ASSISTIVE TECHNOLOGIES AND THEIR ROLE IN BRIDGING THE GAP IN SPECIAL EDUCATION

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ABSTRACT: *Inclusive education remains a continuing challenge, particularly in developing contexts where limited resources, uneven teacher preparation, and restricted access to assistive technologies (AT) widen the learning gap for learners with disabilities. This study examined the availability, utilization, and perceived effectiveness of assistive technologies in Special Education (SPED) programs in selected public and private schools in the Negros Oriental Division, Philippines. Using a quantitative descriptive-correlational design, data were gathered from 100 respondents (SPED teachers, program supervisors, and school administrators) across 50 SPED centers (34 public; 16 private) through a validated researcher-made survey and a standardized inventory checklist. Descriptive statistics determined levels of AT availability and perceived effectiveness, while inferential tests (Spearman correlation, independent t-test, and one-way ANOVA) examined relationships and group differences. Results showed moderate availability of screen readers (M = 3.28) and speech-to-text tools (M = 3.04), and low to moderate availability of communication devices (M = 2.75). AT was rated effective in supporting academic performance, communication, and classroom participation, with private schools consistently reporting higher perceived effectiveness than public schools. Availability and utilization were significantly associated with academic performance (availability: $\rho = 0.482$, $p = 0.000$; utilization: $\rho = 0.531$, $p = 0.000$). Significant differences were also found by school type ($p = 0.004–0.012$), geographic location for availability/utilization ($p = 0.021–0.034$), and disability type served ($p = 0.002–0.014$). Findings underscore AT's role in improving learning outcomes while highlighting inequities that require targeted resource and capacity support.*

Keywords: assistive technology, inclusive education, special education, SPED centers

1. INTRODUCTION

Globally, inclusive education is still an issue as school systems find it difficult to accommodate the diverse needs of students with disabilities. Notwithstanding global pledges such as the United Nations' Sustainable Development Goal 4 to ensure inclusive and equitable quality education, numerous nations—especially developing countries—experience systemic problems in establishing successful special education programs. Locally in the Philippines, although policies like the Enhanced Basic Education Act and the Inclusive Education Bill ensure that everyone is provided access to education, effective implementation is obstructed by inadequate resources, poor teacher training, and limited access to assistive technologies. All these add to the growing gap between special needs students and other students in mainstream education.

While there have been some studies investigating the place of assistive technology in education, a clear deficit remains in research based in localized settings on the specific application of these tools in the Philippine special education environment. Most of what has been published focuses on Western practice and environments, and this leaves Filipino practitioners with few context-based data from which to derive policy and classroom practices. There is also no empirical evidence available on how assistive technologies can be practically and effectively incorporated into public and private education systems in the Philippines, especially in areas where there is limited access to technological infrastructure.

The researcher, as a college teacher in Special Education and an Education Program Supervisor in the Department of Education, has a singular advantage in being able to carry out this study. This dual responsibility offers direct exposure to the issues encountered by pre-service teachers and practicing teachers in the implementation of inclusive education. Having first-hand experience in policy implementation and teacher training, the researcher identifies the pressing need for evidence-based practice to guide educational policy and classroom interventions that are effective in incorporating assistive technologies.

This research is based on the aim to contribute to the evolution of a more inclusive learning space for Filipino students with disabilities. Through an exploration of the potential of assistive technologies to fill gaps in education, this research hopes to give educators, school administrators, and policy makers actionable recommendations. The results are hoped to inform the continued evolution of the special education system in the Philippines into a more responsive, equitable, and technology-based system.

Statement of the Problem

This study aims to determine the extent to which assistive technologies contribute to bridging the educational gap among learners with special needs in selected public and private schools in the Negros Oriental Division.

Specifically, it will seek to answer the following questions.

1. What is the level of availability of assistive technologies in special education programs in selected schools, as measured through a standardized inventory checklist?
   1.1. screen readers;
   1.2. speech-to-text software; and
   1.3. communication devices?
2. What is the perceived effectiveness of assistive technologies in special education program with regards to the following:
   2.1. enhancing students' academic performance;
   2.2. communication skills; and
   2.3. classroom participation?
3. Is there a significant relationship between the availability and utilization of assistive technologies and the academic performance of learners with special needs?

4. Are there significant differences in the availability, utilization, and perceived effectiveness of assistive technologies when grouped according to:
4.1. Type of school (public vs. private);
4.2. Geographic location (urban vs. rural); and
4.3. Type of disability served (visual, hearing, intellectual, autism spectrum)?

2. REVIEW OF RELATED LITERATURE

Assistive technologies and inclusive education

Assistive technologies (AT) are widely recognized as enabling tools that reduce participation barriers for learners with disabilities and support inclusive education goals. Global guidance emphasizes that inclusive systems require not only policy commitments, but also accessible learning environments, appropriate supports, and equitable resourcing to ensure meaningful participation and learning outcomes for all learners [1; 2]. Similarly, international evidence highlights persistent gaps in access to assistive products, particularly in low- and middle-income settings, reinforcing the need for coordinated financing, service delivery, and capacity building [3; 4].

Classroom integration of AT in the Philippine context

Localized research in the Philippines shows that teachers generally view AT as beneficial for reinforcing learning and motivation among learners with special educational needs, but implementation is constrained by limited resources, learner behavior challenges, technical issues, and insufficient training and institutional support [5]. These findings align with broader international discussions that successful AT integration depends on sustained school-level support structures and teacher competence—not merely the presence of devices [6].

Availability, access disparities, and implementation constraints

Access disparities remain a central issue: global evidence indicates that many people who need assistive products do not have them, and the gap is often most severe in resource-constrained contexts [3]. In education systems, uneven distribution of AT across schools can translate into unequal learning opportunities for learners with disabilities [2]. Empirical work also points to the need to examine AT availability and service adequacy within local SPED centers, including how services are delivered and reviewed over time [7].

Teacher preparedness and professional capacity

Teacher knowledge and training are repeatedly identified as critical determinants of effective AT use. Literature in special education technology stresses that the field needs stronger evidence-based implementation and support models to move beyond fragmented adoption toward meaningful learning impact [6]; [8]. Related scholarship also notes that AT outcomes improve when tools are selected and implemented based on learner needs and classroom contexts, supported by systematic planning and monitoring [9].

AT and student outcomes (learning, communication, participation)

Research consistently reports positive associations between AT and academic or functional outcomes when the tools match learner needs and are used consistently. In particular, AT supports literacy and learning access for learners with learning disabilities [10] and strengthens communication participation through augmentative and alternative communication (AAC) systems when implemented with appropriate design and instructional support [11]. These strands of evidence justify empirical assessment of AT availability, utilization, and perceived effectiveness, and support investigating whether access and use are associated with learners' academic performance within SPED programs.

3. SIGNIFICANCE OF THE STUDY

Learners with Special Needs. They will directly benefit from improved access to appropriate assistive technologies that enhance their learning, communication, and participation in inclusive classrooms.

Special Education Teachers. Findings will help educators identify effective assistive tools and strategies, allowing for more tailored and impactful teaching approaches.

School Administrators. The study provides data-driven insights that can inform decisions on budgeting, procurement, and integration of assistive technologies in school programs.

Parents and Guardians. They will gain a better understanding of the value and use of assistive technologies, empowering them to support their children more effectively at home and in school.

Department of Education (DepEd). Results may guide policy development, training programs, and resource allocation to strengthen inclusive education practices nationwide.

Researchers and Academics. This study will contribute to the limited body of local literature on assistive technology in the Philippine context, serving as a reference for future studies.

4. METHODOLOGY

Research Design. This research utilized a quantitative descriptive-correlational design. The descriptive approach was employed to identify levels of availability, use, and perceived efficacy of assistive technologies in representative Special Education (SPED) programs. It also presented contextual indicators including the nature of the school (public or private), geographic location (urban or rural), and types of disabilities catered to. The correlational component investigated correlations between the independent variables (availability, use, and efficiency of assistive technologies) and dependent variables, such as academic performance among students, communication abilities, and classroom engagement.

A structured survey questionnaire was the main instrument for data gathering. It was fielded to SPED teachers, program supervisors, and school administrators of the selected public and private schools providing SPED services. Stratified random sampling was applied to ensure representative fairness among school types and locations. The gathered data were quantified and analyzed statistically through frequency counts, percentages, mean scores, and Pearson correlation to determine potential relationships between variables.

With this research design, the study was able to provide empirical data on the state of and effect of assistive technologies in special education. The findings offered

insightful information on how the technologies helped fill education gaps among special need learners and guided recommendations for enhancing SPED practice and policy.

Research Respondents.

The respondents in this study were randomly drawn from the Special Education (SPED) centers of the Negros Oriental Division, with 34 public and 16 private SPED centers, making a total of 50 schools. The study centered on SPED teachers, program supervisors, and school administrators who directly participated in the provision of special education services and the implementation or supervision of assistive technologies.

A stratified random sampling method was used to provide proportionate representation from both private and public SPED centers. At least one SPED teacher and one key official (either an administrator or a SPED coordinator) from each school were invited to participate. This yielded a total of 100 respondents, giving a balanced view of the availability, utilization, and effectiveness of assistive technologies across different types of institutions.

Inclusion criteria needed to be met for the respondents with a minimum experience of one year working in SPED settings and exposure to assistive technologies that are implemented within schools. The professional opinions from their experience helped to provide much-needed information in the study with specific regard to the way in which assistive technologies aid students with disabilities address learning needs through Negros Oriental.

Research Environment. This research was undertaken in Negros Oriental Division, one of the provinces in Central Visayas, Philippines. The division has a combination of urban and rural populations and falls under the governance of the Department of Education (DepEd) Region VII. At the time of the study, the division had 50 registered Special Education (SPED) centers, 34 of which were public and 16 private. These facilities support students with numerous exceptionalities like intellectual disability, autism spectrum disorder, visual and hearing impairment, physical disability, and learning disorders.

Public SPED centers usually have limited budgets and are mostly dependent on government funding, whereas private SPED schools tend to have more control and diversified funding that enable higher flexibility in the procurement of assistive tools and devices.

The research setting offered a representative cross-section of the opportunities and challenges that exist in the deployment of assistive technologies in special education. It provided a realistic setting for examining how variables such as school type, location, and availability of resources impact the effectiveness and integration of assistive technologies in meeting the educational needs of learners with disabilities.

Research Instrument. The main data collection tool of this research was a researcher-created structured survey questionnaire. The survey questionnaire was employed to collect quantitative information on the availability, utilization, and perceived effectiveness of assistive technologies for the Special Education (SPED) centers operating in the Negros Oriental Division. It also obtained pertinent demographic data from the respondents, namely, their role (SPED teacher, administrator, or program supervisor), number of years in practice, and type of school (public or private).

The survey instrument had four sections. The first section covered the respondents' profile, school categorization, and occupational history. The second section measured the presence of assistive technologies in schools by requesting the respondents to state which of these tools were available and could be used within their schools. The third section explored the usage frequency and scope of these technologies across different classrooms. The fourth section gauged the perceived impact of the technologies on enhancing students' academic achievement, communication, and engagement, employing a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

Prior to mass deployment, the questionnaire was subjected to content validation by an expert panel of special educators and educational technologists. It was also piloted tested in a neighboring division to check on clarity, reliability, and internal consistency. Pilot test results necessitated some slight revision of the wording of certain items for ease of understanding. The instrument was finally given in both online and hard copy forms, depending on each school's accessibility and preference.

Data Gathering Procedure. The data collection for this study was done in a span of two months, specifically from January to February 2025, after the research permit was approved by the Department of Education – Negros Oriental Division. A formal letter of request and endorsement from the researcher's academic institution were prepared and submitted to the Schools Division Superintendent before actual data collection began. After getting endorsement, the researcher contacted school principals and SPED coordinators at public and private SPED centers in the whole division to appeal for their collaboration and arrange administration of the research tool.

Considering the spatial distribution of the 50 SPED centers and differences in accessibility levels, the survey was done mostly through Google Forms to make it convenient and efficient to gather data. An exclusive, secure link to the web-based survey form was forwarded via email or formal communication means to the selected SPED teachers, administrators, and program supervisors. Google Form used a cover letter stating the objectives of the study, questionnaire instruction to complete it, and a virtual informed consent form that was to be approved by respondents prior to access.

Week after week reminders and follow-up via email, SMS, and Facebook Messenger messages ensured that participation reached optimal responses. The responses were viewed online and follow-ups sent to incomplete submit schools by the researcher. After the two-month period of collection, the answers were downloaded, cleaned, and processed for statistical analysis. Responses with missing answers were not included in the final dataset. The information gathered served as the foundation to examine the availability, use, and perceived usefulness of assistive technologies in SPED centers in Negros Oriental.

Statistical Treatment of Data. The data gathered through the survey were organized, encoded, and analyzed using Microsoft Excel and SPSS (Statistical Package for the Social

Sciences). The following statistical tools were used to address the research questions and test the hypotheses:

1. Frequency and Percentage were utilized to describe the demographic profile of the respondents (e.g., role in the school, years of experience, and type of institution) and to determine the availability of various assistive technologies across the SPED centers in Negros Oriental.
2. Weighted Mean was used to assess the level of utilization and perceived effectiveness of assistive technologies in special education classrooms. A 5-point Likert scale guided the interpretation of responses.
3. Pearson Product-Moment Correlation Coefficient (Pearson r) was employed to determine the strength and direction of the relationship between the availability and utilization of assistive technologies and their perceived effectiveness in improving student outcomes such as academic performance and classroom participation.

RESULTS AND DISCUSSION

Table 1. Level of availability of assistive technologies in special education programs (N=100)

Assistive Technology	Mean	Interpretation	SD
Screen Readers	3.28	Moderate to High	1.21
Speech-to-Text	3.04	Moderate	1.16
Communication Devices	2.75	Low to Moderate	1.24

Table 1 presents the level of availability of selected assistive technologies in special education programs as perceived by 100 respondents. The results show variations in the availability of different assistive tools, indicating that access to assistive technologies in SPED settings is present but not uniform across schools.

Screen readers obtained the highest mean score (M = 3.28, SD = 1.21), which is interpreted as a moderate to high level of availability. This finding suggests that screen readers are relatively more accessible in special education programs compared with other assistive technologies. However, the relatively large standard deviation implies variability across schools, indicating that while some institutions have adequate access to screen readers, others still experience limited provision. This pattern is consistent with earlier studies reporting uneven access to commonly used assistive technologies in SPED settings, particularly across schools with differing resource capacities [7; 2].

Speech to text technologies yielded a mean score of 3.04 (SD = 1.16), indicating a moderate level of availability. This suggests that such tools are available in many schools but are not yet consistently provided across all special education programs. Previous studies emphasize that speech to text applications play a significant role in supporting learners with learning disabilities by enhancing writing skills, literacy development, and independent task completion [10; 9]. The moderate availability observed in this study reflects earlier findings that the provision of assistive technologies often depends on institutional resources, administrative support, and teacher familiarity with these tools [5; 8].

Communication devices recorded the lowest mean score (M = 2.75, SD = 1.24), which corresponds to a low to moderate level of availability. This indicates that augmentative and alternative communication devices are less accessible in many special education programs. Considering that communication devices are essential for learners with complex communication needs, particularly those with autism spectrum disorder and severe speech impairments, their limited availability highlights a significant gap in inclusive education support [11]. Global evidence similarly notes that specialized assistive products such as communication devices are among the least accessible due to high cost, maintenance requirements, and limited technical support, especially in low and middle income settings [3; 4].

Table 2: Perceived Effectiveness of Assistive Technologies (N = 50) for Public School

Indicators	Mean	SD	Remarks
Improves students' reading comprehension skills	3.70	1.00	Effective
Enhances writing and spelling through text prediction/speech-to-text tools	3.66	1.01	Effective
Increases attention and engagement in classroom activities	3.54	1.00	Effective
Supports individualized instruction and learning pace	3.66	1.10	Effective
Aids in assessment and progress monitoring	3.54	0.99	Effective

Table 2 presents the perceived effectiveness of assistive technologies in supporting academic performance among learners with special needs as rated by 50 public school SPED teachers. All five indicators obtained mean scores ranging from 3.54 to 3.70 and were uniformly interpreted as Effective, indicating a generally positive perception of assistive technology use in public school settings.

The highest mean score was recorded for improving students' reading comprehension skills (M = 3.70, SD = 1.00). This suggests that public school teachers recognize the value of assistive technologies such as screen readers and text to speech tools in enhancing reading access and comprehension among learners with learning disabilities. This finding supports previous studies which emphasize that assistive technologies play a crucial role in improving literacy outcomes by reducing decoding difficulties and enabling learners to focus on meaning construction [10; 9].

Similarly, the indicators enhances writing and spelling through text prediction and speech to text tools (M = 3.66, SD = 1.01) and supports individualized instruction and learning pace (M = 3.66, SD = 1.10) were both rated as effective. These results highlight the role of assistive technologies in accommodating diverse learner needs by

allowing students to work at their own pace and express ideas more effectively despite difficulties in handwriting or spelling. This aligns with literature emphasizing that assistive technologies are most effective when they support differentiated instruction and individualized learning plans in special education classrooms [5; 8].

The indicators increases attention and engagement in classroom activities (M = 3.54, SD = 1.00) and aids in assessment and progress monitoring (M = 3.54, SD = 0.99) also received effective ratings, although with comparatively lower mean scores. These findings suggest that while assistive technologies contribute to sustaining learner engagement and facilitating assessment, their effectiveness in these areas may be influenced by factors such as class size, availability of devices, and teachers' proficiency in integrating technology into instructional and assessment practices. Edyburn [6] notes that the instructional impact of assistive technologies depends not only on access but also on systematic integration into teaching and evaluation processes.

Table 3: Perceived Effectiveness of Assistive Technologies (N = 50) – Private School SPED Teachers

Indicators	Mean	SD	Remarks
Improves students' reading comprehension skills	4.12	0.88	Effective
Enhances writing and spelling through text prediction/speech-to-text tools	4.08	0.91	Effective
Increases attention and engagement in classroom activities	4.00	0.95	Effective
Supports individualized instruction and learning pace	4.20	0.84	Effective
Aids in assessment and progress monitoring	4.06	0.90	Effective

Table 3 presents the perceived effectiveness of assistive technologies in supporting academic performance among learners with special needs as evaluated by 50 private school SPED teachers. All indicators obtained mean scores ranging from 4.00 to 4.20 and were interpreted as Effective, reflecting a consistently positive and relatively stronger perception of assistive technology use in private school settings.

The highest mean score was observed for supports individualized instruction and learning pace (M = 4.20, SD = 0.84). This finding indicates that private school teachers strongly recognize the capacity of assistive technologies to facilitate differentiated instruction and allow learners to progress according to their individual abilities and needs. This is consistent with the assertion that assistive technologies are most impactful when integrated into individualized educational planning and responsive teaching practices [9; 6].

The indicators improves students' reading comprehension skills (M = 4.12, SD = 0.88) and enhances writing and spelling through text prediction and speech to text tools (M = 4.08, SD = 0.91) also received high effectiveness ratings. These results suggest that private school teachers perceive assistive technologies as highly beneficial in supporting literacy development by reducing barriers related to decoding, spelling, and written expression. Prior studies highlight that consistent access to assistive tools significantly improves literacy outcomes for learners with learning disabilities, particularly in well resourced educational environments [10; 5].

Similarly, increases attention and engagement in classroom activities (M = 4.00, SD = 0.95) and aids in assessment and progress monitoring (M = 4.06, SD = 0.90) were also rated as effective. These findings indicate that assistive technologies support sustained learner engagement and enable teachers to track student progress more efficiently. Lower standard deviations across all indicators suggest greater consistency in perceptions among private school teachers, which may be attributed to better availability of devices, smaller class sizes, and stronger technical and administrative support systems. This observation aligns with earlier research noting that resource availability and institutional support enhance the effective integration of assistive technologies in SPED programs [7; 2].

Table 4: Public School SPED Teachers (N = 50). Perceived Effectiveness of Assistive Technologies on Students' Communication Skills

Indicators	Mean	SD	Remarks
Facilitates verbal expression through AAC (speech-generating devices)	3.60	1.02	Effective
Improves receptive communication (understanding instructions or messages)	3.58	1.05	Effective
Enhances peer-to-peer interaction	3.46	1.08	Moderately Effective
Supports teacher-student communication clarity	3.62	0.98	Effective
Encourages non-verbal communication (symbols, gestures)	3.50	1.04	Effective

Table 4 presents the perceived effectiveness of assistive technologies in enhancing the communication skills of learners with special needs as evaluated by 50 public school SPED teachers. The mean scores for the indicators range from 3.46 to 3.62, reflecting perceptions that generally fall within the Effective category, with one indicator rated as Moderately Effective.

The highest mean score was recorded for supports teacher student communication clarity (M = 3.62, SD = 0.98), followed closely by facilitates verbal expression through AAC such as speech generating devices (M = 3.60, SD = 1.02). These findings suggest that public school teachers recognize the value of assistive technologies in improving both expressive communication and the clarity of instructional interactions between teachers and learners. This observation is consistent with studies indicating that AAC

tools significantly enhance communication access and expressive language development among learners with complex communication needs [11].

The indicators improves receptive communication (M = 3.58, SD = 1.05) and encourages non verbal communication through symbols and gestures (M = 3.50, SD = 1.04) were also rated as effective. These results indicate that assistive technologies support learners in understanding instructions and expressing meaning through alternative communication modes. Literature emphasizes that multimodal communication supports are essential in inclusive classrooms, particularly for learners with autism spectrum disorder and intellectual disabilities [9; 10].

In contrast, enhances peer to peer interaction obtained the lowest mean score (M = 3.46, SD = 1.08) and was interpreted as moderately effective. This suggests that while assistive technologies assist in basic communication, their impact on facilitating social interaction among peers may be more limited in public school settings. Factors such as large class sizes, limited access to individual devices, and insufficient training in social communication strategies may influence this outcome. Similar challenges have been noted in earlier studies highlighting that the social use of assistive technologies requires intentional instructional design and adequate support beyond basic device availability [6; 8].

Table 5: Private School SPED Teachers (N = 50) Perceived Effectiveness of Assistive Technologies on Students' Communication Skills

Indicators	Mean	SD	Remarks
Facilitates verbal expression through AAC (speech-generating devices)	4.20	0.85	Effective
Improves receptive communication (understanding instructions or messages)	4.16	0.88	Effective
Enhances peer-to-peer interaction	4.04	0.92	Effective
Supports teacher-student communication clarity	4.12	0.90	Effective
Encourages non-verbal communication (symbols, gestures)	4.08	0.89	Effective

Table 5 shows the perceived effectiveness of assistive technologies in enhancing the communication skills of learners with special needs as rated by 50 private school SPED teachers. All indicators obtained mean scores ranging from 4.04 to 4.20 and were consistently interpreted as Effective, indicating a strong and positive perception of assistive technology use in private school settings.

The highest mean score was recorded for facilitates verbal expression through AAC such as speech generating devices (M = 4.20, SD = 0.85). This finding suggests that private school teachers strongly recognize the role of augmentative and alternative communication tools in supporting expressive language development among learners with complex communication needs. This aligns with previous research demonstrating that AAC systems significantly enhance speech output, functional communication, and classroom participation when consistently implemented and supported [11; 9].

Similarly, improves receptive communication (M = 4.16, SD = 0.88) and supports teacher student communication clarity (M = 4.12, SD = 0.90) were rated as effective, indicating that assistive technologies help learners better understand instructions and improve the quality of instructional interactions. These findings support earlier studies emphasizing the importance of assistive technologies in strengthening both expressive and receptive communication skills within inclusive and special education settings [10; 5].

The indicators encourages non verbal communication through symbols and gestures (M = 4.08, SD = 0.89) and enhances peer to peer interaction (M = 4.04, SD = 0.92) also received effective ratings. These results suggest that assistive technologies contribute positively to social communication and interaction among learners, enabling participation in collaborative and peer mediated activities. The relatively low standard deviations across all indicators indicate consistent perceptions among private school teachers, which may be attributed to better access to communication devices, smaller class sizes, and more specialized support services. Similar observations have been noted in studies highlighting that adequate resources and structured implementation strengthen the social communication benefits of assistive technologies [7; 2].

Table 6. Public School SPED Teachers (N = 50) Perceived Effectiveness of Assistive Technologies in Enhancing Classroom Participation

Indicators	Mean	SD	Remarks
Promotes active involvement in class discussions	3.48	1.06	Moderately Effective
Encourages student response through devices (e.g., clickers, AAC tools)	3.52	1.02	Effective
Increases confidence in classroom engagement	3.50	1.08	Effective
Reduces dependence on teacher prompts	3.40	1.12	Moderately Effective
Facilitates participation in group work and collaborative tasks	3.46	1.05	Moderately Effective

Table 6 presents the perceived effectiveness of assistive technologies in enhancing classroom participation among learners with special needs as rated by 50 public school SPED teachers. The mean scores range from 3.40 to 3.52, indicating perceptions that fall between Moderately Effective and Effective. These findings suggest that assistive technologies contribute positively to classroom participation, although their impact varies across specific aspects of learner engagement.

The indicator encourages student response through devices such as clickers and AAC tools obtained the highest mean score (M = 3.52, SD = 1.02) and was interpreted as effective.

This result implies that assistive technologies are particularly useful in prompting learner responses and facilitating participation in instructional activities, especially for students who experience difficulties with verbal expression. Prior studies emphasize that AAC tools and response technologies enable learners with communication challenges to participate more actively in classroom discourse [11; 9].

Increases confidence in classroom engagement also received an effective rating (M = 3.50, SD = 1.08), suggesting that assistive technologies help learners feel more comfortable and confident in expressing themselves during classroom activities. This finding aligns with research indicating that access to appropriate assistive tools promotes learner autonomy and reduces anxiety associated with participation in instructional tasks [10].

In contrast, promotes active involvement in class discussions (M = 3.48, SD = 1.06), facilitates participation in group work and collaborative tasks (M = 3.46, SD = 1.05), and reduces dependence on teacher prompts (M = 3.40, SD = 1.12) were rated as moderately effective. These results suggest that while assistive technologies support individual participation, their effectiveness in fostering sustained interaction and independence in public school settings may be influenced by contextual factors such as large class sizes, limited device availability, and teachers' workload. Similar challenges have been noted in the literature, which highlights that effective use of assistive technologies in promoting collaboration and independence requires systematic instructional planning and adequate teacher support [6; 8].

Table 7: Private School SPED Teachers (N = 50)Perceived Effectiveness of Assistive Technologies in Enhancing Classroom Participation

Indicators	Mean	SD	Remarks
Promotes active involvement in class discussions	4.14	0.88	Effective
Encourages student response through devices (e.g., clickers, AAC tools)	4.10	0.90	Effective
Increases confidence in classroom engagement	4.12	0.86	Effective
Reduces dependence on teacher prompts	4.02	0.92	Effective
Facilitates participation in group work and collaborative tasks	4.08	0.87	Effective

Table 7 presents the perceived effectiveness of assistive technologies in enhancing classroom participation among learners with special needs as rated by 50 private school SPED teachers. All indicators yielded mean scores ranging from 4.02 to 4.14 and were uniformly interpreted as Effective, indicating a strong and positive perception of assistive technology use in private school settings.

The highest mean score was recorded for promotes active involvement in class discussions (M = 4.14, SD = 0.88). This finding suggests that private school teachers perceive assistive technologies as highly effective in enabling learners to participate more actively in classroom discourse. Assistive tools such as AAC devices and response systems provide alternative avenues for expression, thereby reducing participation barriers for learners with communication and learning difficulties. This observation aligns with existing literature emphasizing that consistent access to assistive technologies enhances student engagement and classroom interaction [11; 9].

Similarly, increases confidence in classroom engagement (M = 4.12, SD = 0.86) and encourages student response through devices such as clickers and AAC tools (M = 4.10, SD = 0.90) were rated as effective. These results indicate that assistive technologies support learners in expressing ideas confidently and responding to instructional prompts, thereby fostering greater self efficacy and participation. Prior studies report that when learners are provided with appropriate assistive tools and consistent instructional support, their confidence and willingness to engage in classroom activities significantly improve [10]; [5].

The indicators facilitates participation in group work and collaborative tasks (M = 4.08, SD = 0.87) and reduces dependence on teacher prompts (M = 4.02, SD = 0.92) also received effective ratings. These findings suggest that assistive technologies contribute to greater learner independence and collaborative engagement in private school settings. The relatively low standard deviations across all indicators indicate consistent perceptions among teachers, which may reflect better access to devices, smaller class sizes, and stronger technical and instructional support. Similar patterns have been documented in studies highlighting that adequate resources and structured implementation enhance the participatory benefits of assistive technologies [7; 2].

Table 8: Spearman Correlation Between Assistive Technology Availability/Utilization and Academic Performance (N = 100)

Variables	Spearman's ρ (rho)	p-value	Interpretation
Availability of Assistive Technologies	0.482	0.000	Moderate positive correlation **Significant** ($p < .05$)
Utilization of Assistive Technologies	0.531	0.000	Moderate to strong positive correlation **Significant** ($p < .05$)

Table 8 presents the relationship between assistive technology availability and utilization and the academic performance of learners with special needs using Spearman's rho correlation. The results reveal statistically significant positive relationships for both variables, indicating that assistive technologies play an important role in supporting academic outcomes in special education programs.

The availability of assistive technologies shows a moderate positive correlation with academic performance ($\rho = 0.482$, $p = 0.000$). This indicates that higher levels of access to assistive technologies are associated with better academic

performance among learners with special needs. The finding suggests that when schools are equipped with appropriate assistive tools, learners are better able to access instructional content and demonstrate academic competencies. This result is consistent with prior studies emphasizing that access to assistive technologies reduces learning barriers and supports meaningful participation in academic tasks [10; 9]. Global reports likewise stress that insufficient availability of assistive products limits educational attainment among learners with disabilities [3; 4].

A stronger relationship was observed between the utilization of assistive technologies and academic performance (ρ = 0.531, p = 0.000), indicating a moderate to strong positive correlation. This finding highlights that the actual and consistent use of assistive technologies has a greater influence on academic performance than mere availability. It supports existing literature which emphasizes that assistive technologies yield meaningful educational benefits only when they are effectively integrated into teaching and learning processes [6; 8]. Local evidence further confirms that assistive technologies significantly enhance academic participation and learning outcomes when teachers are competent in their use and when instructional practices are aligned with learners' needs [5].

Table 9. Significant Differences in the Availability, Utilization, and Perceived Effectiveness of Assistive Technologies Across Several Contextual Factors

Grouping Variable	Dependent Variable	Test Used	p-value	Interpretation
Type of School (Public vs Private)	Availability	Independent t-test	0.004	**Significant** Private schools report higher availability than public schools.
	Utilization	Independent t-test	0.007	**Significant** Utilization is higher in private schools.
	Perceived Effectiveness	Independent t-test	0.012	**Significant** Teachers in private schools rate AT more effective.
Geographic Location (Urban vs Rural)	Availability	Independent t-test	0.021	**Significant** Urban schools show greater availability of AT.
	Utilization	Independent t-test	0.034	**Significant** Utilization is higher in urban areas.
	Perceived Effectiveness	Independent t-test	0.065	Not Significant No clear difference in perceived effectiveness.
Type of Disability Served	Availability	One-Way ANOVA	0.002	**Significant** Availability varies by disability type served.
	Utilization	One-Way ANOVA	0.005	**Significant** Utilization varies depending on the disability category.

Table 9 presents the results of inferential analyses examining significant differences in the availability, utilization, and perceived effectiveness of assistive technologies across selected contextual factors, namely type of school, geographic location, and type of disability served. Independent samples t tests and one way analysis of variance were employed to determine whether these differences were statistically significant.

When grouped according to type of school, the results show statistically significant differences in all three dependent variables. Availability of assistive technologies differed significantly between public and private schools (p = 0.004), with private schools reporting higher levels of availability. Similarly, utilization of assistive technologies was significantly higher in private schools than in public schools (p = 0.007). Perceived effectiveness also differed significantly (p = 0.012), with teachers in private schools rating assistive technologies as more effective. These findings suggest that differences in funding, infrastructure, and institutional support between public and private schools influence both access to and effective use of assistive technologies. This pattern is consistent with earlier studies indicating that resource availability and administrative support strongly affect assistive technology implementation in special education settings [7; 2].

With respect to geographic location, significant differences were observed in the availability (p = 0.021) and utilization (p = 0.034) of assistive technologies, with urban schools reporting greater access to and more frequent use of assistive tools compared with rural schools. However, no significant difference was found in perceived effectiveness (p = 0.065). This suggests that while urban schools are better resourced, teachers across both urban and rural settings generally recognize the instructional value of assistive technologies once they are available and used. These results align with global evidence indicating that geographic disparities affect access to educational technologies, although perceptions of their usefulness tend to be consistent across settings [3; 1].

Differences were also found when schools were grouped according to the type of disability served. Significant variations were observed in availability (p = 0.002),

utilization (p = 0.005), and perceived effectiveness (p = 0.014) of assistive technologies. These findings indicate that the provision and use of assistive technologies are influenced by the specific needs associated with different disability categories, such as visual, hearing, intellectual, and autism spectrum disorders. This result supports existing literature which emphasizes that assistive technologies must be carefully matched to the functional needs of learners to be effective, and that variability in device availability may reflect differing levels of specialization and training across disability groups [9; 11].

RECOMMENDATION

Based on the results of this research, the following are proposed recommendations to enhance the availability, utilization, and effectiveness of assistive technologies (AT) in special education programs of the Negros Oriental Division:

1. Strengthen Resource Allocation for Public and Rural Schools. DepEd and the local government units must prioritize the allocation of funds for assistive technologies in rural and public schools. Equal provision of resources is needed to close the gap between public and private schools and provide equal access to tools for all students with special needs.
2. Provide Regular Training and Professional Development. Repeated capacity-building training workshops and training on proper utilization of AT should be made available for SPED teachers, particularly for those from underserved locations. The workshops and training must feature hands-on exercise sessions using screen readers, speech-to-text applications, communication devices, and disability-specific assistive technology.
3. Create School-Based AT Management and Monitoring Teams. Schools must have specialized teams in place to manage the integration, maintenance, and evaluation of assistive technologies. This will guarantee that ATs are not only accessible but also effectively used and upgraded according to students' changing needs.
4. Encourage Community and Private Sector Partnerships. Negros Oriental Division schools must involve NGOs, technology firms, and private donors in collaborations to win assistance for AT equipment, training, and facilities. Public-private partnerships can be vital in keeping inclusive learning programs going.
5. Customize AT Support According to Disability Types. Because meaningful differences in AT effectiveness were determined by the type of disability served, schools ought to determine the particular needs of their SPED students and acquire or modify technologies accordingly. Individualized educational plans (IEPs) must clearly incorporate assistive technology strategies.
6. Implement a Localized AT Needs Assessment Tool. AT inventory and utilization checklist in all SPED centers. This will give policymakers reliable data and enhance service delivery based on existing school conditions.
7. Encourage Awareness and Inclusion Among General Education Personnel. Besides SPED teachers, regular education staff ought to be inducted in inclusive practices and assistive technology's role. This enhances inclusive culture within a school and improved class participation by special needs learners.

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