

# Exploring Assistive Technology Integration in Special Needs Education Classrooms in Selected Schools of Iligan City Division: Teachers' Implementation, Perceptions, Challenges, Institutional Support, and Impact of Learners

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## ABSTRACT:

The study investigated the use of assistive technology (AT) in Special Needs Education (SNED) classes, focusing on teachers' practices, perspectives, challenges, coping strategies, institutional support, learner outcomes, ethical considerations, and future directions. The study employed a qualitative research approach to solicit in-depth comments from ten (10) SNED teachers. Using thematic analysis, the data were analyzed, yielding eight themes: individualized and adaptive use of assistive technology; positive perceptions; challenges in integration; institutional support and professional development; impact on student learning and engagement; coping strategies and adaptation; concerns and ethical considerations; and recommendations and future directions. Results demonstrated that teachers utilized assistive technology in highly personalized, learner-centered ways that corresponded with students' Individualized Education Programs (IEPs), abilities, and unique learning needs. We used both low- and high-tech tools, including visual timetables, communication boards, tablets, multimedia programs, and adaptable gadgets. Assistive technology makes learning more accessible, engaging, and inclusive, which teachers say boosts student involvement, communication, independence, and academic performance. However, the study revealed major problems: limited access to devices, poor internet connectivity, large class sizes, heavy workloads, and a lack of specialized training in assistive technology. Institutional support was patchy, and professional development programs were generally generalist and not AT-specific. Teachers worked together, improvised, altered their lessons, and used low-cost or offline materials to get around these limits. There were also ethical

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issues, especially around pupils' dependence on technology, the combination of digital and traditional teaching, and the promotion of appropriate use. Participants called for increased funding, better infrastructure, continuing and targeted training, and equal access to assistive technologies. They also envisioned future classrooms powered by next-generation digital technologies and fully integrated assistive learning environments. Overall, the study finds that the use of assistive technology in SNED settings, as part of individualized, well-supported practices, has a very positive impact on learning and engagement.

**Keywords:** assistive technology, special needs education, inclusive education, teacher practices, learner engagement, qualitative research.

## 1. Introduction

Education was a powerful force for equality, social inclusion, and sustainable development worldwide. The United Nations' Sustainable Development Goal 4 (SDG 4) called upon all governments to ensure inclusive, equitable, and high-quality education to promote lifelong learning opportunities for every individual (United Nations, 2015). This pledge highlighted the importance of education for all learners, including those with impairments. In recent years, the global integration of assistive technology (AT) has been acknowledged as one of the most successful strategies to make education more inclusive. AT encompassed a variety of technologies, from communication devices and speech-to-text software to Braille displays and hearing aids, that enabled students with impairments to overcome learning hurdles. The use of assistive technology in global perspectives to support learners with special needs is universally hailed as a game-changer. WHO and UNICEF's Global Report on Assistive Technology (2022) found that over 2.5 billion people worldwide need at least one assistive device, yet access to AT remains extremely limited, especially in low- and middle-income countries. Moreover, Zheng et al. (2022) found that although schools acknowledged the relevance of AT, its implementation in classrooms was often delayed by hurdles, including insufficient training, limited financial support, and insufficient institutional support.

Therefore, although there is a global demand for inclusive education, the effective application of AT remains an issue that needs to be continuously discussed and contextualized locally.

The Philippine government has made a significant leap in promoting inclusive education programs. The enactment of RA 11650 reinforced the nation's commitment to offering equal educational opportunities to all learners. And DepEd Order No. 72 in 2009 has also encouraged local initiatives for inclusion in education. "However, despite these positive policy improvements, there remains a wide gap between policy and reality. Research shows that many public schools still struggle with poor infrastructure, limited resources, and insufficient teacher training to effectively use assistive technologies, despite policies aimed at inclusiveness (Campado, Toquero, and Ulanday, 2023).

Recent research in the Philippines demonstrates that the utilization of AT in special needs education remains somewhat limited. The AT in selected special needs education (SNED) classrooms was largely low-tech, including multimedia presentations and modest adaptive devices (Campado et al., 2023). Teachers' perceptions of AT were positive, and they noted motivational benefits for children. However, teachers also faced other barriers, including resource constraints, technical issues, and insufficient training. These shortcomings align

with Reyes (2023), who noted ongoing hurdles in SNED programs across the country, particularly poor infrastructure, limited budgets, and a lack of teacher competence in integrating assistive technology effectively.

According to Retiro et al. (2025), during their research in Cebu, they found that instructors had positive views of the AT, but actual use was inconsistent and of poor quality, and teachers were aware of how AT could enhance learning outcomes. It typically lacked the institutional support and technical expertise needed to apply these tools successfully. This discrepancy between favorable perception and low usage suggested that the Philippine educational system had structural problems, especially when it comes to children with impairments. This gap needs to be overcome if the government is to fulfill its objectives of inclusive and equitable education.

Moving on to the municipal level, the heavily urbanized city of Iligan in Northern Mindanao faced particular difficulties in implementing inclusive education. Numerous public and private schools in the city provided SNED programs. However, anecdotal accounts, school inspections, and needs assessments suggested that these classrooms still had limited access to assistive technology. While other schools lacked the infrastructure or technical support for AT use, some also had limited resources, such as speech aids or Braille materials. Teachers sometimes faced obstacles when implementing technology due to a lack of administrative support and training opportunities. These issues resulted in varied educational experiences for students with special needs, potentially impeding their social and academic growth.

Adding assistive technology to schools may also have been difficult due to a lack of support from administrators and stakeholders. Many local schools struggled to buy or repair AT devices due to tight budgets. Sometimes, teachers had to use makeshift or cheap solutions that might not have met all of their students' needs. DepEd's policies on inclusive education were implemented nationwide, but how they were put into practice in each locality depended on available resources and stakeholder participation. Because of this, it

was very important to examine how these national policies affected classrooms in the Philippines, especially in Iligan City, where efforts to include everyone in education were still evolving.

So, the point of this study was to find out how the AT merger is going in local SNED programs right now. It looked into which assistive tools were being used, how they were used in the classroom, the problems teachers were having, and the support systems in place. By examining these aspects, the study sought data-driven insights to inform more effective inclusive education strategies in Iligan City and other parts of the country.

This study was conducted for various important reasons. First, it provided empirical data on the current state of AT integration in SNED classes in Iligan City, an area that has received little or no scholarly attention in the local context. Second, it contributed to improving policies by identifying the gaps between national requirements and local implementation. Third, it enabled schools and teachers to identify where they required most capacity-building and resources. Ultimately, the outcomes of this study could inform local education stakeholders in designing sustainable programs to effectively help both teachers and learners use assistive technology.

As a whole, the study on the integration of assistive technology in SNED classrooms in Iligan City was not just an intellectual exercise but a practical move toward the realization of the concept of inclusive education. With global, national, and local concerns converging, the need to bridge the gap between policy and classroom practice became critical. This study provides stakeholders with a more complete picture of the existing status of AT integration, the challenges that impede its effective usage, and the potential for development. Thus, our study has contributed to the realization of equal access to excellent education for all learners, regardless of ability, in line with the national inclusive education framework and the global Sustainable Development Goals.

## Statement of the Problem

### The Central Question

The core question guiding this phenomenological study was: How do teachers implement and perceive assistive technology integration in special needs education classrooms in selected schools of the Iligan City Division, especially in terms of challenges, institutional support, and its effect on learners?

### Corollary Questions:

In this understanding, the researcher was guided by the following corollary questions:

1. How did teachers implement assistive technology to support learners with special needs in their classrooms?
2. What were the perceptions of teachers regarding the use of assistive technology in special needs education settings?
3. What challenges did teachers and schools face in integrating assistive technology into special needs education?
4. What forms of institutional support and professional development were available to teachers for the effective use of assistive technology?
5. How did the integration of assistive technology influence the learning experiences and engagement of students with special needs?
6. What recommendations can be made to enhance the integration and sustainability of assistive technology in special needs education classrooms?

### Significance of the Study

**Learners with Special Needs.** Indirectly, the study benefited learners by advocating for greater access to assistive technologies to improve their learning experience, independence, and academic outcomes.

**Teachers.** Educators benefited from shared experiences and practices in the use of assistive technology. The study helps uncover effective solutions and common barriers, enabling teachers to adopt more flexible, inclusive, and innovative teaching methods.

**Parents.** The study increased parents' awareness of the potential benefits of assistive technology for their children's education. It enabled them to be proactive in advocating for and supporting their children's educational needs within the education system.

**School Administrators.** The results helped administrators identify their schools' infrastructure and training needs. This insight informed decisions on allocating funds and acquiring appropriate assistive tools and support systems for teachers and learners.

**DepEd Officials.** The research provided data-driven insights into the current status of assistive technology adoption and identified challenges and opportunities. This guided the creation of more inclusive policies, the distribution of resources, and strategic planning for learners with special needs.

**Teacher-Training Institutions.** The results were used to revise or expand curriculum elements in special education and technology integration to better prepare pre-service teachers to work in inclusive classrooms.

**Future Researchers.** This study provided a contextual background for future research in special education and technology integration. It revealed gaps and developing themes that could guide future investigations, especially in local or comparably resourced settings.

## Brief Review of Relevant Literature

### Implementation of Assistive Technology

The introduction of AT in the Philippine educational system has attracted much interest in recent years, especially in the context of inclusive education. Campado, Toquero, and Ulanday (2023) noted that, in this context, the successful implementation of AT among learners with special educational needs is highly contingent on teacher readiness and resource availability. Their research shows that despite the widespread use of interactive multimedia and traditional assistive technologies in Philippine classrooms, numerous challenges still prevent their successful implementation, including a lack of high-tech equipment, technical issues, and differences in

student participation. Supporting these conclusions, Manuel (2025) noted that planned instructional preparation and specific teacher training are critical to increasing the impact of AT tools, such as audiobooks, speech-to-text software, and FM systems, on student learning outcomes.

The regional backdrop of the study was provided by Kurnia et al. (2025), who explored the use of AI-augmented assistive devices in schools in the Philippines, Malaysia, and Indonesia. They discovered that while these technologies have the potential to enable personalized learning, the lack of infrastructure and teacher training often holds back their use in Philippine schools. This is consistent with other local work that highlights that access to technology does not ensure successful integration, but that success depends on supporting policies and strong professional development.

Meanwhile, international studies provide further insights that help contextualize the Philippine experience. For instance, Sánchez, Reyes-Rojas, and Alé-Silva (2024) highlighted the increasing role of digital and distance learning tools in supporting students with disabilities, particularly in remote or hybrid learning environments. Similarly, Bicen and Adedoyin (2023) analyzed global research trends on AT, identifying consistent benefits such as enhanced accessibility and improved learning outcomes, while also noting persistent gaps in teacher training and the assessment of long-term impacts. In addition, Heredia-Solórzano and Villafuerte-Holguín (2025) emphasized that the successful implementation of AT requires inclusive policies and the active engagement of students, educators, and parents—recommendations that are highly relevant to the Philippine educational landscape.

Theoretical viewpoints also guide local AT activities in valuable ways. Abu-Alghayth and Arishi (2023) argue that frameworks such as the Technology Acceptance Model and the Technological Pedagogical Content Knowledge model can facilitate effective integration by providing teachers with a structured approach to

adopting technology. Similarly, Ayub, Shoaib, and Amjad (2024) emphasized that empowering students with intellectual impairments requires the meticulous selection of devices that meet their personal needs, along with ongoing observation and support. This idea is parallel to the learner-centered AT program in the Philippines.

Additionally, the use of customized assistive technology has been found to increase inclusion for kids with diverse needs. López et al. (2024) examined the use of orientation and mobility tools for visually impaired learners to promote independence and active engagement in the classroom. These insights add to local experiences in which educators are increasingly finding AT solutions for kids with hearing, cognitive, or motor impairments, and underscore the need for context-sensitive techniques for meaningful learning.

The synthesis of local and international literature indicates that the effectiveness of AT implementation is greatest when guided by a mix of technical readiness, teacher competency, policy support, and active stakeholder participation. Despite technical advances, limitations such as insufficient resources, poor professional development, and low awareness remain persistent, especially in underdeveloped nations such as the Philippines. Therefore, overcoming these hurdles is crucial to convert the availability of assistive resources into real learning benefits, underscoring the importance of context-specific approaches to support inclusive education for all learners.

### **Assistive Technology**

The use of assistive technology (AT) is critical to enable people with disabilities to live more independent and meaningful lives. It involves an array of gadgets, equipment, or product systems, whether acquired, altered, or custom-made, that function along with related support services to enhance their utility (Arkansas School-Based Related Services, 2025; TechTarget, 2025). But combined, these tools and this support, from identifying needs to choosing appropriate technologies and providing training, create a

powerful combination that shows the important role AT can play in helping individuals become more independent, capable, and engaged in everyday life. Investment in AT is a game-changer for persons with disabilities and their full participation in society and a better quality of life.

AT can involve low-tech tools such as pencil grips and visual aids to high-tech tools such as speech-to-text software, Augmentative and Alternative Communication (AAC) devices, and interactive digital resources (European School Education Platform, 2024) in educational settings. The objective is to enable students with disabilities to access learning resources and develop functional skills to meaningfully participate in classroom activities. Over the last decade, AT has evolved from simple functional gadgets to a wide range of tools for learners of diverse ages, abilities, and cultural backgrounds, indicating its growing acceptance as a cornerstone of inclusive education (Zallio et al., 2022).

To better understand its uses, assistive technology (AT) is frequently classified into three levels: low-tech, mid-tech, and high-tech. Low-tech AT includes basic, inexpensive, non-digital tools (e.g., slant boards, visual timetables, colored overlays, Velcro attachments) that are particularly useful for early intervention or resource-limited schools. Mid-tech AT uses electrical components to increase functionality. These include digital audio recorders, calculators with speech output, audiobook devices, customized keyboards, and predictive text software, which support learners with literacy or communication difficulties. Advanced, computer-based solutions such as speech recognition software, screen readers like JAWS or NVDA, AAC systems like Proloquo2Go, gaze-controlled devices, and intelligent wheelchairs are part of high-tech AT. These high-level resources increase communication, independence, and educational opportunities for kids with more serious physical or intellectual disabilities and are continually refined through breakthroughs in artificial intelligence and adaptive technology.

Considering AT benefits outside of schooling, e.g., mobility and physical freedom. Research at Tulane University found that AT can provide early inclusion and encourage developmental growth from an early age, where students constructed lightweight mobility chairs for toddlers with disabilities, according to AP News (2023). However, AT can only reach its full potential in educational settings once it is coupled with continual teacher training and the provision of accessible infrastructure so that every student has the opportunity to benefit from these game-changing resources.

### **Teacher Perspectives on Assistive Technology Implementation**

In the last five years, research on teachers' opinions on the application of AT in inclusive and special education settings has been a growing area of investigation. In the Philippine setting, teachers are typically aware of AT's potential to improve learning outcomes for students with disabilities, as identified by Campado, Toquero, and Ulanday (2023). However, despite their hopes, individuals often face challenges, including limited access to devices, insufficient training, and ongoing technical difficulties. Quiño-Justol (2024) also found that Filipino educators recognize the social and academic benefits of AT but call for greater institutional support and professional development programs to ensure successful implementation. Retiro et al. (2025) found a strong correlation between higher levels of student involvement and teachers' positive views of AT, highlighting the importance of teachers' readiness in transforming technology availability into meaningful learning opportunities.

International research supports these local findings. For example, Aldehami (2022) found that, on average, special education teachers in Saudi Arabia have good opinions toward the use of assistive technology (AT) for students with intellectual disabilities. But they face hurdles, including a lack of experience and technological assistance. According to Masoud (2025), in Jordan, teachers' intention to use AT in the classroom for students with hearing impairments

depends on the availability of training and the perceived usefulness of the tools. Similarly, Tulepova et al. (2022) found that competency-based training programs for pre-service special education in Kazakhstan significantly boost teachers' self-efficacy and readiness to effectively apply AT. These findings were corroborated by Abu-Alghayth and Arishi (2023), who indicated that clear policy frameworks and theoretical models, such as the Technology Acceptance Model, provide instructors with a structured support system to overcome barriers and successfully integrate AT into education.

Overall, research in both global and local contexts indicates that teachers recognize the benefits of AT for learning and inclusion, but successful implementation depends on a mix of factors, including professional development, the availability of suitable resources, institutional support, and wider policy support. These findings underscore the importance of teacher readiness and positive attitudes in achieving the educational purpose of assistive technologies and offer useful insights into inclusive education in the Philippines and abroad.

## 2. Methodology

### Methodology

This chapter presented the methods and procedures employed in the study on the integration of assistive technology in special needs education classrooms in selected schools of the Iligan City Division, particularly the teachers' implementation, perceptions, challenges, institutional support, and impact on learners. The researcher then used the study's results to develop a framework.

### Research Design

The phenomenological qualitative research design, namely Interpretative Phenomenological Analysis (IPA), was used in this study to explore the lived experiences of SNED teachers regarding the integration of assistive technology in special needs classrooms in selected schools in the Iligan City Division. The focus was on teachers' implementation, attitudes, obstacles, institutional support, and their impact on

learners. The approach used was appropriate, as it sought to explore how instructors saw, interpreted, and made sense of their personal and professional experiences with assistive technologies to serve learners with special needs. Interpretative Phenomenological Analysis was particularly noteworthy for allowing the researcher to explore in depth how participants made sense of their experiences. This allowed the researcher to discover the meanings that were embedded in their stories. In-depth interviews were conducted to obtain rich, thorough accounts of these experiences, providing insights into the realities, obstacles, coping methods, and support systems associated with the use of assistive technology in public schools in the Iligan City Division.

The qualitative data were analyzed according to Colaizzi's Seven-Step Method. Colaizzi's Seven-Step Method includes the following steps: (1) becoming familiar with the data gathered, (2) identifying the significant statements, (3) formulating meanings, (4) clustering themes, (5) developing a comprehensive description, (6) producing the fundamental structure, and (7) seeking verification from the participants. The rigorous method offered a comprehensive and detailed understanding of the contextual and experiential dimensions of assistive technology (AT) integration from the perspective of individuals directly involved.

### Data Generation

The purposive sampling technique was used to pick ten (10) out of twenty (20) Special Needs Education (SNED) instructors in the public schools of the Division of Iligan City. Using the technique, it was determined that the participants had relevant experience and knowledge. The criteria used for selection were: (a) active participation in SNED programs, (b) a minimum of one year of teaching experience, and (c) expertise in the use of assistive technology in the classroom. This strategy enabled the researcher to gain valuable insights from teachers who were directly involved in the use of assistive technology in inclusive education settings.

A qualitative phenomenological approach was used, specifically through one-on-one interviews. The data collection tools were included in the researcher-made questionnaire, which was validated and reliability tested by three experts. Qualitative data underwent analysis using phenomenological reduction in transcendental phenomenology.

The dissertation proposal was approved by the University of Perpetual Help System-Dalta before commencement. A letter of recommendation was issued to the Schools Division Superintendent, and the heads of schools were informed. The University of Perpetual Help-Dalta Ethics Board granted clearance. Participants were presented with consent forms, and confidentiality and anonymity were assured through the use of aliases. Participation was voluntary, non-incentivized, and guaranteed to be respectful and safe during the study.

Interviews used interview guidelines. Interviews were conducted in person or online, depending on availability and accessibility. All sessions were audio-recorded (with participants' consent) and subsequently transcribed verbatim for analysis. The participants were informed about the verification process, so they could clarify their statements. Data were appropriately analyzed and prepared in accordance with the study goals.

### **Selection of Co-participants**

The study involved co-participants, who contributed additional perspectives on the incorporation of assistive technology in SNED classes to the main participants. School administrators, special education coordinators, or support personnel who had worked closely with SNED instructors and learners with disabilities also participated. The co-volunteers were similarly selected using purposive sampling strategies, designed to capture participants with direct experience and/or knowledge relevant to the study. Their opinions provided a more thorough insight into the issues, techniques, and practices involved in implementing assistive technology within the local public school system.

The number of participants was guided by data saturation, that is, when data collection ceased, and no new themes or insights emerged. Empirical research indicates that saturation for homogeneous groups is generally reached after 9–17 interviews (Guest et al., 2021). Saturation was continuously monitored during data collection to ensure sufficient depth and diversity of responses, particularly within each stakeholder group, as recommended by Hennink and Kaiser (2022) and Saunders et al. (2024).

### **Thematic Reflection**

This study evaluated the implementation, attitudes, obstacles, institutional support, and impact on learners of the integration of assistive technology in special needs education classrooms of selected schools in Iligan City Division. The views of SNED teachers revealed numerous major themes that mirrored the realities of implementing inclusive education. The first is access and availability of assistive technology. Schools differed in resources and infrastructure, which influenced the consistency and efficacy of AT use. Second, teacher readiness and training were identified as important, as many teachers struggle to successfully integrate AT owing to a lack of professional development opportunities. Third, administrative and stakeholder support were key drivers of the adoption and durability of AT practices, underscoring the need for greater institutional support. Finally, the findings on student involvement and learning outcomes showed that AT, when appropriately deployed, improved participation, independence, and overall learning experiences for learners with impairments. These all pointed to the fact that successful integration of assistive technology required more than simply the provision of tools; it also required continual training, mutual support, and adaptive ways to meet students' diverse needs. It revealed how resources, education, and the school context worked in tandem to promote inclusion.

### **Literature Comparison**

Picture a classroom where every learner, regardless of ability, can fully participate and flourish. Assistive technology (AT) has become

an increasingly powerful tool for promoting inclusive education and is a strong support for this objective. First, AT gives students with disabilities access to learning, the opportunity to develop functional skills, and the chance to connect meaningfully with their peers. As per Campado et al. (2023) and Manuel (2025), the successful adoption of AT in the Philippines requires teachers' readiness to use it, the availability of resources, and careful lesson organization. Audiobooks, speech-to-text software, and interactive multimedia are the most popular tools. But there are limitations, such as insufficient high-tech equipment, technological problems and sporadic student engagement. Kurnia et al. (2025) suggest that AI-powered AT could provide tailored learning experiences; however, local schools frequently face infrastructure constraints and a shortage of qualified instructors.

These findings are supported by international studies. Although AT improves accessibility, learning outcomes, and student independence, issues remain with teacher training, policy support, and long-term evaluation according to Bicen and Adedoyin (2023), Sánchez et al. (2024), and Heredia-Solórzano and Villafuerte-Holguín (2025). So, teachers are aided by models such as the TAM and TPACK to effectively integrate AT into their classrooms (Abu-Alghayth & Arishi, 2023).

In addition, learner-centered strategies emphasize the careful selection of devices and the continuous monitoring of their use, as noted by Ayub et al. (2024). There are many tools that can foster student independence, participation, and engagement. They include low-tech tools such as pencil grips and visual timetables; mid-tech tools such as digital recorders and predictive text software; and high-tech solutions such as screen readers and gaze-controlled systems (Zallio & Ohashi, 2022; European School Education Platform, 2024).

In general, the local and global literature is aligned on one important principle: AT works best when combined with the right level of technology preparedness, teacher competence,

inclusive policies, and active participation of students, educators, and parents. However, challenges such as limited resources, restricted professional development, and poor awareness continue to hinder progress, especially in developing nations. Thus, initiatives need to be context-specific to ensure that AT is not only available but also leads to significant educational outcomes.

Research continually demonstrates that, despite the revolutionary impact of Assistive Technology (AT), a major challenge is teacher preparation. Research in Saudi Arabia, Canada, and the Philippines shows that many teachers are not prepared to select, implement, or evaluate AT because they have not experienced it during their pre-service training and do not have enough professional development (Al-Azawei et al., 2022; Lamond & Cunningham, 2020; Campado, Toquero, & Ulanday, 2023). However, teacher attitudes, such as perceived usefulness and self-confidence, are important for the adoption of AT (Ontario-certified teachers study, 2022; Abu-Alghayth, 2020).

Resource constraints intensify these issues. Expensive technology equipment is sometimes not used to its full capacity due to high costs, the need for technology upgrades (O'Sullivan et al., 2021), and unequal funding, especially in rural or public schools (Zallio & Ohashi, 2022). Finally, the lack of administrative support, ambiguous policies, and poor communication among teachers, therapists, and IT personnel underscore the need for structured frameworks, such as SETT and UDL, to guide the implementation of assistive technology, as noted by Zabala (2020) and the Ministry of Education (2023).

Studies have shown that institutional support plays a substantial role in educational attainment. Alsolami (2022), Montgomery (2022), Babia et al. (2022), and Manuel (2025) found that schools that have provided ongoing training, mentorship, technical assistance, and administrative guidance have demonstrated improvements in teacher confidence, consistent use of assistive technology (AT), and increased student engagement. This is an important connection,

since Zallio and Ohashi (2022) stress that even the most innovative technology may not be utilized to their full potential without sufficient systemic support.

Importantly, student outcomes are a true measure of the AT advantages. Results indicate enhancements in academic achievement, independence, involvement, and socio-emotional growth (Khasawneh, 2024; Al-Dokhny et al., 2022; Loveys & Butler, 2023). Low-tech and high-tech devices can both promote involvement and autonomy when carefully matched to student requirements and supported by trained educators (Alnahdi, 2020; Flanagan & Bouck, 2020). Emerging AI and AR capabilities also bring the potential for even more individualized learning; however, accessibility, usability, and teacher preparedness continue to present obstacles (Special Olympics & TIME, 2024; Zahoor & Ahmad, 2021).

In conclusion, there is a significant body of data indicating that AT success is not based solely on technology but also on human and systemic factors. Teachers' competence, institutional support, professional development, teamwork, and student-centered planning are the keys to the successful implementation of AT. Hence, concerted investment in these areas is required to ensure that AT translates educational opportunities into meaningful and inclusive learning experiences for all students.

### **Ethical Considerations**

This study was conducted to determine the implementation, perception, obstacles, support, and impact of assistive technology integration on learners by teachers in special education classrooms in selected schools in Iligan City Division. Following certain ethical guidelines throughout the research process is closely adhered to.

Participants were properly informed about the study, the procedures, the prospective advantages, and the general overview of the investigation. Participants' voluntary involvement was assured through their signature on a written informed consent form prior to data collection. The informed consent process

emphasized the participants' right to refuse to participate, to withdraw from the study at any time without penalty, and to ask questions about the research.

Participants were also guaranteed that their personal information would remain confidential and anonymous. All data were anonymized in reports and publications to safeguard their identities. Throughout the study, we emphasized the rights, dignity, and well-being of all participants and, in this respect, participation did not cause any discomfort or harm.

The research proposal was submitted to the relevant Institutional Review Board (IRB) or ethics committee for approval, ensuring that ethical requirements were met. The research was also undertaken in a manner that honored cultural sensitivities and aligned with the community's and schools' norms and values. The data management protocols were closely followed, including secure storage of data, limited access to the research team, and appropriate disposal or long-term storage in compliance with the institutional rules upon completion of the study. The integrity, respect, and safety of all stakeholders involved in the research were ensured by adhering to these ethical principles.

### **3. Results**

Data were gathered through individual interviews of ten (10) SNED teachers in the Division of Iligan City. Participants were selected through purposive sampling, according to precise inclusion criteria based on their relevant experience and knowledge related to the study. This study analyzed the qualitative data using Colaizzi's seven-step procedure as used in the study by Montecino and Bernaldez (2025). It is a well-established strategy in phenomenological research. This required collecting noteworthy remarks from the interview transcripts, generating meanings, organizing the meanings into themes, and developing an extensive description and core structure that conveyed the essence of the participants' shared experiences. This procedure provided insights into how assistive technology was implemented in special

needs education classrooms in selected schools in the Division of Iligan City.

### **Thematic Presentation of Findings**

Using Colaizzi's phenomenological technique as a guide, an examination of interview transcripts of 10 Special Needs Education (SNED) instructors yielded several significant themes that summarized their real experiences integrating assistive technology into SNED lessons. These topics give a comprehensive and nuanced examination of how assistive technology is practiced, illustrating both common and different views. In the next subsections, each theme is outlined, together with important statements from the participants and their interpretations. Participant identities are utilized where appropriate to protect anonymity and to show the diversity and range of perspectives.

The themes are structured around these essential areas:

1. Personalized and Adaptive Utilization of Assistive Technology
2. Favorable Views on Assistive Technology
3. Difficulties with Integration
4. Institutional Backing and Professional Growth
5. Effects on Student Learning and Involvement
6. Adaptation and Coping Strategies
7. Ethical Considerations and Concerns
8. Suggestions and Paths Ahead

Each of these themes was explored thoroughly in the following subsections, complete with direct quotes from the participants and reflective analysis. This thematic structure, which reflects the essence of participants' lived experiences, is essential to developing practical, inclusive strategies for the effective integration of assistive technology in SNED classrooms.

### **SOP #1. Practices in the Implementation of Assistive Technology**

#### **Theme 1: Individualized and Adaptive Use of Assistive Technology**

The results show that educators adopt highly personalized and adaptive strategies to implement assistive technology, all based on learners' Individualized Education Programs, strengths, and specific learning needs. Participants consistently emphasized that AT selection is not standardized but tailored to each learner. For example, P1 remarked, "I select the technology according to each student's learning needs, abilities, and IEP goals," and P8 echoed this by stating, "I align each tool with the student's specific needs to guarantee participation." Furthermore, P7, P9, and P10 emphasized the importance of low-tech tools, such as visual schedules and communication boards, whereas P1, P3, and P6 included high-tech options, such as tablets and multimedia applications.

In addition to using technology, teachers said they adjusted their instruction. P1 clarified, "I adapt by simplifying instructions and giving step-by-step directions." This shows that assistive technology is woven into differentiated instruction rather than used in isolation.

This theme highlights that the best outcomes from assistive technology occur when it is used in conjunction with learner-centered pedagogy. Teachers take on the role of facilitators, adjusting both their teaching methods and tools to guarantee accessibility and participation. The latest research confirms that tailored assistive technology can greatly improve learner engagement, communication, and academic success when it matches learner profiles and instructional objectives (Al-Azawei et al., 2022; World Bank, 2022). In the same vein, UNESCO (2021) points out that for inclusive education to work, we need flexible teaching systems that can adapt to the diversity of learners.

Moreover, new empirical findings support the effectiveness of personalized assistive technology in improving outcomes in inclusive classrooms. For example, research by Okolo and

Bouck (2021) shows that personalized assistive technology interventions can significantly enhance academic performance and task completion among learners with disabilities, especially when integrated into differentiated instruction. In the same vein, Edyburn (2021) points out that the effectiveness of assistive technology depends on how well it meets the learner's needs, rather than the sophistication of the tool, underscoring the necessity of personalized selection.

Hassan et al. (2022) also found that teachers believed that changing their teaching methods with assistive technology led to greater learner engagement and reduced learning challenges, particularly in special education settings. Zilz et al. (2023) similarly emphasize the importance of using learner-centered assistive technology to enhance students' autonomy, communication skills, and classroom engagement, regardless of their diverse learning needs.

Spooner et al. (2020) identified that specific instructional strategies and assistive technology tools can be improved to enhance knowledge and retention, especially for students with cognitive and developmental challenges. This idea is reinforced by recent studies by Khan et al. (2024), who found that assistive technology supports individualized instruction, encouraging inclusion and minimizing instructional gaps in classrooms with diverse students.

Together, these studies highlight the significance of the best AT, which is personalized, flexible to instruction, and readily integrated into learner-centered teaching approaches that accommodate the diversity of learners in education.

## **SOP #2. Teachers' Perceptions of Assistive Technology Use**

### **Theme 2: Positive Perceptions of Assistive Technology**

Based on these tailored implementation techniques, the debate then examines teachers' opinions of assistive technology use in inclusive classrooms. The results indicate that teachers' attitudes towards assistive technology are highly positive. They see assistive technology as

stimulating, effective, and needed to serve diverse learners. All participants reported that assistive technology enhances educational delivery and student engagement. For example, P1 stated: "I feel very motivated using assistive technology as it enhances my teaching and enables me to meet the individual learning needs of each student," and P2 said: "I feel very happy using assistive technology as it helps me to support my students' learning and engagement more effectively." Similarly, P3 said, "I have a very positive perception of assistive technology as it helps to create a more inclusive learning environment."

Such opinions are also corroborated by P4, who initially voiced uncertainty but then acknowledged its efficacy by expressing, "I was hesitant at first, but now I see it is an interactive and effective learning tool. P5 and P6 also mentioned that AT enhances motivation and instructional efficacy, whereas P7, P8, P9, and P10 consistently stressed improved student participation and independence.

These results align with OECD (2021), which found that teacher beliefs are a determinant of technology uptake. Similarly, good teacher attitudes are identified as essential predictors of successful integration by Ertmer and Ottenbreit-Leftwich (2020). The recent confirmations by Ndlovu and Lawrence (2022) and Alkahtani (2023) further suggest that teachers' positive perception of assistive technology is a key factor for its consistent and effective usage in inclusive classrooms.

## **SOP #3. Barriers to Assistive Technology Integration**

### **Theme 3: Challenges in Integration**

Positive attitudes towards AT have been reported; however, its practical use in the classroom is limited by several ongoing barriers. Some of these are restricted equipment, inconsistent internet connectivity, intense workload, and insufficient training. P1 said, "We have limited devices and slow internet access." P2 said, "Unstable internet often disrupts lessons." "We don't have enough gadgets for all learners," P3 added.

P4 also pointed to the "lack of training and resistance from colleagues and parents" as influencing implementation. P5 and P6 highlighted the importance of individualized support, which is rarely promoted in large courses. P7 and P8 highlighted the deficiencies of low-tech resources.

Such obstacles are indicative of systemic issues, as documented by the World Bank (2022), which found that infrastructural limitations constitute a critical barrier to the integration of educational technology in underdeveloped countries. Trust and Whalen (2020) similarly observe that connection and resource restrictions hinder effective adoption.

The lack of ICT infrastructure hinders inclusive education (Mafa & Kriel, 2021). On the other hand, Chukwuemeka et al. (2023) found that workload and large class sizes are limiting factors for teachers' effective use of assistive technology. Singh and Hassan (2024) also stressed that poor technical support is detrimental to the sustainability of assistive technology use.

#### **SOP #4. Support Systems and Professional Development for Assistive Technology**

##### **Theme 4: Institutional Support and Professional Development**

The findings also demonstrate the role of institutional support and professional development in the successful integration of assistive technology in relation to the obstacles addressed.

Results indicate some institutional support for assistive technology (AT), though it is weak and inconsistent. The participants repeatedly stressed that the professional development opportunities available through their institutions are generally aimed at inclusive education rather than the practical implementation of assistive technology in classrooms in Special Needs Education (SNED).

For instance, P1 expressly stated, "I have not yet attended training that is specifically focused on assistive technology." This was indicative of a lack of targeted capacity-building opportunities.

P4 also said, "Trainings were not specifically focused on assistive technology," confirming the view that the current seminars do not sufficiently address AT deployment at the classroom level. Supporting this, P2 added "seminars were somewhat helpful but not enough for actual classroom application," and P3 pointed out "more hands-on training sessions on how to use new assistive tools effectively." Together, these replies show that teachers are exposed to inclusive education concepts but are not sufficiently trained in the practical and pedagogical aspects of assistive device use.

The gap has important implications for teaching strategies, as assistive technology requires both technical expertise and the ability to successfully embed these tools into training. Without adequate training, teachers may struggle to achieve the full benefits of AT, leading to inconsistent application and limited classroom use.

This finding is consistent with UNESCO (2021), which states that inclusive education systems require continuous, targeted, and practical professional development that directly supports teachers in implementing assistive and inclusive strategies. Darling-Hammond et al. (2020) likewise argue that quality teacher learning results from ongoing, hands-on professional development that includes modeling, coaching, feedback, and continued practice, rather than isolated or theoretical workshops.

These findings are consistent with recent studies showing that many instructors feel ill-equipped to use assistive technology effectively in their classrooms, particularly in schools with limited resources (Howard et al., 2022). Making this problem worse is the fact that Blackwell and Martinez (2023) suggest that existing professional development programs are focused on theoretical or abstract principles rather than actual, hands-on application. This disparity between training content and the real-world issues teachers face, such as inadequate infrastructure, diverse student needs, and time constraints, weakens their competency and confidence in using AT. This suggests that even

in places where technologies are available, their potential is not fully realized. This points to the need for more context-sensitive, practice-oriented training that equips educators with concrete skills and provides continued support.

According to Rivera et al. (2024), continuous mentoring, instructional coaching, and collaborative professional learning communities are long-term support systems that outperform one-time training sessions in increasing teachers' use of assistive technology. Teachers are more likely to improve their skills over time, exchange successful ideas with colleagues, and receive timely, contextual feedback that directly affects their classroom practices when the school has ongoing support systems in place. This active, collaborative approach not only improves technical skills but also builds educators' confidence in adapting assistive technology to a wide range of learning needs. Special education is a crucial area for continued support, since individualizing instruction and adapting to student diversity are critical to maximizing the benefits of assistive technology.

Overall, the data imply that, despite institutional attempts to assist teachers, these efforts are lacking in depth, frequency, and specialization. Strengthening professional development through persistent, practical, and mentorship-based training is the best way to bridge the gap between policy purpose and effective classroom implementation.

## **SOP #5. Influence of Assistive Technology on Student Learning and Engagement**

### **Theme 5: Impact on Student Learning and Engagement**

The findings underscore the importance of institutional support and teacher readiness for further analysis of how assistive technology directly affects student learning and engagement outcomes. The results showed that all the participants agreed that assistive technology greatly promotes students' participation, communication, independence, and academic success. Teachers consistently reported that learners showed improved motivation, attentiveness, and involvement when assistive

technologies were included in class. This suggests that AT plays an important role in enhancing access to learning and eliminating educational obstacles.

For example, P1 said, "Students are more focused, more engaged, and participative while using assistive technology," demonstrating an immediate improvement in attention and class participation. Besides increasing engagement, AT also increases learners' self-efficacy. As pointed out by P5, "It boosts students' confidence and participation." P6 further reinforced this observation, stating, "When learners use talking pens and tablets, learners are more attentive and motivated," highlighting how interactive tools can keep learners engaged and focused throughout sessions.

Participants also reported gains in academic performance and functioning abilities. P2 stated, "One student excelled in reading comprehension with graphic organizers." This shows the need for structured visual assistance for literacy development. "Students can complete tasks independently with the help of visual schedules," P7 pointed out. Assistive aids, therefore, promote independence and decrease reliance on instructor support. P8, P9, and P10 also reported continuous improvements in communication, task completion, and independence for learners using low-tech resources such as communication boards, image cards, and modified writing materials.

Overall, these results imply that assistive technology is not just a tool for education, but also a transformational instrument that improves academic and socio-emotional development. Low-tech and high-tech assistive aids play a major role in learner involvement, especially for those with communication, cognitive, and movement problems.

These findings are consistent with UNICEF (2022), which argues that assistive technology enhances participation, inclusion, and independence for learners with disabilities by reducing obstacles to learning and communication. Likewise, Okolo and Bouck (2021) noted that the use of assistive technology

might dramatically improve academic performance, particularly in reading and writing, for children with impairments.

This is also supported by recent investigations. Assistive technology helps learners with impairments complete tasks, promote literacy, and access academia, according to Bouck et al. (2022). Edyburn (2022) highlights that assistive technology fosters learner autonomy by enabling students to engage in academic activities with minimal teacher intervention, thereby supporting independence and self-regulated learning. Sharma and Das (2023) further stress that assistive technology improves communication and social engagement, especially for learners with speech and language impairments, resulting in greater meaningful involvement in inclusive classroom environments.

In general, research and the supporting literature suggest that assistive technology has a strong positive impact on academic and behavioral results. The effect extends beyond cognitive skills to include confidence, independence, communication, and social involvement, supporting this role as a key element in inclusive education.

#### **SOP #6. Recommendations for Enhancing Assistive Technology Integration and Sustainability**

##### **Theme 6: Coping Strategies and Adaptation**

In response to the documented learning implications, instructors employ a variety of adaptation tactics and coping behaviors to maintain the use of assistive technology in classroom instruction. These findings further highlight instructors' responses to these restraints through adaptive tactics that continue to facilitate the adoption of AT in SNED classrooms. Participants displayed resilience and instructional flexibility, actively modifying their teaching techniques, cooperating with stakeholders, and making the most of available resources, rather than being passive recipients of structural impediments.

For example, P1 said, "I plan lessons carefully and ask for support from parents", which is a

combination of proactive preparation and home-school cooperation to improve learning support. "I have colleagues that I work with and use low-cost or offline tools," stated P2, in a similar adaptive reaction. This highlights the importance of peer support and resource substitution in overcoming challenges to assistive technology access. In this adaptive sense, P3 referred to instructional responsiveness, "I change teaching methods according to how students are doing," which illustrates continual assessment and adaptive teaching judgments. Similarly, P7 presented a practical issue of implementation, mentioning the use of "low-tech, cost-effective tools because of limited resources from the schools". P9 and P10 emphasized improvisation and peer learning as important strategies for maintaining educational continuity under restrictions.

Together, these testimonies demonstrate that coping mechanisms are ingrained in regular teaching practice, not just reactive responses to obstacles. Instead, they are a continuous process of adaptation in which instructors consciously adjust lessons, use suitable low-cost technologies, and collaborate to maintain inclusive learning environments. The findings suggest that successful implementation of assistive technology depends not just on resources, but also on teacher agency and flexibility.

These findings align with the OECD (2021), which emphasizes teacher flexibility as a key aspect of the effective implementation of inclusive education, especially in resource-limited settings. Similarly, Koehler and Mishra (2021) state that seamless technology integration involves continuous harmonization of pedagogy, subject knowledge, and technical understanding by employing the TPACK framework to adapt to the ever-changing classroom environment.

Recent research supports this viewpoint. According to Tondeur et al. (2021), teacher cooperation is essential for enhancing technology integration, as it enables collaborative problem-solving and the sharing of individual talents. Teachers in low-resource contexts are

also known to improvise and use readily available materials to continue education (Yusuf & Adeyemi, 2023). Kumar and Singh (2024) also emphasize the need for adaptable teaching practices to ensure continuity and inclusivity across a variety of classroom settings.

Overall, the findings show that coping techniques and adaptability serve as a vital link between institutional limits and good classroom practice, allowing instructors to continue using assistive technology despite contextual constraints.

#### 4. Discussion

##### Exhaustive Description

The cross-theme synthesis of findings portrays assistive technology (AT) in special needs education (SNED) as a complex, interdependent, and evolving educational phenomenon mediated by the interplay of pedagogical practices, institutional structures, teacher beliefs, learner needs, ethical considerations, and future-oriented aspirations. AT is not an educational tool in itself, but an integrated system within inclusive education, the effectiveness of which is dependent on a variety of contextual and human elements being aligned.

The key finding is the strong evidence that teacher agency and instructional adaptation are the key enablers of effective AT integration. The data consistently indicated that AT is not used in a standardized way but is carefully adapted to individual learner profiles. This is clear in the statements of P1, "I choose the technology based on each student's learning needs, abilities, and IEP goals," and P8's similar emphasis, "I match each tool to the student's specific needs to ensure participation." These comments show a strong commitment to tailored instruction and to the ideals of inclusive education. Teachers are not just consumers of technology but creators of learning experiences who choose, adapt, and integrate resources to meet the needs of varied learners. This one-on-one method is part of a larger trend in education towards more personalized teaching, with education tailored to the individual rather than a one-size-fits-all approach.

Closely related to this tailored practice is the development of positive teacher views, which serve as a reinforcing mechanism for the continuous use of AT. Teachers reported motivation, contentment, and perceived efficacy of employing assistive aids. "I feel very motivated using assistive technology because it improves my teaching" (P1). This helps me to facilitate my students' learning more effectively" (P2). These impressions are significant inasmuch as they determine the readiness to adopt AT and the originality and consistency of its execution. Favorable perceptions establish a virtuous cycle: favorable experiences with AT boost teachers' confidence, which promotes more consistent and innovative use. This dynamic shows that the successful implementation is as much a result of emotional and cognitive acceptance of the technology as it is a function of the technical availability.

However, institutional and systemic impediments severely hamper the incorporation of AT, creating a continuous tension in the findings. Teachers consistently noted obstacles, including a lack of equipment, unreliable internet, and large class sizes. P2 said the unstable internet often disrupts sessions, and P3 said they do not have enough gadgets for all learners. These limits reflect a fundamental disjuncture between the reality of infrastructure and the goals of training. Even the most dedicated instructors are challenged to fully utilize AT without the necessary resources. This systemic problem results in uneven education delivery and limited equitable access. It also increases the effort for teachers who must continually modify their lessons to the changing availability of technology. The data indicate that AT efficacy is not just a function of teacher competence but is highly dependent on systemic readiness and resource availability.

Teachers show significant levels of professional resilience and adaptive coping techniques under these constraints. This includes working with peers, using low-cost or offline resources, simplifying lessons, and improvisation. For example, P2 said, "I work with colleagues, and I use low-cost or offline tools," and P7 said, "I use

low-tech, cost-effective tools because of a lack of resources". P1 also included strategic planning: "I plan lessons carefully and ask for help from parents." Such adaptive tactics demonstrate how teachers are actively filling systemic gaps through innovation and resourcefulness. They are not giving up AT use due to restrictions, but are adapting implementation tactics to preserve inclusion. This suggests a strong level of professional commitment, consistent with the idea of adaptive competence in teaching, in which teachers modify their instruction in real time to contextual constraints.

There is a significant deficiency in institutional support and professional development for adaptive efforts, particularly in Assistive Technology (AT). Teachers said training opportunities are generally too generic and not specifically related to assistive technology. For example, one teacher noted, "We have not had training specifically on assistive technology," and another stated, "I have not yet attended any training that focused on assistive technology. The lack of focused professional development hinders teachers' capacity to make good use of available resources and erodes their confidence in working with advanced technologies. Many teachers use experiential learning techniques, trial-and-error, and peer collaboration. But the dearth of formal, hands-on training in assistive technology is a systemic issue in capacity building: professional development that does not align with classroom realities and educators' technical needs.

Although the limitations are real, studies consistently indicate that AT has a significant positive impact on student learning outcomes and engagement. Teachers reported improved attention, motivation, communication, independence, and academic success. P1 commented that, "Students are more engaged, focused, and participative when using assistive technology," and P6 observed that learners become "more attentive and motivated when using talking pens and tablets." P7 also explained that "students can work on tasks independently with visual schedules." These findings show that AT enables learners with impairments to access,

engage, and exercise autonomy. It removes barriers to communication and cognition, enabling students to interact more meaningfully with the instructional content. Notably, AT also promotes socio-emotional development, boosting confidence and participation in class, and establishing a more inclusive learning environment.

But in addition to these beneficial results, the study raises ethical and pedagogical issues connected to overdependence and developmental equilibrium. Teachers were concerned about relying too much on technology. P4 reported that "Students may become over-reliant on technology," and P5 expressed concern about the potential impact on the development of core skills. These points show that while assistive technology (AT) could significantly improve access to learning, inappropriate or excessive use could inadvertently limit the development of independent cognitive skills. Therefore, the teachers support the balanced use of technology and traditional teaching methods to promote students' overall development. Additionally, responsible governance highlights the importance of data privacy and the ethical use of information in digital learning environments. This suggests a changing role for teachers as ethical gatekeepers of technology in the classroom, responsible not only for implementation but also for its responsible, equitable, and pedagogically sound use.

Finally, the findings converge into forward-looking recommendations and future objectives focusing on sustainability, equity, and innovation. Teachers are powerful advocates for additional funding, improved infrastructure, and ongoing training. P1 said, "We need more access to tools and regular training," while P7 suggested "1:1 access to tablets for learners". P3's goal of "AI-powered tools and smart classrooms" indicates a readiness to integrate new technologies that may further improve personalization and access. These ideas indicate a shared understanding that sustained integration of AT is not the outcome of piecemeal initiatives but the result of systemic change through

legislative reform, institutional investment, and technological innovation. Teachers see a future in which AT is an integral part of inclusive education systems, with a solid infrastructure, well-trained staff, and equal access for all learners.

Overall, the cross-theme synthesis shows that the integration of assistive technology in SNED is a multi-layered ecosystem defined by the dynamic interaction of human, institutional, and technological elements. Teachers are the primary adaptive implementers and reflective

practitioners. However, teachers' effectiveness is mediated by structural constraints and institutional support systems. Students experience significant benefits in engagement, independence, and learning outcomes, but ethical considerations require careful balancing of technology use. In conclusion, the study reveals that the use of sustainable and effective AT integration involves alignment across several domains: pedagogy, infrastructure, policy, ethics, and innovation, and working in concert to develop inclusive, egalitarian, and future-ready educational settings.

**Table 1 Coded Thematic Analysis: Assistive Technology in SNED Classrooms**

| Theme                                                             | Significant Statements                                                                                                                                                                                                                               | Codes                                                                                             | Formulated Meanings                                                                                                                                                                    | Participants                    |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <b>1. Individualized and Adaptive Use of Assistive Technology</b> | "I choose the technology based on each student's learning needs, abilities, and IEP goals."; "I match each tool to the student's specific needs to ensure participation."; "I adapt by simplifying instructions and giving step-by-step directions." | IEP-based selection; differentiated instruction; learner-centered adaptation; multimodal teaching | Assistive technology is implemented through individualized instructional design where tools and strategies are tailored to learner profiles to ensure accessibility and participation. | P1, P2, P3, P6, P7, P8, P9, P10 |
| <b>2. Positive Perceptions of Assistive Technology</b>            | "I feel very motivated using assistive technology because it enhances my teaching."; "It helps me support my students' learning more effectively."; "It creates a more inclusive learning environment."                                              | Motivation; instructional effectiveness; inclusivity; positive attitude toward AT                 | Teachers perceive assistive technology as beneficial, motivating, and essential for inclusive and effective instruction, strengthening adoption and use.                               | P1, P2, P3, P4, P6              |
| <b>3. Challenges in Integration</b>                               | "Unstable internet often disrupts lessons."; "We have limited devices and slow internet access."; "We do not have enough gadgets for all learners."                                                                                                  | Limited devices; unstable connectivity; workload; large class size;                               | Structural and institutional limitations hinder consistent and effective implementation of assistive                                                                                   | P1, P2, P3, P4, P6, P7          |

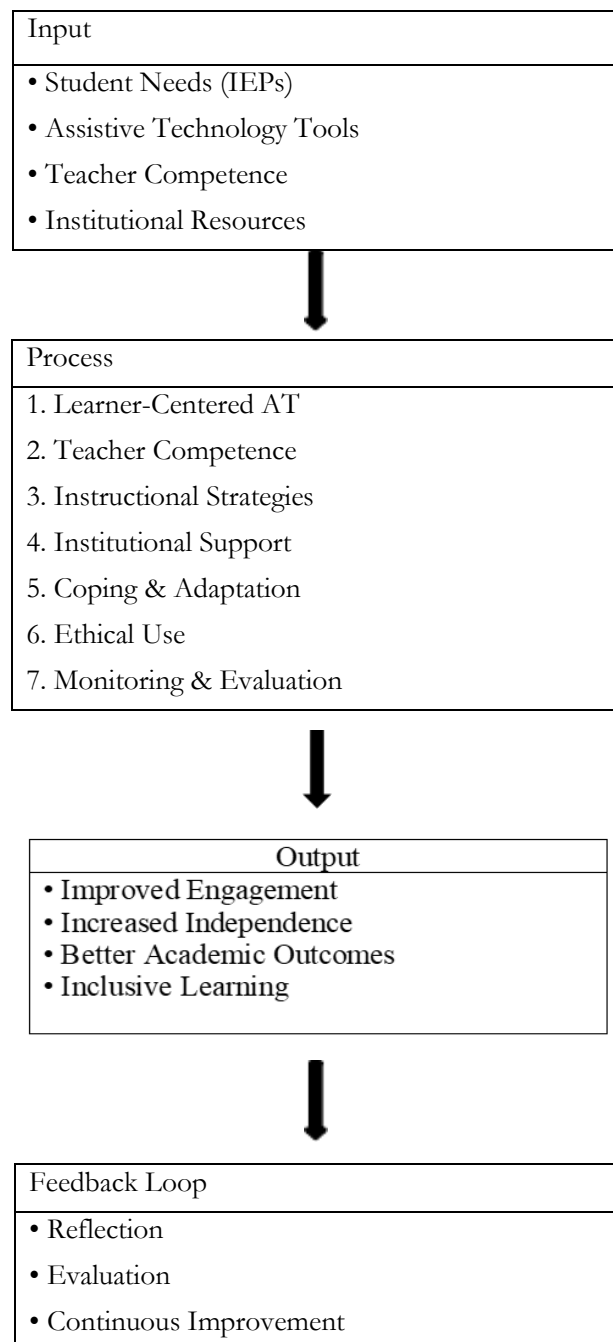
|                                                              |                                                                                                                                                                                                                      |                                                                                                   |                                                                                                                                                          |                                         |
|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
|                                                              |                                                                                                                                                                                                                      | insufficient training                                                                             | technology in classrooms.                                                                                                                                |                                         |
| <b>4. Institutional Support and Professional Development</b> | “Trainings were not specifically focused on assistive technology.”; “I have not yet attended training specifically on AT.”; “We receive some workshops but they are general.”                                        | Insufficient AT training; general PD programs; limited technical support; funding support         | Institutional support exists but is inadequate and not specialized, limiting teacher competency in assistive technology integration.                     | P1, P2, P3, P4, P5, P6, P7, P8          |
| <b>5. Impact on Student Learning and Engagement</b>          | “Students are more engaged, focused, and participative when using AT.”; “One student improved in reading comprehension through graphic organizers.”; “Students complete tasks independently using visual schedules.” | Increased engagement; improved comprehension; independence; motivation; communication improvement | Assistive technology enhances students’ academic performance, independence, communication, and engagement in learning activities.                        | P1, P2, P5, P6, P7, P8, P9, P10         |
| <b>6. Coping Strategies and Adaptation</b>                   | “I collaborate with colleagues and use low-cost tools.”; “I plan lessons carefully and seek support from parents.”; “I adjust teaching strategies based on student progress.”                                        | Collaboration; improvisation; low-cost tools; adaptive teaching; parental involvement             | Teachers demonstrate resilience by adapting instruction and using alternative resources to sustain assistive technology integration despite constraints. | P1, P2, P3, P7, P9, P10                 |
| <b>7. Concerns and Ethical Considerations</b>                | “Students may become over-reliant on technology.”; “It may affect foundational skill development.”; “We need to balance technology with traditional instruction.”                                                    | Overdependence; skill loss; ethical balance; data privacy concerns                                | Teachers express concerns about overuse of AT, emphasizing the need for balanced, ethical, and responsible implementation.                               | P1, P4, P5, P7, P8, P9, P10             |
| <b>8. Recommendations and Future Directions</b>              | “We need more access to tools and regular training.”; “1:1 tablet access for learners.”; “AI-powered tools and                                                                                                       | Funding improvement; infrastructure development; 1:1 device access; AI                            | Teachers recommend systemic improvements, including funding, training,                                                                                   | P1, P2, P3, P4, P5, P6, P7, P8, P9, P10 |

|  |                                  |                             |                                                                         |  |
|--|----------------------------------|-----------------------------|-------------------------------------------------------------------------|--|
|  | smart classrooms in the future.” | integration; policy support | infrastructure, and future adoption of AI-based assistive technologies. |  |
|--|----------------------------------|-----------------------------|-------------------------------------------------------------------------|--|

### Output of the Study

A.C.C.E.S.S. (Adaptive and Collaborative Classroom Engagement through Supportive Systems) Framework for Assistive Technology

Integration in SNED Classroom



The A.C.C.E.S.S. (Adaptive and Collaborative Classroom Engagement through Supportive Systems) Framework for Assistive Technology Integration in SNED Classroom is a comprehensive, practice-based model that helps teachers, schools, and stakeholders systematically use assistive technology (AT) to support learners with special needs. At its heart, the framework acknowledges that successful AT integration is not just about providing devices, but about matching technology to learners' unique requirements. This starts with a heavy emphasis on learner-centered approaches, in which AT materials are purposefully selected based on each student's Individualized Education Program (IEP), skills, and learning styles. This approach supports greater independence, engagement, and authentic participation, enabling students to access learning in ways that align with their abilities.

The framework gives equal importance to teacher competency and attitude. Teachers are seen as a crucial driver of successful AT integration, and their receptiveness to novel methods has a substantial impact on outcomes. The framework emphasizes the importance of reflective teaching, continuing professional growth, and capacity-building. Teachers are better able to adjust instruction, address obstacles, and maximize the benefits of assistive aids in the classroom when they have the necessary knowledge and skills and a positive, open attitude toward technology.

The framework also highlights the value of excellent teaching methodologies and implementation. It promotes the use of high and low-tech assistive aids in everyday teaching activities, with diversified and inclusive strategies. Instead of being an add-on, AT is integrated into lesson delivery to support comprehension, communication, and skill development. This helps make technology a natural and meaningful part of the learning process, enabling students to meet their academic and developmental goals.

Another key element is the institutional support framework that recognizes that sustained

integration of AT is not only the responsibility of individual teachers. Schools need sufficient resources, finances, infrastructure, and technical assistance to ensure that teachers and students can use assistive technologies effectively. Collaboration is another area of emphasis, including participation of administrators, parents, specialists, and the community in planning and implementation. This collaborative approach shows a conducive environment for inclusive practices to flourish.

The framework recognizes the realities of the classroom context and includes coping and adaptation mechanisms that allow teachers to be resourceful and flexible. It promotes the adoption of innovative tactics, including generating low-cost or improvised AT materials, managing time effectively, and sharing best practices with peers. Such flexibility allows teachers to overcome common challenges, such as scarce resources, large classes, and technical difficulties, enabling AT integration and success even in resource-poor contexts.

The framework also considers one of the major factors to be the ethical and responsible use of assistive technology. It emphasizes the need to protect student data privacy and confidentiality and warns against over-reliance on technology. Instead, AT should improve instruction and foster the development of critical abilities, combining technological support with independent learning.

Finally, the framework also includes ongoing monitoring and evaluation to assess the effectiveness of AT use. We urge teachers and school leaders to track student achievement, collect feedback, and use data to influence instructional decisions. There is a feedback loop that reinforces this, encouraging introspection and continuing progress. The framework guarantees that AT integration is flexible, evidence-based, and adapts to learners' changing requirements through ongoing evaluation of outcomes and refinement of procedures.

In summary, the Assistive Technology Integration Framework offers a holistic and dynamic approach to inclusive education. It links

inputs such as student needs, teacher capabilities, and institutional resources to planning, execution, and assessment processes, ultimately resulting in increased student engagement, independence, and academic success. Continuous feedback and collaboration throughout the framework create a sustainable system for advancing inclusive, equitable, and learner-centered education for students with exceptional needs.

## 5. Conclusion

1. Individualization is the key to successful AT integration. When we match tools to learners' talents and needs, we can promote meaningful involvement and improve academic and social outcomes.
2. Teachers' perceptions and motivation affect implementation: A consistent, creative, student-centered use of assistive technology (AT) that increases engagement and learning outcomes results when teachers have positive perceptions of AT.
3. The integration of AT demonstrates a holistic approach to learning: it goes beyond academic improvements by enhancing social interaction and

communication skills and fostering an inclusive classroom culture.

4. But there are still systemic and contextual barriers: limited school resources, technological constraints, and a lack of training prevent optimal integration, and teachers need to develop adaptive coping mechanisms.
5. Ethical and reflective practice is crucial: Educators need to find a balance between using technology and developing skills, ensuring that AT serves as a helper rather than a substitute for essential foundational learning experiences.
6. Institutional support for sustainability: Ongoing professional development, policy implementation, funding, and stakeholder coordination are important for the long-term, effective integration of AT.

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## Author Declaration

Confirm originality of work

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