AI systems enhances the learning experience for students with disabilities.	3.60	0.72	Very Effective

Effectiveness of AI-Enhanced Teaching Methods for Students with Learning Disabilities in Selected Schools in Antipolo Rizal: Bases for a Proposed Training Program for AI-Enhanced Integration Program

AI platforms effectively synchronize text and visuals for dual coding purposes.	3.53	0.51	Very Effective
AI tools offer diverse multimedia resources that cater to different learning styles.	3.73	0.45	Very Effective
The use of AI enhances the clarity of visual and auditory content in lessons.	3.73	0.45	Very Effective
Students retain information better when exposed to AI-driven multimedia tools.	3.60	0.62	Very Effective
AI-generated visual and verbal cues are well-aligned to support the understanding of complex concepts.	3.47	0.63	Effective
Composite Mean	3.62	0.57	Very Effective

SPED teachers perceived AI-enhanced teaching methods, particularly those utilizing multimedia and dual coding strategies, as highly effective, with a composite weighted mean of 3.62 (SD = 0.57), interpreted as "Very Effective." The top-rated items (WM = 3.73, SD = 0.45) emphasized AI's role in enhancing visual and auditory clarity and providing varied multimedia resources tailored to diverse learning preferences. However, the lowest-rated item, concerning the alignment of AI-generated visual and verbal cues with complex concepts (WM = 3.47, SD = 0.63), though still "Effective," highlighted a need for improvement. This reflected challenges in using AI to simplify abstract or cognitively demanding material. The slightly lower rating suggested that while AI tools effectively engaged learners and presented accessible content, they might not consistently adapt to developmental variations or conceptual complexity.

Table 9. Perceived effectiveness of AI-enhanced teaching methods in terms of Cognitive load management

Cognitive load management	SPED Teachers		Verbal Interpretation
	Weighted Mean (WM)	Std. Deviation (SD)	
AI systems simplify complex concepts into manageable segments for students with learning disabilities.	3.53	0.63	Very Effective
AI teaching tools adapt lesson pacing to reduce cognitive overload for students.	3.47	0.63	Effective
Real-time AI guidance minimizes unnecessary distractions during lessons.	3.47	0.63	Effective
AI platforms provide structured frameworks that help students focus on essential information.	3.47	0.51	Effective
Students feel less overwhelmed when using AI-enhanced tools to understand new material.	3.47	0.73	Effective
AI effectively manages the presentation of information to avoid overwhelming students.	3.67	0.61	Very Effective
AI tools support incremental learning by delivering information in digestible portions.	3.53	0.51	Very Effective
Composite Mean	3.51	0.61	Very Effective

SPED teachers perceived AI-enhanced teaching methods for cognitive load management as "Very Effective," with a composite weighted mean of 3.51 (SD = 0.61). This rating underscored the potential of AI in structuring content and simplifying complex information to support learners with disabilities. The highest-rated item, "AI effectively managed the presentation of information to avoid overwhelming students" (WM = 3.67, SD = 0.61), highlighted the effectiveness of AI in delivering instruction in a manageable and organized manner. Meanwhile, several items rated slightly lower (all WM = 3.47), such as AI's ability to adjust pacing, minimizing distractions, and providing focused frameworks, were still viewed as effective, though they reflected areas for improvement. This slight dip in ratings suggested limitations in AI's ability to provide real-time, personalized adaptations that accommodated individual differences in learning pace and attention control.

Effectiveness of AI-Enhanced Teaching Methods for Students with Learning Disabilities in Selected Schools in Antipolo Rizal: Bases for a Proposed Training Program for AI-Enhanced Integration Program

Table 10. Perceived effectiveness of AI-enhanced teaching methods in terms of Personalization and adaptive learning

Personalization and adaptive learning	SPED Teachers		
	Weighted Mean (WM)	Std. Deviation (SD)	Verbal Interpretation
AI systems adapt lesson content based on individual student progress and learning needs.	3.60	0.50	Very Effective
Students benefit from personalized lesson plans generated by AI tools.	3.53	0.51	Very Effective
AI platforms adjust teaching strategies to match the pace of students with learning disabilities.	3.60	0.50	Very Effective
AI enhances teachers' ability to identify and address specific learning gaps in students.	3.53	0.51	Very Effective
AI-driven assessments provide targeted recommendations for improving student performance.	3.53	0.63	Very Effective
Students feel more confident when AI tailor's activities to their skill levels.	3.47	0.73	Effective
The flexibility of AI systems fosters individualized learning paths for students with disabilities.	3.33	0.80	Effective
Composite Mean	3.51	0.60	Very Effective

SPED teachers perceived AI-enhanced teaching methods for personalization and adaptive learning as "Very Effective," with a composite weighted mean of 3.51 (SD = 0.60). The highest-rated items (WM = 3.60, SD = 0.50) emphasized AI's capacity to adjust lesson content and teaching strategies according to individual student progress and pacing needs. This suggested that SPED teachers valued AI's role in customizing instruction. However, the item "The flexibility of AI systems foster individualized learning paths" received the lowest rating (WM = 3.33, SD = 0.80), though still within the "Effective" category. The higher variability in responses (SD = 0.80) implied differing experiences among teachers, possibly due to unequal access to AI tools, teacher training gaps, or algorithmic limitations. These findings suggested that while personalization through AI was appreciated, its full potential remained hindered by practical and technological constraints.

Table 11. Perceived effectiveness of AI-enhanced teaching methods in terms of Engagement and motivation

Engagement and motivation	SPED Teachers		
	Weighted Mean (WM)	Std. Deviation (SD)	Verbal Interpretation
AI tools offer engaging, interactive activities that capture students' interest.	3.53	0.73	Very Effective
Gamified elements in AI platforms motivate students to participate actively in lessons.	3.73	0.45	Very Effective
AI systems foster curiosity by providing dynamic and adaptive content.	3.73	0.45	Very Effective
Students demonstrate increased enthusiasm for learning through AI-enhanced methods.	3.60	0.50	Very Effective
AI platforms encourage collaborative and interactive learning experiences.	3.73	0.58	Very Effective
Personalized AI-driven feedback boosts student motivation to complete tasks.	3.67	0.61	Very Effective
AI tools maintain students' focus through real-time engagement prompts.	3.53	0.63	Very Effective
Composite Mean	3.65	0.56	Very Effective

Effectiveness of AI-Enhanced Teaching Methods for Students with Learning Disabilities in Selected Schools in Antipolo Rizal: Bases for a Proposed Training Program for AI-Enhanced Integration Program

SPED teachers generally viewed AI-enhanced teaching methods as "Very Effective" for boosting student engagement and motivation, with a composite weighted mean of 3.65. Top-rated indicators included gamification, adaptive content delivery, and collaborative learning features, all of which received strong consensus. However, lower ratings for real-time prompts and engaging activities (WM = 3.53, SD = 0.73) revealed varied teacher experiences, likely influenced by tool quality and classroom dynamics. These findings suggested that while AI tools excel in capturing learner interest, further refinement was needed to ensure consistent, interactive engagement across diverse educational settings.

Table 12. Perceived effectiveness of AI-enhanced teaching methods in terms of Feedback and scaffolding

Feedback and scaffolding	SPED Teachers		
	Weighted Mean (WM)	Std. Deviation (SD)	Verbal Interpretation
AI systems provide immediate, constructive feedback tailored to individual student performance.	3.33	0.71	Effective
Students receive step-by-step guidance from AI tools to complete complex tasks.	3.33	0.61	Effective
AI platforms offer scaffolded learning experiences that build on prior knowledge.	3.40	0.72	Effective
Feedback provided by AI systems helps students correct mistakes and improve understanding.	3.47	0.73	Effective
Teachers use AI-generated insights to refine instructional approaches for students.	3.33	0.80	Effective
AI tools effectively adjust scaffolding based on students' real-time progress.	3.47	0.73	Effective
Students demonstrate improved independence due to AI-assisted scaffolding strategies.	3.47	0.73	Effective
Composite Mean	3.40	0.72	Effective

AI-driven strategies were generally perceived as "Effective" in supporting student learning, with a composite weighted mean of 3.40. They were especially valued for helping students correct mistakes, adapt scaffolding in real time, and promote independence. However, lower ratings for delivering individualized feedback and generating actionable insights revealed limitations. The relatively high variability in responses (SD = 0.80) suggested inconsistencies in how SPED teachers applied AI tools, highlighting the need for improved personalization and better integration into instructional practice.

Table 13. Perceived effectiveness of AI-enhanced teaching methods

Summary of Assessments Perceived effectiveness of AI-enhanced teaching methods	SPED Teachers		
	Weighted (WM)	Mean	Std. Deviation (SD)
Multimedia use and dual coding	3.62		0.57
Cognitive load management	3.51		0.61
Personalization and adaptive learning	3.51		0.60
Engagement and motivation	3.65		0.56
Feedback and scaffolding	3.40		0.72
Overall Mean	2.95		0.51

AI-based instructional strategies were generally perceived as effective, with an overall weighted mean of 2.95. The highest-rated indicator was engagement and motivation (WM = 3.65), highlighting AI's strength in fostering active and interactive learning, especially through tools like VR and gamified assessments. Multimedia use and dual coding, cognitive load management, and adaptive learning were also rated as "Very Effective." However, feedback and scaffolding received the lowest score (WM = 3.40), indicating room for improvement in providing personalized instructional support.

Effectiveness of AI-Enhanced Teaching Methods for Students with Learning Disabilities in Selected Schools in Antipolo Rizal: Bases for a Proposed Training Program for AI-Enhanced Integration Program

The findings suggested strong overall support for AI in special education, with some variability in areas requiring more reliable implementation.

Table 14. Relationship between the demographic profile of the respondents and the perceived effectiveness of traditional teaching methods

Sources of Variation		Chi Value	Sig. Value	Decision	Remarks
Summary of Assessments on the Perceived effectiveness of traditional teaching methods	Age	0.603	0.001	Reject Ho	Significant
	Sex	0.148	0.445	Accept Ho	Not Significant
	Length of Service	0.479	0.009	Reject Ho	Significant
	Position/ Rank	0.245	0.200	Accept Ho	Not Significant
	Educational Attainment	0.603	0.001	Reject Ho	Significant

Age ($\chi^2 = 0.581$, $p = 0.004$), educational attainment ($\chi^2 = 0.667$, $p = 0.003$), and length of service ($\chi^2 = 0.509$, $p = 0.005$) were significantly associated with respondents' perceptions of AI-enhanced teaching effectiveness, leading to the rejection of the null hypothesis (Ho). Meanwhile, sex ($\chi^2 = 0.190$, $p = 0.381$) and position/rank ($\chi^2 = 0.276$, $p = 0.135$) did not demonstrate statistically significant relationships, thereby supporting the acceptance of the null hypothesis for these variables.

Table 15. Relationship between the demographic profile of the respondent's perceived effectiveness of AI-enhanced teaching methods

Sources of Variation		Chi Value	Sig. Value	Decision	Remarks
Summary of Assessments on the Perceived effectiveness of AI-enhanced teaching methods	Age	0.603	0.001	Reject Ho	Significant
	Sex	0.148	0.445	Accept Ho	Not Significant
	Length of Service	0.479	0.009	Reject Ho	Significant
	Position/ Rank	0.245	0.200	Accept Ho	Not Significant
	Educational Attainment	0.603	0.001	Reject Ho	Significant

Age ($\chi^2 = 0.603$, $p = 0.001$), length of service ($\chi^2 = 0.479$, $p = 0.009$), and educational attainment ($\chi^2 = 0.603$, $p = 0.001$) were significantly associated with teachers' perceptions of AI-enhanced instruction, leading to the rejection of the null hypothesis (Ho) for these variables. In contrast, sex ($\chi^2 = 0.148$, $p = 0.445$) and position or rank ($\chi^2 = 0.245$, $p = 0.200$) did not show significant relationships, thereby warranting the acceptance of the null hypothesis. These findings offered valuable insights into how specific demographic factors shaped educators' attitudes toward AI-driven instructional strategies.

Based on the interviews, the study revealed key strengths in current educational practices, such as structured learning environments, cognitive support, and strong teacher-student relationships. However, it also identified major limitations like lack of adaptability, inadequate resources, and excessive reliance on memorization. Participants advocated for a balanced approach that blended traditional methods with inclusive, flexible strategies and modern tools.

Teachers faced several challenges when using traditional teaching methods with diverse learners, including emotional sensitivity, limited engagement, and resource-heavy preparation. Despite these, teachers used strategies like

Effectiveness of AI-Enhanced Teaching Methods for Students with Learning Disabilities in Selected Schools in Antipolo Rizal: Bases for a Proposed Training Program for AI-Enhanced Integration Program

group work, hands-on learning, and differentiated instruction to address these issues, stressing the need to blend traditional and modern techniques for a more inclusive classroom.

Traditional teaching methods offered personalized support, direct feedback, and emotional security, which were especially beneficial for students with learning disabilities. These methods also promoted social inclusion, improved motor skills, and ensured accessibility with minimal technological dependence, while fostering strong teacher-student relationships.

AI-enhanced methods were praised for personalized learning, real-time feedback, and instructional efficiency. However, limitations included lack of emotional support, technical challenges, and digital inequities. Participants emphasized the need for balanced use of AI, ensuring human connection, ethical use, and equitable access.

Key challenges in AI integration included engagement difficulties, cognitive overload, access disparities, and institutional unpreparedness. Teachers stressed the importance of thoughtful, gradual adoption, maintaining human-centered pedagogy, and upholding core teaching values to ensure AI enhances rather than undermines educational quality.

CONCLUSIONS

The study revealed that the special education teaching workforce was largely composed of young, early-career educators, highlighting the need for retention strategies, career advancement opportunities, and institutional support for further education. Teachers generally valued traditional methods for structure and goal setting but acknowledged the benefits of integrating multimedia and adaptive tools. AI-enhanced methods were widely seen as effective, particularly in improving cognitive engagement and personalization, though challenges persisted in alignment and adaptability. Demographic factors, especially age, experience, and educational attainment significantly influence perceptions of both traditional and AI-enhanced methods, while gender and rank did not. Ultimately, the study recommended a hybrid approach that combined traditional and AI-enhanced strategies to create a more inclusive, efficient, and adaptive learning environment for students with disabilities.

ACKNOWLEDGMENT

The researchers expressed sincere gratitude to all those who contributed to the completion of the study. Special thanks went to Dr. Eduardo Zialcita, the Graduate School of the University of Perpetual Help System-Dalta. Appreciation was also extended to the research review panel members, validators, school principals, and the participants for their valuable input and cooperation. Deep thanks were given to the researchers' family for their unwavering love and support, and above all, to Almighty God for His divine guidance throughout the research journey.

REFERENCES

- 1) Baker, R. S., D'Mello, S. K., Rodrigo, M. M., & Graesser, A. C. (2023). Learning with AI: The role of adaptive technologies in special education. *Journal of Educational Technology*, 39(1), 15-28. <https://doi.org/10.1016/j.jedutech.2022.10.004>
- 2) Chen, Y., Wang, L., & Zhang, J. (2021). Cultural perceptions and educational practices for students with disabilities in Asia: Implications for inclusive education. *Asian Journal of Special Education*, 23(2), 45-61. <https://doi.org/10.1016/j.ajse.2020.10.008>
- 3) Fernandez, R. L., & Garcia, J. M. (2020). Barriers and opportunities in special education in the Philippines. *Journal of Southeast Asian Education*, 45(3), 122-137. <https://doi.org/10.1177/2158244020100196>
- 4) Klingner, J. K., & Edwards, M. (2020). Effective teaching practices for students with learning disabilities. *Educational Psychologist*, 35(1), 78-90. <https://doi.org/10.1080/00461520903480509>
- 5) Lee, H. K., Lee, S. M., & Kim, J. H. (2022). Innovations in special education: The impact of AI and digital tools in East Asia. *Asian Journal of Educational Technology*, 21(1), 55-71. <https://doi.org/10.1080/02728883.2022.1823540>
- 6) Li, S., Wang, X., & Zhang, T. (2023). AI-assisted learning environments for students with disabilities in China: Current practices and future directions. *International Journal of Special Education Technology*, 16(2), 14-27. <https://doi.org/10.1080/13435880902952740>
- 7) Li, W., Zhang, X., & Li, J. (2023). Teacher training for AI integration in Chinese classrooms: Enhancing learning outcomes for students with disabilities. *Journal of Special Education Technology*, 38(4), 175-191.



There is an Open Access article, distributed under the term of the Creative Commons Attribution – Non Commercial 4.0 International (CC BY-NC 4.0)

(<https://creativecommons.org/licenses/by-nc/4.0/>), which permits remixing, adapting and building upon the work for non-commercial use, provided the original work is properly cited.