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UTILIZATION OF TECHNOLOGY IN SPECIAL EDUCATION CLASS IN RELATION TO STUDENTS' LEARNING STYLE: BASIS FOR AN INTEGRATION FRAMEWORK

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ABSTRACT

This study examines the integration of modern technology in special education (SPED) classes, analyzing teacher demographics, pedagogical approaches, and the congruence of technological resources with students' varied learning preferences. The findings indicate that the SPED workforce mostly consists of early- to mid-career educators, predominantly female and well-educated, suggesting a preparedness for the adoption of digital technologies. The synergy of seasoned educators and digitally adept novices cultivates a collaborative atmosphere favorable for technology integration. Educators emphatically endorse the significance of technology in augmenting learning, fostering participation, and facilitating data-driven decision-making. Nonetheless, despite its usage, a significant disparity exists between the deployment of technology and the adaptation of its application to accommodate students' unique learning modalities, visual, aural, kinesthetic, and tactile. Demographic variables, including age, gender, and tenure, substantially affect teachers' utilization of technology, highlighting the necessity for specialized professional development. The research presents a thorough integration framework aimed at mitigating inequities, bolstering teacher confidence, and emphasizing inclusivity. The framework encompasses customized ICT training, mentorship initiatives, and stakeholder involvement to guarantee efficient and equitable execution. The conclusions underscore the imperative for ongoing, tailored professional development and the congruence of digital tools with varied teaching strategies. Recommendations advocate for gender-responsive, skill-appropriate training, enhanced resource accessibility, and ongoing institutional support. Aligning technology with personalized pedagogical approaches can substantially enhance the educational experience for individuals with special needs. This study enhances the conversation on inclusive education and emphasizes the significance of deliberate, data-driven technology integration in special education environments.

KEYWORDS: *Assistive Technologies, Auditory learning style, Inclusive Education, Kinesthetic learning style, Multimodal learning style*

I. INTRODUCTION

In recent decades, there has been a significant shift towards inclusive education globally, emphasizing equitable learning opportunities for all students, including those with disabilities. This movement is supported by international frameworks like the United Nations Convention on the Rights of Persons with Disabilities, which advocates for non-discriminatory access to quality education (United Nations, 2020). Many countries have responded by enacting legislation that promotes inclusive education, aligning their systems with these principles. Notable legal frameworks, such as the Individuals with Disabilities Education Act (IDEA) in the U.S. and India's Inclusive Education Policy, mandate special education services and accommodations in mainstream settings (U.S. Department of Education, 2020; Government of India, 2019), demonstrating a commitment to inclusive learning environments for diverse learners.

In the Philippines, the Department of Education (DepEd) has advanced inclusive education through initiatives like the Enhanced Basic Education Act of 2013 and the Magna Carta for Persons with Disabilities, which affirm the right of individuals with disabilities to quality education in inclusive settings (Republic of the Philippines, 2013; Republic of the Philippines, 2018). This study explores the integration of technology in special education, aiming to develop a framework that enables educators to utilize technology effectively to support diverse learning needs. The educational landscape has shifted towards inclusivity, addressing historical barriers faced by individuals with disabilities and promoting their integration into general education classrooms (Smith & Johnson, 2019; Brown et al., 2022; Jones & Roberts, 2020).

The integration of technology in special education classrooms holds promise for fostering inclusive education; however, significant challenges persist. Barriers such as limited access to technology, insufficient educator training, and a lack of awareness about resources hinder effective utilization. Additionally, there is a need for empirical research to assess technology's impact on learning outcomes for special needs students (Johnson et al., 2023). This study aims to contribute to the discourse on inclusive education by examining technology integration, identifying diverse learning styles among special needs students, and exploring the relationship between technology use and learning outcomes, ultimately seeking to inform effective strategies for inclusive practices.

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This study employs the Technology Acceptance Model (TAM), which identifies perceived ease of use and perceived usefulness as crucial factors in technology adoption (Davis, 1986). It also integrates constructivist learning theory, which posits that learners construct knowledge through social interactions and environmental engagement (Smith & Garcia, 2019; Jones et al., 2020). Constructivism emphasizes the role of collaboration and meaningful interactions in learning (Garcia & Taylor, 2022; Smith et al., 2023), and advocates for technology integration to enhance collaborative learning, fostering peer interaction and problem-solving (Johnson et al., 2022). This approach supports diverse learning styles and promotes authentic, project-based learning experiences (Taylor & Garcia, 2023; Williams & Clark, 2021), bridging theory and practice for transferable skills in the digital age (Johnson & Smith, 2018). The study aims to explore the impact of technology integration on learning outcomes and improve pedagogical practices to enhance student engagement and academic success (Clark & Davis, 2021).

This study explores the integration of technology in special education classrooms to foster inclusive education. It focuses on three key components: input, process, and output. The research focuses on the profiles of respondents, the use of modern technologies, and different learning styles. The study uses standardized and researcher-made instruments to gather, analyze, and interpret data. Statistical tools are used to derive meaningful conclusions. The results form the basis of an integration framework, offering guidance for educators to harness technology's transformative potential in fostering inclusive practices. The framework empowers educators to navigate technology integration complexities with confidence and efficacy, leading to actionable recommendations and interventions.

The study investigates the integration of technology in special education classrooms and its impact on inclusive education practices. It examines the types of technologies used, frequency of use, accessibility, and integration into instructional practices. The research focuses on the experiences of educators, students, and parents/caregivers in special education within the Montalban and San Mateo Sub-Offices in the Division of Rizal for the 2024-2025 school year. The study explores the use of assistive devices, educational software, online resources, and adaptive technologies to support diverse learning needs and facilitate personalized experiences. It also examines the challenges and barriers associated with technology integration in special education classrooms, including access, training, support, and infrastructure. The study acknowledges its limitations, including its geographical focus, self-reported data, and lack of in-depth analysis of individualized instructional practices.

1.1 Statement of the Problem

1. What is the profile of the teacher-respondents in terms of Age, Sex, Educational attainment; and Length of service?
2. What is the composite mean on the extent of Utilization of modern technologies in special education classrooms in terms of Usefulness, Ease of Use and External Factor?
3. Is there a significant difference in the utilization of modern technologies in special education when respondents are grouped according to profile?
4. What is the composite mean on the extent of the different learning styles of the special needs students as assessed by the teacher-respondents in terms of Visual learning style, Auditory learning style, Kinesthetic learning style, Tactile learning style, and Multimodal learning style?
5. Is there a significant relationship between the utilization of modern technologies and extent of the different learning styles?
6. Based on the findings, what integration framework may be proposed?

2. REVIEW OF RELATED LITERATURE

Rosario et al. (2024), which revealed that special education instructors typically possess favorable attitudes toward the integration of information and communication technology (ICT) in their teaching, with Age, educational qualifications, and years of experience not serving as significant predictors of these attitudes. Moreover, Hafalla Jr. (2019) indicates that Age is a crucial determinant of the effective Utilization of technology in education, with younger educators demonstrating a greater propensity to embrace technological tools for classroom organization and management.

Kusuma (2023) revealing significant disparities between male and female student teachers regarding the frequency of technology tool usage in online teaching, indicating that gender may affect technology integration practices. Adeoye (2024) also revealed that male secondary school teachers had superior digital abilities compared to their female counterparts in the instruction of STEAM courses, underscoring the necessity for focused interventions to address digital literacy disparities. Nonetheless, other research, such as Quiño-Justol (2024), emphasizes the significance of assistive technology in inclusive classrooms while not emphasizing notable differences between the sexes, indicating that elements such as training and support may be more pivotal than gender alone.

Research by Fernández-Batanero et al. (2022) indicated that primary education teachers frequently lack sufficient training in utilizing ICT to assist pupils with special needs, revealing a disparity between academic qualifications and practical skills. These findings underscore the necessity for ongoing professional development centered on the practical implementation of technology in special education environments. Moreno's (2020) study, which highlights that the effective integration of new technology in the classroom is largely contingent upon professional development, highlighting that sustained training centered on active learner experiences substantially influences the propensity for technology adoption and implementation among special educators.

Perkmen (2024) indicates that multimedia-based teaching strategies considerably improve the technology integration self-efficacy of special education pre-service teachers, especially those with initially low to medium self-efficacy levels. This indicates that specialized training enables instructors to integrate technology into their instructional methodologies proficiently. A comprehensive review by Sánchez-Serrano et

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al. (2022) indicated that digital technologies, such as multimedia, virtual reality, and augmented reality, facilitate the development of academic skills in special education. The review highlighted that when integrated with suitable technological resources, student-centered educational methods result in favorable learning results for students with impairments. Furthermore, Licwinko (2024) examined the perspectives of special education co-teachers on technology integration, indicating that educators are proactively pursuing further educational opportunities related to technology and emphasizing pedagogy in the context of technology integration. This highlights the proactive responsibility of educators, especially women in special education, in improving their technical skills to assist their children more effectively.

The research conducted by Zaman et al. (2024), which indicates that although educators acknowledge the significant utility of ICT in educational environments, they express concerns regarding its ease of use, frequently due to insufficient training and constrained resources. This highlights the necessity of extensive teacher training and infrastructural improvements to reconcile the disparity between policy and reality in ICT integration. Research by Alghamdi (2022) indicates that teachers' confidence in utilizing assistive technology is affected by their training and experience, underscoring the necessity for specific preparatory programs to enhance effective technology integration in special education.

Xu et al. (2025) demonstrates that although external support, including institutional and technical assistance, is essential for enhancing teachers' ICT integration capabilities, its impact is diminished without considering internal elements such as instructors' motivation and beliefs. This indicates that offering external help may not effectively enhance teachers' research.

Marino et al. (2024) emphasize the necessity of incorporating developing technologies into special education teacher preparation programs. The results highlight that extensive professional development, ongoing support, and using Universal Design for Learning (UDL) principles are crucial for educators to integrate technology into their instructional methods proficiently.

Pérez and Cruz (2023), which revealed that special education educators largely acknowledge the efficacy of technology in improving instruction; however, they also noted considerable obstacles to its comprehensive integration, chiefly stemming from deficiencies in teacher training and restricted resource availability. Garcia and Tan (2022) underscored that the user-friendliness of technology is pivotal for its acceptance and stressed the necessity of offering adequate training and assistance to educators to facilitate effective implementation in inclusive classrooms. Mendez and Flores (2024) conducted a mixed-methods study that confirmed external factors such as infrastructure, administrative support, and technical assistance significantly influence technology utilization in special education environments. These studies collectively highlight that although instructors usually see educational technology favorably, systemic support and continuous professional development are crucial to fully leverage their potential in addressing various student requirements.

Ramírez and Cedeño (2023), which shows that visual aids markedly enhanced understanding and retention in students with learning difficulties, especially in reading and science disciplines. Their research indicated that students exhibited increased confidence and engagement when classes incorporated visual aids. A study by Chen and Lee (2022) highlighted that visual-based instructional tactics, including mind mapping and interactive graphics, promote cognitive processing in children with autism spectrum disorder, resulting in enhanced academic achievement. Furthermore, Gómez and Dela Cruz (2021) emphasized that integrating visual learning aids in inclusive classrooms enhances student motivation and engagement, particularly for those who find traditional text-heavy instruction challenging. These findings underscore the imperative of incorporating visual learning strategies in special education environments to accommodate and assist kids' chosen learning modalities.

Lim and Morales (2023), which demonstrated that students with learning disabilities exhibited significant enhancement in comprehension and retention when subjected to recurrent oral instruction and auditory resources, in contrast to conventional visual-based approaches. A study by Johnson and Rivera (2022) indicated that auditory learners, especially those with reading difficulties, gain from podcasts and vocal feedback, enhancing their engagement with content. Castillo and Nguyen (2021) underscored the significance of multimodal learning settings, highlighting those auditory tactics, including collaborative conversations and verbal repetition, are especially beneficial for students with attention difficulties and processing disorders. These findings underscore the necessity of incorporating auditory learning strategies to address varied learning styles in special education, mandating their integration into everyday instruction to guarantee inclusive education.

Patel and Santos (2023) indicates that children with developmental disabilities exhibit notable improvements in concentration and academic achievement when engaging in physical and interactive learning activities. Their research underscores the significance of multimodal training incorporating tactile and kinesthetic activities. Kim and Alonzo (2022) discovered that role-playing and simulations aided kids with ADHD and autism in developing cognitive and social skills, rendering kinesthetic learning effective academically and therapeutically advantageous. Dizon and Herrera (2021) found that children in inclusive classrooms responded favorably to task-based physical activities, enhancing their motivation and engagement. These findings substantiate the assertion that kinesthetic learning enhances educational achievements and particularly benefits individuals with special needs.

Nguyen and Castillo (2022), which indicates that tactile-based training markedly enhances concept memory in children with intellectual disabilities by facilitating information processing through sensory experience. Ramos and Bennett (2023) discovered that tactile teaching tools, such as clay modeling, puzzle games, and physical charts, improved students' engagement and academic performance in inclusive classrooms. These activities facilitated cognitive growth and promoted the enhancement of fine motor skills. A study by Lopez and Fajardo (2021) demonstrated that tactile learning

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methodologies are particularly beneficial for students with visual impairments, highlighting the significance of touch-based instruction in facilitating meaningful learning experiences. These findings collectively confirm that tactile learning is essential in special education and should be focused on in curriculum development.

Rivera and Santos (2023) supports that student with learning difficulties had markedly enhanced academic performance when instructed through multimodal techniques, which addressed diverse cognitive capabilities. Lin and Sharma (2021) highlighted that multimodal training enhances cognitive processing and memory retention, particularly for students facing attention and sensory integration difficulties. Their research indicated that employing mixed sensory inputs enabled pupils to enhance learning through many pathways. Choi and Valdez (2022) emphasized that integrating visual, aural, and kinesthetic stimuli enhanced student motivation and engagement in inclusive settings.

Sharma and Delgado (2021) substantiates that multimodal and diverse instructional strategies enhance engagement and academic performance in special education environments. They underscored the significance of acknowledging and addressing individual learning profiles. Nguyen et al. (2023) performed a cross-sectional study demonstrating that inclusive classrooms incorporating visual, auditory, and kinesthetic components enhanced student happiness and improved subject retention. Li and Haruta (2022) emphasized that a balanced approach accommodating various learning styles is especially successful in special education since it improves adaptability and cultivates confidence in learners.

Kim and Zhang (2022), indicating that numerous educators extensively utilize digital tools; however, they frequently lack the requisite skills to tailor their application to individual student requirements. This disconnection can restrict the potential efficacy of technology in personalized training. Rivera and Santos (2023) discovered that, despite significant technological use, educators often utilize generic programs without adequately considering the engagement of learners with diverse sensory preferences. Torres and Ibrahim (2021) highlighted that effective technology integration necessitates comprehension of the interaction between digital resources and cognitive and sensory learning modes; nevertheless, numerous instructors indicate a lack of assistance in this area.

II. RESEARCH METHODOLOGY

Research Design

This study utilized a quantitative descriptive research design to explore the integration of technology in special education classrooms and its effects on inclusive education practices. This approach facilitated systematic observation and analysis of real-world phenomena, allowing for the collection of data on technology types, usage frequency, accessibility, and instructional integration. The researcher chose this design for its efficiency, cost-effectiveness, and flexibility in handling quantitative data, which provides various options for data-gathering instruments (Fraenkel, Wallen, & Hyun, 2019).

Population and Sampling

This study involved 50 special needs education (SNED) teachers and 50 receiving teachers at the Montalban and San Mateo Sub-office in the Division of Rizal. A random sample of 100 receiving teachers was selected from the 200 receiving teachers, ensuring equal representation and ensuring equal chances of selection.

Respondents of the Study

The respondents of the study were fifty (50) SNED Teachers and fifty (50) Receiving Teachers from Montalban and San Mateo Sub-Office in the Division of Rizal. The respondents were assessing the utilization of technology in special education class in relation to students' learning style.

Research Instrument

This study used a structured survey questionnaire to investigate technology integration and learning styles in special education settings. The questionnaire was divided into three parts, each focusing on different aspects of the research investigation. Part I collected demographic information from respondents, aiming to understand how demographic factors influenced their perceptions and experiences. Part II assessed respondents' perceptions of the usefulness and ease of use of technology in special education instruction using a Likert scale. Part III evaluated respondents' assessments of students with special needs in terms of their preferred learning styles, using a Likert scale to measure respondents' agreement with statements regarding each learning style. The questionnaire checklist used a four-point scale.

Data Gathering Procedure

The researcher obtained permission from the school's division office and principal, and obtained consent from special needs education (SNED) and receiving teachers. Data collection involved surveys, interviews, and classroom observations. A structured questionnaire was used to gather quantitative data on technology utilization in special education classrooms, while semi-structured interviews provided qualitative insights into experiences, attitudes, and recommendations regarding technology integration and inclusive education practices.

Statistical Treatment

The study used SPSS software to analyze quantitative data, employing tools like frequency distribution, percentages, weighted mean, t-test, ANOVA, and Pearson correlation. These tools were used to process the data into meaningful information, with non-parametric equivalents used for non-normally distributed data. Frequency Distribution was used to count frequencies under teacher-respondent profiles, percentages were used to determine the percentage of respondents' assessments, and weighted mean was used for Likert scale questionnaire responses. ANOVA was used to analyze significant differences among group means, and Pearson correlation was used to test the relationship between major variables.

Ethical Consideration

This study upholds ethical standards to protect participants' rights, well-being, and findings integrity. It obtains informed consent, maintains confidentiality, and respects autonomy. Participants have the freedom to withdraw without negative

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consequences. The research team considers potential impact on participants and the community, ensuring accurate communication without harm. Recommendations promote inclusion and well-being of students with special needs. Institutional review board approval is obtained before commencing the study.

III. RESULTS AND DISCUSSION

Profile of the teacher-respondents in terms of Age, Sex, Educational attainment, and Length of service.

Table 1 Demographic profile of the respondents in terms of Age

	Frequency	Percent
18-28	7	14.0
29-39	25	50.0
40-55	13	26.0
56 and above	5	10.0
Total	**50**	**100.0**

Table 1 indicates that the predominant demographic is in the early to mid-career phases, with a substantial segment within the 29–39 age range. This indicates a comparatively youthful workforce and possibly more amenable to incorporating technology in special education environments. The presence of respondents from different age groups signifies a variety of experiences and viewpoints, which might promote collaborative initiatives in executing technology-enhanced learning methodologies.

The majority of respondents are younger teachers, indicating a favorable environment for integrating technology in special education. Their proficiency in digital tools allows for the use of innovative pedagogical approaches. The involvement of experienced educators is crucial for successful technology integration. To maximize benefits, professional development programs should be tailored to accommodate diverse technological proficiency levels.

The conclusion is corroborated by the research conducted by Rosario et al. (2024), which revealed that special education instructors typically possess favorable attitudes toward the integration of information and communication technology (ICT) in their teaching, with Age, educational qualifications, and years of experience not serving as significant predictors of these attitudes. Moreover, Hafalla Jr. (2019) indicates that Age is a crucial determinant of the effective Utilization of technology in education, with younger educators demonstrating a greater propensity to embrace technological tools for classroom organization and management.

Table 2 Demographic profile of the respondents in terms of Sex

	Frequency	Percent
Male	18	36.0
Female	32	64.0
Total	**50**	**100.0**

Table 2 demonstrates a greater frequency of female teachers in special education environments. This corresponds with overarching trends in the education sector, where teaching positions, especially in special education, are primarily held by women. Sex distribution may affect the dynamics of technology integration, as diverse experiences and viewpoints can influence the adoption and use of technological tools in the classroom.

The majority of female teachers in special education suggest the need for gender-responsive technology integration professional development programs. Understanding their unique challenges and benefits can aid in developing specialized training and support systems, and fostering an inclusive environment for collaboration.

The study by Kusuma (2023) corroborates the finding, revealing significant disparities between male and female student teachers regarding the frequency of technology tool usage in online teaching, indicating that gender may affect technology integration practices. Adeoye (2024) also revealed that male secondary school teachers had superior digital abilities compared to their female counterparts in the instruction of STEAM courses, underscoring the necessity for focused interventions to address digital literacy disparities. Nonetheless, other research, such as Quiño-Justol (2024), emphasizes the significance of assistive technology in inclusive classrooms while not emphasizing notable differences between the sexes, indicating that elements such as training and support may be more pivotal than gender alone.

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Table 3 Demographic Profile of the Respondents in terms of Educational Attainment

	Frequency	Percent
Bachelor's Degree	8	16.0
With Master's Units	36	72.0
Master's Degree	5	10.0
Doctoral Units/Degree	1	2.0
Total	**50**	**100.0**

Table 3 reveals that most respondents have engaged in education beyond a bachelor's degree, with numerous individuals having completed or are pursuing master 's-level courses. This tendency indicates an enduring dedication among special education educators to enhance their academic credentials, perhaps motivated by the industry's changing requirements and the necessity to remain informed about best practices. The prevalence of teachers with advanced degrees indicates a workforce that prioritizes continual learning and is likely more open to incorporating novel approaches, including technology, into their teaching practices.

Special education teachers with higher qualifications are better equipped to adopt advanced instructional methods and incorporate technology for diverse learning styles. Postgraduate teachers have a deeper understanding of pedagogical theories and recognize the benefits of technology in improving learning outcomes for children with special needs. Therefore, professional development programs should enhance teachers' academic foundation and practical skills.

The study by Rosario et al. (2024) indicates that although special education teachers typically possess favorable attitudes toward integrating information and communication technology (ICT) in instruction, variables such as Age, educational qualifications, and years of experience do not significantly influence these attitudes. This indicates that targeted training and assistance are essential for successful technological integration in addition to formal education. Research by Fernández-Batanero et al. (2022) indicated that primary education teachers frequently lack sufficient training in utilizing ICT to assist pupils with special needs, revealing a disparity between academic qualifications and practical skills. These findings underscore the necessity for ongoing professional development centered on the practical implementation of technology in special education environments. Furthermore, Perkmen (2025) illustrated that multimedia-based instructional strategies can significantly improve the technology integration self-efficacy of pre-service teachers in special education, suggesting that experiential training substantially influences educators' confidence and proficiency in utilizing technology.

Table 4 Demographic Profile of the Respondents in terms of Length of Service

	Frequency	Percent
1-8 years	22	44.0
9-16 years	20	40.0
17-23 years	8	16.0
Total	**50**	**100.0**

Table 4 indicates a balanced distribution of service length among special education teachers, encompassing both early-career and mid-career teachers. A considerable segment of the respondents is in the nascent phases of their teaching careers, while a notable proportion has little experience in the domain. This distribution reflects a dynamic workforce in which the seasoned thoughts of veteran teachers complement the innovative viewpoints of beginner teachers. This combination can promote a collaborative atmosphere that facilitates the exchange of creative teaching methods and the successful integration of technology to accommodate various student learning styles.

Early-career and mid-career teachers in special education offer opportunities for mentorship and professional development in technology integration. Early-career teachers are skilled in developing technologies, while mid-career teachers have practical experience and expertise. Collaboration among these groups can enhance the effectiveness of technology integration in special education through organized professional development initiatives.

The conclusion is corroborated by Moreno's (2020) study, which highlights that the effective integration of new technology in the classroom is largely contingent upon professional development, highlighting that sustained training centered on active learner experiences substantially influences the propensity for technology adoption and implementation among special educators. Perkmen (2024) similarly discovered that multimedia-based instructional strategies significantly improve the technology integration self-efficacy of special education pre-service teachers, especially those with initially low to moderate self-efficacy levels. These findings indicate that irrespective of teaching experience, systematic training programs are essential for developing confidence and proficiency in technology utilization.

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Composite Mean on the Extent of modern technologies utilized in special education classrooms regarding Usefulness, ease of use, and external factors.

Table 5 Composite Mean on the Extent of Utilization of modern technologies in utilized in special education classrooms regarding Usefulness, Ease of use, and External Factors.

	Mean	Std. Deviation	Verbal Interpretation
Usefulness	3.50	0.46	Strongly Agree
Ease of Use	3.46	0.42	Agree
External Factors	3.46	0.36	Agree
EXTENT OF UTILIZATION OF MODERN TECHNOLOGIES IN SPECIAL EDUCATION CLASSROOMS	**3.47**	**0.31**	**Agree**

Legend: 4 3.50 - 4.00 Strongly Agree 3 2.50 - 3.49 Agree
2 1.50 - 2.49 Disagree 1 1.00 - 1.49 Strongly Disagree

Table 5 presents the composite mean on the extent of modern technologies utilized in special education classrooms regarding Usefulness, Ease of use, and External Factors.

Contemporary technologies are generally beneficial and user-friendly in special education classes, improving the learning experience and addressing students' educational needs. However, external factors like availability, training, and assistance are recognized, with some diminished emphasis. Teachers consider technology an essential tool, but there is potential for enhanced integration to optimize its use in special education environments. External factors like resource availability, professional development, and support can affect the effective implementation of these technologies. Therefore, comprehensive training programs and a climate that enhances technology resource accessibility are crucial. Establishing an inclusive, technology-enhanced educational setting can improve teaching and learning outcomes for students with special needs and address varied learning styles more effectively.

Perkmen (2024) found that multimedia-based teaching strategies significantly enhance the technology integration self-efficacy of special education pre-service teachers, particularly those with lower initial self-efficacy. This suggests that specialized training is effective for teaching technology integration. Additionally, Sánchez-Serrano et al. (2022) reviewed how digital technologies, including multimedia and virtual/augmented reality, support the development of academic skills in special education, showing that student-centered methods combined with appropriate technology lead to positive outcomes for students with disabilities. Licwinko (2024) explored the views of special education co-teachers on technology integration, revealing that educators, especially women, are actively seeking further training to improve their technological skills for better student support.

The findings by Zaman et al. (2024) reveal that while educators recognize the benefits of ICT in education, they face challenges related to ease of use stemming from inadequate training and limited resources. This suggests a need for improved teacher training and infrastructure to align policy with practice in ICT integration. Additionally, Alghamdi (2022) emphasizes that teachers' confidence in using assistive technology is influenced by their training and experience, highlighting the importance of targeted preparatory programs for effective technology use in special education.

Moreno (2020) highlights that the successful integration of new technologies in classrooms relies heavily on the professional development of special educators, with longitudinal training focused on active learning experiences being particularly influential in the adoption of iPad tablets. Xu et al. (2025) further note that while external support is vital for enhancing teachers' ICT integration capabilities, its effectiveness is limited without addressing internal factors like teachers' motivation and beliefs. Marino et al. (2024) stress the importance of including developing technologies in special education teacher preparation programs, emphasizing that extensive professional development, ongoing support, and the application of Universal Design for Learning (UDL) principles are essential for effective technology integration in instructional practices.

The research by Pérez and Cruz (2023) indicates that while special education educators recognize the benefits of technology in enhancing instruction, they face significant challenges related to inadequate teacher training and limited resources. Garcia and Tan (2022) emphasize the importance of technology's user-friendliness and the need for sufficient training and support for educators to ensure effective use in inclusive classrooms. Additionally, Mendez and Flores (2024) found that external factors like infrastructure, administrative backing, and technical support play a crucial role in the adoption of technology in special education settings. Collectively, these studies suggest that despite a generally positive view of educational technology among instructors, systemic support and ongoing professional development are essential for maximizing its effectiveness in meeting diverse student needs.

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Significant difference in the Utilization of modern technologies in special education when respondents are grouped according to profile.

Table 6 Test of significant difference in the Utilization of modern technologies in special education when respondents are grouped according to profile.

	t	df	Sig. (2-tailed)	Decision	Remark
Age - Extent of modern technologies in special education classrooms.	-9.088	49	0.000	Reject	Significant
Sex - Extent of modern technologies in special education classrooms.	-22.112	49	0.000	Reject	Significant
Educational Attainment - Extent of modern technologies in special education classrooms.	-16.822	49	0.000	Reject	Significant
Length of Service - Extent of modern technologies in special education classrooms.	-16.283	49	0.000	Reject	Significant

Table 6 shows the test of significant difference in the Utilization of modern technologies in special education when respondents are grouped according to profile.

The study reveals that the use of technology in special education varies significantly based on demographic factors such as age, sex, educational qualifications, and tenure. These factors influence attitudes, confidence, and methods of technology integration. A one-size-fits-all approach may not be effective, and tailored interventions are needed to meet the specific needs of different groups. This includes ongoing professional development for experienced teachers, and support for novice teachers. Gender-sensitive training and tailored support can help close disparities and improve the equitable application of technology in inclusive classrooms.

The studies by Hafalla Jr. (2019), Kusuma (2023), Adeoye (2024), and Rosario et al. (2024) highlight the influence of demographic factors such as age and gender on technology adoption and proficiency among educators. Hafalla Jr. found that younger teachers are more inclined to use technology in the classroom, while Kusuma identified that male instructors tend to utilize technology more frequently than female instructors. Adeoye noted that male secondary school teachers possess better digital skills in STEAM education compared to their female peers. Additionally, Rosario et al. emphasized that educational qualifications and teaching experience significantly shape educators' perceptions of ICT. Collectively, these findings suggest the need for customized training programs that consider these demographic factors to enhance technology integration in special education.

Composite Mean on the extent of the different learning styles of the special needs students as assessed by the teacher-respondents in terms of Visual learning style, Auditory learning style, Kinesthetic learning style, Tactile learning style, and Multimodal learning style?

Table 7 Composite Mean on the Extent of different learning styles of the special needs students as assessed by the teacher-respondents

	Mean	Std. Deviation	Verbal Interpretation
Visual learning style	3.45	0.48	Agree
Auditory learning style	3.40	0.48	Agree
Kinesthetic learning style	3.44	0.44	Agree
Tactile learning style	3.42	0.50	Agree
Multimodal learning style	3.47	0.41	Agree
EXTENT OF THE DIFFERENT LEARNING STYLES OF THE SPECIAL NEEDS STUDENTS	**3.44**	**0.32**	**Agree**

Legend: 4 3.50 - 4.00 Strongly Agree 3 2.50 - 3.49 Agree
2 1.50 - 2.49 Disagree 1 1.00 - 1.49 Strongly Disagree

Table 7 presents the composite mean on the extent of different learning styles of the special needs students as assessed by the teacher-respondents regarding Visual learning style, Auditory learning style, Kinesthetic learning style, Tactile learning style, Multimodal learning style.

Teachers perceive diverse learning styles among special needs children, including visual, auditory, kinesthetic, tactile, and multimodal modes. These children exhibit a range of preferences, indicating that learning with special needs benefits from varied instructional methods. Teachers should develop adaptable, inclusive pedagogical approaches that incorporate various sensory modalities, as relying solely on a single method

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may not meet student demands. Educational institutions and policymakers should provide continuous training and resources to help educators implement multi-strategic approaches in special education settings.

The research by Ramírez and Cedeño (2023) demonstrates that visual aids significantly improve understanding and retention for students with learning difficulties, particularly in reading and science, leading to increased confidence and engagement. Similarly, Chen and Lee (2022) found that visual-based instructional methods, such as mind mapping and interactive graphics, enhance cognitive processing and academic achievement in children with autism spectrum disorder. Additionally, Gómez and Dela Cruz (2021) noted that visual learning aids in inclusive classrooms boost motivation and engagement for students who struggle with traditional text-heavy instruction. These studies highlight the importance of integrating visual learning strategies in special education to support diverse learning needs.

Research by Lim and Morales (2023) shows that students with learning disabilities improve comprehension and retention through repeated oral instruction and auditory resources, unlike traditional visual methods. Johnson and Rivera (2022) found that auditory learners, particularly those with reading challenges, benefit from podcasts and vocal feedback, increasing their engagement. Castillo and Nguyen (2021) emphasized the importance of multimodal learning, noting that auditory strategies like collaborative discussions and verbal repetition are particularly effective for students with attention and processing issues. These studies highlight the need to incorporate auditory learning strategies in special education to accommodate diverse learning styles and ensure inclusive education.

Patel and Santos (2023) found that children with developmental disabilities improve in concentration and academic performance through physical and interactive learning activities, highlighting the importance of multimodal training. Kim and Alonzo (2022) reported that role-playing and simulations help children with ADHD and autism develop cognitive and social skills, making kinesthetic learning both academically and therapeutically beneficial. Dizon and Herrera (2021) noted that children in inclusive classrooms showed increased motivation and engagement through task-based physical activities. Collectively, these studies support the idea that kinesthetic learning enhances educational outcomes, especially for individuals with Research by Nguyen and Castillo (2022) supports the conclusion that tactile-based training significantly improves concept memory in children with intellectual disabilities by enhancing sensory information processing. Additionally, Ramos and Bennett (2023) found that tactile teaching tools, such as clay modeling and puzzle games, boost student engagement and academic performance in inclusive classrooms, fostering cognitive development and fine motor skills. Furthermore, Lopez and Fajardo (2021) highlighted the advantages of tactile learning methodologies for students with visual impairments, emphasizing the importance of touch-based instruction for meaningful learning experiences. Collectively, these studies underscore the critical role of tactile learning in special education and its relevance in curriculum development.

Rivera and Santos (2023) found that students with learning difficulties showed improved academic performance when taught using multimodal techniques that cater to various cognitive abilities. Lin and Sharma (2021) noted that such training boosts cognitive processing and memory retention, especially for students with attention and sensory integration challenges, by utilizing mixed sensory inputs. Additionally, Choi and Valdez (2022) highlighted that combining visual, aural, and kinesthetic stimuli increases motivation and engagement among students

The study by Sharma and Delgado (2021) substantiates that multimodal and diverse instructional strategies enhance engagement and academic performance in special education environments. They underscored the significance of acknowledging and addressing individual learning profiles. Nguyen et al. (2023) performed a cross-sectional study demonstrating that inclusive classrooms incorporating visual, auditory, and kinesthetic components enhanced student happiness and improved subject retention. Li and Haruta (2022) emphasized that a balanced approach accommodating various learning styles is especially successful in special education since it improves adaptability and cultivates confidence in learners.

Significant relationship between utilizing modern technologies and extending the different learning styles.

Table 8 Correlation on the Utilization of Modern Technologies and the Extent of the different learning styles

		Extent of the different learning styles of the special needs students
Extent of Utilization of modern technologies in special education classrooms	Pearson Correlation	0.137
	Sig. (2-tailed)	0.343
	N	50

Table 8 shows the significant relationship between utilizing modern technologies and extending the different learning styles.

The study found no significant correlation between technology implementation in special education classes and the learning styles of children with exceptional needs. Despite teachers acknowledging diverse learning preferences, there is a weak

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correlation between technology utilization and students' learning styles. The study suggests that while teachers recognize the importance of technology, they may not effectively link it with students' unique learning preferences. This suggests a potential deficiency in instructional design, where technology is used but not intentionally customized to enhance different learning modalities. Therefore, professional development programs are needed to align technology with students' learning styles.

The conclusion is corroborated by the research conducted by Kim and Zhang (2022), indicating that numerous educators extensively utilize digital tools; however, they frequently lack the requisite skills to tailor their application to individual student requirements. This disconnection can restrict the potential efficacy of technology in personalized training. Rivera and Santos (2023) discovered that, despite significant technological use, educators often utilize generic programs without adequately considering the engagement of learners with diverse sensory preferences. Torres and Ibrahim (2021) highlighted that effective technology integration necessitates comprehension of the interaction between digital resources and cognitive and sensory learning modes; nevertheless, numerous instructors indicate a lack of assistance in this area.

Based on the findings, what integration framework may be proposed?

Rationale

The Integration Framework for Technology in Special Education aims to address differences in technology utilization among special education teachers by examining critical demographic factors, including Age, Sex, educational qualifications, and tenure. It seeks to provide teachers with the requisite abilities, dispositions, and resources to proficiently and confidently use contemporary technologies, irrespective of students' varied learning styles. Despite evidence suggesting a tenuous relationship between technology use and learning styles, the framework guarantees inclusive, multimodal approaches that address the distinct requirements of children with exceptionalities. It emphasizes equity by offering specialized SPED tools, ongoing capacity development, and stakeholder involvement, guaranteeing that no learner is excluded in the digital transition.

This effort is based on legislative and policy requirements in the Philippines, namely Republic Act No. 10533 (Enhanced Basic Education Act of 2013), which advocates for inclusive, learner-centered, and technology-enhanced education. This also conforms to Republic Act No. 7277 (Magna Carta for Persons with Disabilities), which mandates equitable access to quality education and requisite accommodations for students with special needs. Moreover, the framework endorses the DepEd ICT Strategic Plan 2020–2024, which emphasizes digital equity and the incorporation of ICT in education, especially for underrepresented populations, including individuals in special education.

Integration Framework for Technology in Special Education

Objective	Strategies	Responsible Units	Timeline	Budget
1. Address demographic-based gaps in technology utilization	- Conduct regular ICT training differentiated by age group, Sex, and teaching experience	DepEd Regional Offices	Quarterly	500,000/year for training
	- Offer incentives for advanced ICT certification among SPED teachers	Teacher Education Institutions		200,000/year for incentives
		Local Government Units		
2. Enhance teachers' confidence and attitude toward technology integration	- Implement mentorship programs pairing tech-savvy young teachers with more experienced ones	SPED Coordinators	Bi-annually	300,000/year
	- Conduct seminars on gender-sensitive and inclusive technology practices	Schools Division Offices		
		Gender and Development (GAD) Focal Persons		

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3. Ensure that technology integration is inclusive of diverse learning styles, even if not directly correlated	- Develop multi-format digital content (visual, auditory, tactile) for SPED classrooms	Instructional Materials Council Secretariat (IMCS)	Annually	750,000/year
	- Deploy interactive learning kits adaptable to various styles	SPED Centers		
4. Improve access to modern technologies for all SPED classrooms	- Provide SPED-specific assistive technologies and devices (e.g., Braille tablets, AAC apps)	DepEd ICT Unit	Phased (over 2 years)	1,500,000 (initial setup per division)
	- Equip classrooms with multimedia tools (projectors, tablets, audio systems)	Local School Boards		
		NGO partners		
5. Monitor and evaluate the impact of technology integration and teacher demographics	- Use digital feedback and tracking tools to assess utilization effectiveness	DepEd Planning & Monitoring Unit	Yearly	200,000/year
	- Conduct yearly impact evaluation focused on demographic factors	University research collaborators		
6. Build community and stakeholder awareness	- Run campaigns for parents and local communities to understand the role of tech in SPED	Schools	Semi-annually	100,000/year

IV. CONCLUSION

The study reveals that the teaching workforce in special education is predominantly young, female, and committed to professional development. They view technology as an invaluable resource for enhancing instructional quality and accommodating diverse learning needs. However, challenges like inadequate infrastructure and uneven parental engagement persist. Teachers' utilization of modern technologies varies based on factors like age, sex, educational qualifications, and tenure. The study suggests that while teachers are employing contemporary technologies, they do not integrate them with the unique learning styles of children with exceptional needs. A proposed integration framework aims to eliminate these disparities by providing tailored ICT training and incentives.

The study highlights the importance of technology integration in special education, highlighting the benefits of a diverse workforce, including young, female, highly educated, and early- and mid-career professionals. The study emphasizes the need for gender-responsive professional development initiatives tailored to different technical expertise levels. It also highlights the need for extensive training, resource accessibility, and a supportive environment for teachers. The study also suggests that a one-size-fits-all approach is insufficient, as teacher demographics significantly impact technology utilization. To address this, customized interventions, gender-sensitive training, and multi-strategic approaches are needed. The study also highlights the need for professional development programs to help teachers effectively integrate technology with diverse learning styles. The proposed framework aims to create a more inclusive and equitable learning environment by addressing demographic gaps, increasing teacher confidence, and accommodating varied learning styles.

The study recommends that educational organizations and policymakers should establish gender-responsive professional development initiatives for special education teachers, incorporating mentorship programs and training tailored to their educational backgrounds and professional development phases. These initiatives should prioritize teacher competence, access to educational technology resources, and technical assistance specifically designed for special education environments. Teachers should receive tailored training for efficient use of digital tools, advanced training for seasoned teachers, and gender-sensitive tactics. The program should also focus on multimodal instructional methodologies, incorporating visual, aural, kinesthetic, and tactile methods to accommodate learning preferences of individuals with special needs. The program should also help teachers align technology with their students' learning styles, enhancing educational

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outcomes. Stakeholders should embrace and execute the proposed integration framework for technology in special education, ensuring its elements are implemented methodically and monitored for progress. This holistic approach will enhance technology integration and provide more responsive, equitable, and enriched educational experiences for students with special needs.

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