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Gauging the influence of assistive technology utilization on the learners with special needs' learning outcomes

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ABSTRACT

This study determined the extent of assistive technology utilization and its relationship with the learning outcomes of Learners with Special Educational Needs (LSENs) at Zapatera SPED Center during School Year 2025–2026. A descriptive-correlational research design was employed. Using complete enumeration, all 30 SPED teachers comprised the respondents. A researcher-adapted questionnaire assessed assistive technology utilization in terms of availability and accessibility, appropriateness, frequency and consistency, teacher competence, and monitoring and support; it also assessed teacher-reported academic performance and task completion, classroom engagement, communication and functional independence, and attainment of learning goals. Frequency, percentage, weighted mean, standard deviation, and Pearson product–moment correlation were used. Results indicated generally high assistive technology utilization, with teacher competence a strong area and availability, accessibility, and appropriateness requiring further attention. Teacher-reported learning outcomes were generally very satisfactory, particularly classroom engagement and participation. The relationship between assistive technology utilization and learning outcomes was negligible, positive, and not statistically significant ($r = 0.139$, $p = 0.464$); the null hypothesis was not rejected. These results do not establish a causal effect of technology use. A school-based assistive technology enhancement action plan was proposed to improve access, individualized matching, instructional support, and progress monitoring.

Keywords: Special education; assistive technology utilization; learning outcomes; descriptive-correlational research; Zapatera SPED Center.

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INTRODUCTION

Assistive Technology (AT) has become an essential component of inclusive education, especially for Learners with Special Educational Needs (LSENs) who experience barriers in communication, mobility, cognition, sensory processing, and academic participation. AT refers to any device, software, material, or system, whether low-tech or high-tech, that helps learners with disabilities improve their functional capabilities and participate more meaningfully in classroom activities. Globally, the need for assistive technology has been recognized as both

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an educational and developmental concern. The World Health Organization and UNICEF (2022) reported that many individuals who require assistive products still do not have adequate access to them, particularly in low- and middle-income countries. This lack of access affects not only independence and participation but also the ability of learners with disabilities to benefit fully from instruction.

International studies have shown that assistive technology can improve academic performance, learner engagement, communication skills, independence, and classroom participation among learners with disabilities. Research findings indicate that AT supports literacy development, communication, task completion, and access to instructional materials when it is properly matched to the learner's specific needs and consistently integrated into teaching practices (Alnahdi et al., 2023). However, studies also emphasize that the presence of assistive devices alone does not guarantee improved learning outcomes. The effectiveness of AT depends greatly on how it is used, how often it is used, whether it is appropriate to the learner's condition, and whether teachers have the competence and support needed to integrate it effectively into instruction (Okolo & Bouck, 2022). Thus, the issue is not only the availability of assistive technology, but also the extent and quality of its utilization.

In the Philippines, laws and educational policies have been crafted to address the needs of learners with disabilities and to promote their meaningful participation in basic education. These legal and policy frameworks aim to strengthen inclusive education by ensuring that learners with special educational needs are provided with appropriate support services, learning resources, assistive devices, and accessible learning environments. Their objective is to remove barriers that prevent LSENs from participating in school activities, accessing instruction, and achieving learning outcomes alongside their peers. In this context, assistive technology serves as one of the practical mechanisms through which inclusive education can be implemented in classrooms.

Despite these national efforts, challenges remain in the actual implementation of assistive technology in schools. Studies in the Philippine setting reveal that teachers generally acknowledge the importance of AT, yet its use in classroom instruction remains inconsistent because of limited training, lack of appropriate devices, insufficient technical support, and inadequate monitoring of its impact on learner performance (Serrano & Lopez, 2021). Other studies in special education contexts also show that AT is sometimes used only when available, rather than as a planned and systematic instructional support. In some cases, teachers rely on improvised materials or general classroom strategies because assistive tools are either unavailable, outdated, or not properly aligned with the learner's specific disability-related needs (Delos Reyes et al., 2020).

In the local context, similar concerns may be observed in schools that serve LSENs, particularly in early childhood and inclusive classroom settings. Learners with communication difficulties may struggle to express basic needs, answer questions, or participate in oral activities when communication boards, picture cards, speech applications, or other assistive tools are not consistently provided. Learners with fine motor difficulties may find it hard to write, manipulate learning materials, or complete seatwork without adapted pencils, slant boards, enlarged worksheets, or digital alternatives. Meanwhile, learners with sensory processing concerns may experience difficulty focusing during class activities when appropriate sensory supports, visual schedules, or structured routines are not used. These situations can limit participation, reduce engagement, and affect the development of foundational literacy, numeracy, communication, and social skills.

In Zapatera National High School – SpEd Center (ZNHS), the need to examine assistive technology utilization is significant because LSENs may have different learning needs that require individualized support. While teachers may already be using some forms of AT, such as visual aids, printed activity cards, manipulatives, audio-visual materials, tablets, or

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teacher-made instructional supports, the extent of their use may vary from one classroom to another. Some teachers may use AT regularly during instruction, while others may use it only during specific activities or when a learner shows difficulty. There may also be instances where assistive tools are available but not fully utilized because teachers lack training, time, confidence, or technical guidance. As a result, the potential of assistive technology to improve learner participation and performance may not be fully realized.

These local classroom realities highlight the importance of investigating how assistive technology is actually utilized and how such utilization affects the learning outcomes of LSENs. The issue is not limited to whether assistive devices or materials are present in the school, but whether they are appropriate, accessible, regularly used, and integrated into teaching and learning activities. Without examining these factors, schools may find it difficult to determine whether their current practices truly support the academic and developmental progress of learners with special educational needs. Moreover, a lack of evidence may limit the ability of school administrators and teachers to make informed decisions regarding resource allocation, teacher training, instructional planning, and learner support services.

A critical gap in the existing literature is the limited empirical investigation of the relationship between the extent of assistive technology utilization and the learning outcomes of LSENs, especially at the local school level. Many studies focus on the availability of AT, teacher attitudes, or policy implementation, but fewer studies directly examine how utilization factors such as frequency of use, appropriateness of tools, teacher competence, and institutional support relate to measurable learner outcomes. This gap is especially important in early childhood and inclusive education settings, where timely and appropriate intervention can strongly influence communication, behavior, participation, and academic readiness.

In light of these considerations, this study examines the extent of assistive technology utilization and its effect on the learning outcomes of LSENs. By determining how assistive technology is used in the local school context and how it relates to learner performance, the study aims to provide evidence that can guide teachers, school administrators, and education stakeholders in improving inclusive education practices. The findings may also help strengthen planning, capacity-building, resource provision, and classroom-based intervention for LSENs.

Finally, the study aims to support the development of a more responsive and effective learning environment where learners with special educational needs have meaningful opportunities to participate, progress, and achieve their full learning potential.

Statement of the problem

This study aimed to determine the extent of assistive technology utilization and its effect on the learning outcomes of Learners with Special Educational Needs (LSENs) in selected inclusive schools during the School Year 2025–2026.

Specifically, the study sought to answer the following quantitative research questions:

1. What were the demographic profiles of the teacher respondents in terms of age, gender, length of teaching service, highest educational attainment, and number of trainings or certifications related to assistive technology and inclusive education?
2. What was the extent of assistive technology utilization for Learners with Special Educational Needs in terms of availability and accessibility of assistive technology, appropriateness of assistive technology to learner needs, frequency and consistency of assistive technology use in instruction, teacher competence in integrating assistive technology, and monitoring and support mechanisms for assistive technology implementation?

3. What was the level of learning outcomes of Learners with Special Educational Needs in terms of academic performance and task completion, classroom engagement and participation, communication and functional independence, and attainment of individualized or curriculum-based learning goals?
4. Was there a significant relationship between the extent of assistive technology utilization and the learning outcomes of Learners with Special Educational Needs?
5. Based on the findings of the study, what assistive technology–based action plan could be proposed to enhance the learning outcomes of Learners with Special Educational Needs in inclusive school settings?

METHODOLOGY

Research design

This study employed a descriptive-correlational research design. This design was used to describe the existing extent of assistive technology utilization and determine whether a significant relationship existed between assistive technology utilization and the learning outcomes of Learners with Special Educational Needs (LSENs).

A correlational research design is appropriate when the purpose of the study is to determine the degree of relationship between two or more variables without manipulating them. According to Fraenkel, Wallen, and Hyun (2019), correlational research is used to investigate whether, and to what extent, variables are related to one another. Similarly, Creswell (2014) explained that correlational research is suitable when the researcher seeks to examine associations among variables as they naturally occur, rather than establish a cause-and-effect relationship.

In this study, the descriptive component was used to determine the extent of assistive technology utilization for LSENs in terms of availability, appropriateness, frequency of use, teacher competence, and support mechanisms. These indicators described how assistive technology was utilized in the educational setting.

The correlational component was used to test the relationship between the extent of assistive technology utilization and the learning outcomes of LSENs. Specifically, the study examined whether availability, appropriateness, frequency of use, teacher competence, and support mechanisms were significantly related to learners' academic performance, classroom engagement, functional independence, and attainment of learning goals.

This design was appropriate for the study because the researcher did not introduce any intervention, manipulate classroom practices, or control the learning environment. Instead, the study examined existing practices in the utilization of assistive technology and determined how these related to the observed learning outcomes of LSENs. Since the main objective was to describe current conditions and identify relationships among variables, the descriptive-correlational design was suitable for generating empirical evidence on the role of assistive technology in supporting inclusive education.

Respondents and locale of the study

The respondents were all 30 SPED teachers at Zapatera SPED Center, consisting of 18 elementary and 12 high school SPED teachers. The researcher used complete enumeration, whereby every eligible teacher in the defined study population was included.

The classroom setting of the study was the SPED room, where learners with special educational needs received individualized, modified, and differentiated instruction based on their identified needs and abilities. In this setting, teachers provided instructional support to

learners who required assistance in communication, academic tasks, social interaction, behavior management, sensory regulation, and functional skill development. The SPED room also served as a learning environment where assistive technology and other instructional support materials were used to help learners access lessons, participate in classroom activities, and accomplish learning tasks.

Complete enumeration was applied because the study included all 30 eligible SPED teachers in the identified research locale. No subset was drawn from this population. The inclusion criteria required that the respondents were SPED teachers assigned at Zapatera SPED Center, were handling learners with special educational needs in the elementary or high school level, and had direct classroom experience in using instructional supports or assistive technology for LSENs. These criteria ensured that the data gathered were based on actual teaching practices and firsthand classroom experiences.

The demographic profile of the teacher-respondents, including age, gender, length of teaching service, highest educational attainment, and number of trainings or certifications related to assistive technology and inclusive education, was gathered to provide background information for the study. These data helped describe the respondents and provided context in understanding their experiences and competence in utilizing assistive technology.

The choice of SPED teachers as respondents was justified by their direct role in the education of LSENs. Since they regularly handled learners with disabilities and developmental needs in the SPED room, they had practical knowledge of the learners' academic performance, classroom engagement, communication abilities, functional independence, and attainment of individualized or curriculum-based learning goals. They were also the primary implementers of assistive technology and instructional accommodations in the classroom. Thus, their responses were considered essential in determining the extent of assistive technology utilization and its relationship to the learning outcomes of LSENs.

The resulting 30 teacher-respondents represented the defined group of SPED teachers at the center; the findings therefore describe this local population and should not be generalized automatically to other schools.

Research instrument

The research instrument used in this study was a researcher-adapted survey questionnaire designed to determine the extent of assistive technology utilization and the learning outcomes of Learners with Special Educational Needs (LSENs). The questionnaire was adapted from established concepts and frameworks on assistive technology, inclusive education, and educational measurement. These served as the basis for developing items that were relevant to the research objectives and appropriate to the educational experiences of SPED teachers.

The first part of the questionnaire gathered the demographic profile of the teacher-respondents in terms of age, gender, length of teaching service, highest educational attainment, and number of trainings or certifications related to assistive technology and inclusive education. The information provided a description of the respondents' personal and professional characteristics and helped establish the context of their experiences in using assistive technology in teaching LSENs.

The second part of the questionnaire assessed the extent of assistive technology utilization based on five indicators: availability and accessibility of assistive technology, appropriateness of assistive technology to learner needs, frequency and consistency of assistive technology use in instruction, teacher competence in integrating assistive technology, and

monitoring and support mechanisms for its implementation. The items were developed following the principles of scale construction discussed by DeVellis (2017), which emphasize clarity of statements, consistency of response options, and alignment of questionnaire items with the variables being measured. The indicators were further supported by literature highlighting the importance of accessible assistive devices, appropriate instructional applications, teacher preparedness, and institutional support in facilitating inclusive education (Meyer et al., 2014; Okolo & Bouck, 2022; World Health Organization & UNICEF, 2022).

The third part of the questionnaire determined the level of learning outcomes of LSENs as perceived by the teacher-respondents. It covered academic performance and task completion, classroom engagement and participation, communication and functional independence, and attainment of individualized or curriculum-based learning goals. These indicators reflected the different aspects of learner development emphasized in special and inclusive education. Friend and Bursuck (2019) explained the importance of considering academic progress alongside learners' participation, communication abilities, and independence in educational activities. Through these indicators, the questionnaire provided a broader assessment of the learning experiences and progress of LSENs within the classroom setting.

A four-point Likert scale was employed to determine the respondents' assessments of assistive technology utilization and learner outcomes. The scale assigned a numerical value of 4 for "To a Very Great Extent," 3 for "To a Great Extent," 2 for "To a Less Extent," and 1 for "To a Very Less Extent." This response format allowed teachers to express their assessments based on their actual classroom observations and instructional experiences. It also provided a consistent basis for summarizing and interpreting responses through the statistical procedures employed in the study.

Before the administration of the questionnaire, the instrument was subjected to content validation by experts in special education, inclusive education, and research instrumentation. The validators examined the clarity, relevance, appropriateness, and alignment of the questionnaire items with the objectives and variables of the study. Their comments and recommendations were considered in refining the statements and improving the organization of the instrument. This process was intended to establish the content suitability of the questionnaire for gathering information from the identified respondents.

No pilot testing was conducted in the study. The researcher proceeded with the administration of the researcher-adapted questionnaire following the content validation process. Although expert validation provided a basis for assessing the relevance and appropriateness of the instrument, it did not independently establish its statistical reliability. Accordingly, the absence of pilot testing was recognized as a methodological limitation when interpreting the findings.

The finalized questionnaire was administered to all 30 SPED teachers of Zapatera SPED Center during School Year 2025–2026 through complete enumeration. The data gathered served as the basis for describing the respondents' profiles, determining the extent of assistive technology utilization, assessing teacher-reported learning outcomes, and examining the relationship between assistive technology utilization and the learning outcomes of LSENs.

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Data analyses procedure

The data gathering procedure of the study was carried out in a systematic and ethical manner to ensure the accuracy, validity, and confidentiality of the data collected. The procedure was implemented in three phases: pre-data gathering, during data gathering, and post-data gathering.

Prior to the conduct of the study, the researcher sought formal approval from the School Head of Zapatera SPED Center and the Schools Division Office of Cebu City to allow the conduct of the study and the collection of data within the school premises. Upon receipt of the necessary approvals, the researcher prepared and distributed informed consent forms to the participating teacher-respondents. For any learner-related data derived from classroom observations, informed consent was also secured from the parents or legal guardians of Learners with Special Educational Needs (LSENs).

All participants were fully informed of the purpose of the study, the voluntary nature of their participation, their right to withdraw from the study at any time without penalty, and the measures undertaken to ensure confidentiality and data protection. The study strictly adhered to the provisions of the Data Privacy Act of 2012 to safeguard the personal information of all respondents.

After securing informed consent, the researcher administered the Teacher Survey Questionnaire to the selected SPED teachers handling LSENs at Zapatera SPED Center. The administration of the questionnaire was scheduled in coordination with the school administration to avoid disruption of regular instructional activities. Respondents were given sufficient time to complete the questionnaire to ensure thoughtful and accurate responses.

Classroom observations related to instructional practices and learning engagement were limited to non-intrusive documentation of assistive technology use and learner participation. These observations were conducted using structured observation guides aligned with the study variables, focusing on how assistive technology was utilized during instruction and how learners responded in terms of engagement, task completion, and functional participation. Multiple observation sessions were conducted, when applicable, to capture consistent patterns and minimize observer bias.

Upon completion of data collection, all accomplished questionnaires and observation records were systematically organized, encoded, and tabulated for analysis. Descriptive statistical tools such as frequency counts, percentages, and weighted means were used to describe the demographic profile of the teacher-respondents, the extent of assistive technology utilization, and the level of learning outcomes of LSENs. Inferential statistical analysis, specifically correlational analysis, was applied to determine the relationship between assistive technology utilization and learning outcomes.

Throughout the post-data gathering phase, strict confidentiality was maintained by anonymizing respondent identities and securely storing all data in protected files accessible only to the researcher. The structured and ethical implementation of these procedures ensured that the findings of the study were credible, valid, and reflective of actual instructional practices within the SPED learning environment of Zapatera SPED Center.

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RESULTS AND DISCUSSION

This section presents and interprets the data gathered from 30 SPED teachers of Zapatera SPED Center during School Year 2025 to 2026. A descriptive-correlational research design was used, and all 30 teachers were included through complete enumeration, so no sampling was involved. Data were collected with a researcher-adapted questionnaire that was content validated by experts but not pilot tested, and responses were rated on a four-point Likert scale. Frequency, percentage, weighted mean, standard deviation, and the Pearson product-moment correlation were used. The discussion is grounded in the data gathered, and each result is interpreted in direct relation to the objectives of the study: the respondents' profile, the extent of assistive technology (AT) utilization, the level of learning outcomes of Learners with Special Educational Needs (LSENs), and the relationship between the two.

Profile of the respondents

Of the 30 respondents, 11 (36.67%) were aged 28 to 36 years, 8 (26.67%) were aged 46 to 54 years, 6 (20.00%) were aged 37 to 45 years, and 5 (16.67%) were above 54 years. The manuscript reports that 19 respondents (63.34%) were between 28 and 45 years old and 13 respondents (43.34%) were aged 46 years or older. The respondents therefore came from several adult age groups. The concentration in the 28 to 36 age group may suggest greater exposure to contemporary digital tools, but age alone is not a direct measure of technological competence. UNESCO (2023) reported that 54% of teachers working with LSENs had only basic knowledge of assistive technologies and 28% had received no training in their implementation. The WHO and UNICEF (2022) likewise identified limited awareness, insufficient funding, inadequate access, and workforce-capacity gaps as barriers. Training should thus be differentiated by existing skills and not by age. These descriptive results do not establish that age influences utilization or learner outcomes, which would require inferential testing.

Regarding gender, 26 respondents (86.67%) were female and 4 (13.33%) were male. The group was predominantly female, which may reflect the composition of special education personnel in the setting, and the findings therefore largely represent female perspectives. The distribution does not indicate that women are more competent or receptive than men. Uloh-Bethels and Okonji (2025) and Shaheen (2025) found no significant gender differences in teachers' perceptions of assistive technology, and both emphasized training, resources, and institutional support. Because the male subgroup was small, any gender comparison would have limited reliability, and the imbalance is acknowledged as a limitation.

For length of service, 10 respondents (33.33%) had served 6 to 10 years, 8 (26.67%) had served 16 years or more, 7 (23.33%) had served 1 to 5 years, and 5 (16.67%) had served 11 to 15 years. Altogether, 23 respondents (76.67%) had at least six years of service and 13 (43.34%) had served more than ten years. The pool combined established practitioners with newer teachers. Longer service does not automatically mean greater competence, as Alsolami (2022) found only moderate knowledge, skills, and confidence among special education teachers. Park et al. (2024) showed that direct instruction in assistive technology improved teachers' knowledge, skills, and attitudes. The frequency distribution does not prove that tenure affects utilization or learner outcomes. It does support career-stage-responsive development, such as peer mentoring that pairs experienced teachers with technology-confident colleagues.

In terms of educational attainment, 23 respondents (76.67%) had earned units toward a master's degree, 6 (20.00%) had completed an MA or MS degree, and 1 (3.33%) held a Ph.D.

or Ed.D. Thus 7 respondents (23.33%) had completed a graduate degree, and all 30 had pursued education beyond the bachelor's level. Advanced study may strengthen teachers' judgment in deciding whether a tool suits a learner. Park et al. (2022) and Şahin et al. (2024) indicated that hands-on preparation, and not credentials alone, builds confidence and intention to use assistive tools. Evmenova et al. (2024) added that evidence-based technology improves outcomes when educators pair it with proven instructional practices. The table is descriptive and does not confirm that educational attainment improves utilization or learner outcomes.

On training, 24 respondents (80.00%) had attended five or more trainings related to assistive technology and inclusive education, and 6 (20.00%) had attended three to four. No respondent reported attending fewer than three. This is substantial exposure to professional learning. The number of trainings does not reveal their duration, quality, or relevance, and attendance is not proof of competence. Fernández-Batanero et al. (2022) found that insufficient teacher preparation remained a major obstacle to technology-supported inclusion. Volkov (2024) found that training influences practice most when schools also supply equipment, technical help, and administrative support. A 2025 Philippine study in Bulacan associated the use of assistive tools with the performance of students with disabilities, and it identified staff development, availability, accessibility, and consistent application as important elements. The data cannot establish that training produced better utilization or outcomes.

Extent of assistive technology utilization

Availability and accessibility obtained an aggregate mean of 2.93 and an aggregate standard deviation of 0.62, described as High. The availability of devices in the classroom or school scored highest (weighted mean 3.17, standard deviation 0.65), followed by learners' access to assistive technology when needed (3.13, 0.63). The adequacy of school-provided resources and the ready availability of materials during activities both had a weighted mean of 2.87, with standard deviations of 0.51 and 0.57 respectively. The lowest indicator was learners' ability to use assistive technology across different learning environments (2.63, 0.76), which had the widest spread and was close to the lower limit of the High category. Tools may therefore be present in school yet inaccessible across settings because of portability, connectivity, compatibility, or technical support limits. Hata et al. (2023) found that availability varied with school capacity, awareness, teacher preparation, and stakeholder coordination. O'Sullivan et al. (2021) and Senjam, Foster, and Bascaran (2021) showed that equipment access, awareness, affordability, and support jointly shape effective use. Dabi and Golga (2022) linked resource provision to user awareness. Provision was satisfactory but still improvable, and schools should prioritize portable equipment, compatible applications, clear borrowing procedures, maintenance, and home-school coordination.

Appropriateness to learner needs obtained an aggregate mean of 2.98 and an aggregate standard deviation of 0.59, interpreted as High. The statement that assistive technology contributes to learners' achievement of educational goals scored highest (3.50, 0.51) and was rated Very High. Support for accomplishing academic tasks followed (2.97, 0.72), then selection according to individual needs (2.93, 0.45), and reduction of barriers to participation (2.77, 0.82). The widest spread of responses was on barrier reduction. The lowest indicator was alignment with learners' abilities and developmental levels (2.73, 0.45). Respondents thus valued assistive technology broadly but were less certain how precisely tools are matched to individual learners. Lynch et al. (2024), Randall et al. (2024), Klavina et al. (2024), and Vaccarella et al. (2025) all showed that effectiveness depends on contextual suitability, usability, learner involvement, and adaptation to user, task, and setting. A structured, multidisciplinary selection process with trial periods and learner feedback is therefore warranted.

Frequency and consistency of use obtained an aggregate mean of 3.27 and an aggregate standard deviation of 0.49, interpreted as Very High. Encouraging learners to use assistive technology independently scored highest (3.67, 0.48), followed by application across subject areas (3.40, 0.67), both Very High. Regular use during instruction (3.17, 0.38) and consistent incorporation into teaching strategies (3.10, 0.55) were rated High, and integration into daily lesson activities was lowest (3.00, 0.37), also High. Technology was therefore a recurring part of instruction, although frequent use differs from full integration into lesson planning, and use should occur where it provides meaningful advantage. McNicholl et al. (2020) linked assistive technology with competence, adaptability, and self-esteem. Mulcahy et al. (2024) synthesized 67 studies and Mikropoulos and Iatraki (2023) reviewed 21 studies, and both supported cross-curricular use. Zilz and Pang (2021) cautioned that independence develops progressively and some young learners still need adult help.

Teacher competence obtained an aggregate mean of 3.51 and an aggregate standard deviation of 0.47, interpreted as Very High. Knowledge of selecting appropriate assistive technology scored highest (3.73, 0.45), followed by having sufficient training (3.67, 0.48), confidence in use during instruction (3.53, 0.51), and integration into lesson planning (3.43, 0.50), all Very High. Troubleshooting basic technical concerns was lowest (3.20, 0.41) and was the only indicator rated High. This agrees with the finding that 80.00% of respondents had five or more trainings, although the ratings are self-reports that may overestimate actual performance and should be verified through observation. Alanazi (2020) found that trained teachers showed greater knowledge of assistive technology use. Fernández-Cerero et al. (2023), Starks and Reich (2023), and Theodorio et al. (2024) showed that competence depends on training, resources, collegial support, and dependable technical assistance.

Monitoring and support mechanisms obtained an aggregate mean of 3.39 and an aggregate standard deviation of 0.50, described as Very High. Ongoing training and professional development scored highest (3.60, 0.50), followed by active administrative support (3.50, 0.51), periodic evaluation (3.47, 0.51), and regular monitoring of learners' progress (3.43, 0.50), all Very High. Technical support was lowest (2.97, 0.49) and was the only indicator rated High. Strong human and organizational supports thus exist, but technical assistance lags behind, and monitoring cannot resolve a breakdown without qualified help. Atanga et al. (2020) and Ogondiek (2025) emphasized practical training and continuing service. McMahon and Tucker (2025) proposed a multi-tiered system in which teachers handle basic concerns and specialists handle complex ones. Schools should document who monitors performance and who responds to technical problems, and should include objective progress measures.

Taken together, the five components produced a grand mean of 3.22 and a grand standard deviation of 0.53, interpreted as High and only 0.03 below the 3.25 lower boundary of Very High. Teacher competence ranked first (3.51, 0.47), followed by monitoring and support (3.39, 0.50), frequency and consistency (3.27, 0.49), appropriateness (2.98, 0.59), and availability and accessibility (2.93, 0.62). The results show an imbalance between human capacity and material provision. Teachers appear capable, monitoring is in place, and use is frequent, yet resources and their fit to individual learners are weaker. Olakanmi et al. (2020) reviewed 126 publications, Abdelwahab and Al-Karawi (2025) reviewed 32 studies, and Navas-Bonilla et al. (2025) examined 159 studies. Together they support appropriate, portable, reliable, and compatible technology as a condition for benefit. Investment should therefore target inventory, individual needs assessment, trial periods, portability, maintenance, and technical assistance.

Level of learning outcomes

Academic performance and task completion obtained an aggregate mean of 2.97 and an aggregate standard deviation of 0.54, interpreted as Very Satisfactory. Improvement in academic performance scored highest (3.37, 0.49) and was the only indicator rated Excellent. The ability to follow instructions and finish classroom activities scored 2.97 (0.49), successful completion of assigned work 2.93 (0.64), mastery of targeted learning competencies 2.87 (0.51), and submitting work within the expected period was lowest at 2.73 (0.58). All of these were Very Satisfactory. The perceived improvement cannot be attributed to assistive technology alone, since instruction, family involvement, motivation, and specialized services may also contribute. Slow submission should not be read as lack of knowledge, because learners may need more time to process directions or operate devices. Paglialunga et al. (2025) found promising but design-limited evidence of academic gains from technology interventions. Mikropoulos and Iatraki (2023) identified motivation as a frequent benefit. Gist and Bulla (2022) found small to large effects across 11 studies with 170 participants for repeated practice with measurement. Taconet et al. (2023) reviewed 42 studies of prompting and video modeling. Assessment should separate mastery from speed.

Classroom engagement and participation obtained an aggregate mean of 3.26 and an aggregate standard deviation of 0.49, described as Excellent. Interest and motivation scored highest (3.50, 0.51), followed by active participation in discussions (3.40, 0.50), appropriate interaction with teachers and peers (3.37, 0.49), and engagement in learning activities (3.33, 0.48), all Excellent. Sustained attention was lowest (2.70, 0.47) and was rated Very Satisfactory. The 0.80 difference between motivation and sustained attention shows that interest does not guarantee sustained concentration, which may be affected by sensory, cognitive, behavioral, or environmental factors. Dechsling et al. (2022), Fu et al. (2025), Da et al. (2025), and Ariza et al. (2025) showed that technology-supported activities can promote interaction and attention, but they also noted weaknesses in research design and uncertain transfer and long-term effects. Technology should be used selectively, because animated or crowded applications may distract.

Communication and functional independence obtained an aggregate mean of 3.07 and an aggregate standard deviation of 0.64, interpreted as Very Satisfactory, and no indicator reached Excellent. Independence in completing learning tasks scored highest (3.17, 0.70), the largest standard deviation among the indicators. Making appropriate decisions about learning activities followed (3.10, 0.66). Appropriate communication strategies during instruction and classroom routines with minimal assistance both scored 3.07 (0.64). Effective communication of needs and ideas was lowest (2.93, 0.58). Independence was thus rated slightly higher than communication, and task completion alone does not guarantee learner agency. Crowe et al. (2021) reported that AAC interventions improved communication skills for 97% of participants. Brittlebank et al. (2024), Dumitru et al. (2025), and a 2025 early AAC study similarly supported individualized communication systems, partner preparation, and early access.

Attainment of individualized or curriculum-based goals obtained an aggregate mean of 3.25 and an aggregate standard deviation of 0.49, at the lowest boundary of the Excellent category. Progress toward individualized learning goals and measurable improvement in targeted skills both had a weighted mean of 3.43 (standard deviations 0.57 and 0.50). Attaining curriculum-based competencies and meeting outcomes in individualized plans both scored 3.17 (0.38) and were Very Satisfactory. Achieving the objectives identified in the educational program was lowest (3.07, 0.64). A learner may show meaningful growth without reaching every target, so evaluation should consider growth from baseline. Kurth et al. (2022) noted weaknesses in the quality of IEP components. Swain et al. (2022) stressed systematic goal data

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collection. Wilcox et al. (2021) supported data-based decision making. The ratings are perceptual and do not show that assistive technology caused these outcomes.

Consolidated across the four dimensions, learning outcomes had a grand mean of 3.14 and a grand standard deviation of 0.54, interpreted as Very Satisfactory. Classroom engagement and participation ranked first (3.26, 0.49), followed by attainment of learning goals (3.25, 0.49), both Excellent. Communication and functional independence ranked third (3.07, 0.64), and academic performance and task completion was lowest (2.97, 0.54), both Very Satisfactory. Active involvement offers more opportunities to practice and receive feedback, but participation does not automatically produce timely mastery. Dell'Anna et al. (2022) found favorable outcomes from inclusion that depend on instructional quality. Van Herwegen et al. (2024) reported that targeted interventions yielded about five months of additional progress. Mukhtarkyzy et al. (2025) and Guo et al. (2025) supported need-matched assistive technology and parental involvement.

Relationship between assistive technology utilization and learning outcomes

The Pearson product-moment correlation was used to test the relationship between the extent of assistive technology utilization and learning outcomes at a 0.05 level of significance, two-tailed. The coefficient was r = 0.139, a negligible positive relationship, and the coefficient of determination was r^2 = 0.019, so the two variables shared only about 1.9 percent of their variance. The probability value of p = 0.464 exceeded 0.05, so the null hypothesis was not rejected. There was insufficient evidence of a significant relationship among the 30 respondents. This is an absence of evidence in the present sample and not proof that assistive technology lacks educational value, and it does not establish a causal effect. Three conditions may explain the result. Both variables were rated high, which narrows variation. The sample of 30 limits statistical power. Frequency of use may not capture quality or fit. Al-Dababneh and Al-Zboon (2022) found that curricular use depends on teachers' beliefs, knowledge, and competence. Howorth et al. (2025) stressed individualizing support by student, environment, task, and tool. Voultsiou and Moussiades (2025) reviewed 139 studies and noted both potential and persistent implementation challenges. The ratings were teacher perceptions at a single time point, and the overall score may conceal differences among devices, disabilities, and outcome domains. Future studies should use more respondents, learner-level records, objective measures, pretest-posttest designs, and separate analyses by technology type.

Synthesis

Overall, the 30 teachers reported a High extent of assistive technology utilization (grand mean 3.22), with teacher competence (3.51) as the strongest component and availability and accessibility (2.93) as the weakest. They reported Very Satisfactory learning outcomes (grand mean 3.14), led by engagement (3.26). The relationship between utilization and outcomes was negligible, positive, and not statistically significant (r = 0.139, p = 0.464), and the null hypothesis was not rejected. These results address the research objectives by describing current practice, locating strengths and gaps, and showing that frequent use alone does not statistically predict better outcomes in this setting. The study contributes local evidence that appropriateness, access, technical support, and monitoring matter alongside teacher competence. These findings lead into the conclusions, the recommendation, and the proposed School-Based Assistive Technology Enhancement Action Plan.

CONCLUSION

Based on the findings, the study concluded that assistive technology was utilized to a great extent at Zapatera SPED Center, particularly in terms of teacher competence. However, improvements in accessibility and appropriateness were needed to address the diverse learning needs of LSENs. The learning outcomes of LSENs were generally favorable, especially in classroom engagement and participation. Nevertheless, academic task completion and communication skills required further instructional support. The study revealed no statistically significant relationship between assistive technology utilization and learning outcomes ($r = 0.139$, $p = 0.464$). This indicated that greater reported technology utilization was not significantly associated with better learning outcomes among the respondents. In professional practice, the findings emphasized the importance of individualized assistive technology selection, appropriate instructional strategies, and continuous learner progress monitoring. For program development and policy implementation, the results highlighted the need to strengthen equitable access, teacher development, resource allocation, and school-based support systems to promote responsive and inclusive education.

It is recommended that Zapatera SPED Center adopt and implement the proposed School-Based Assistive Technology Enhancement Action Plan developed from the findings of the study. The proposed plan shall serve as a guide for improving access to appropriate assistive technology, strengthening instructional support, and establishing systematic monitoring of learner progress. Its implementation may be periodically evaluated to determine its effectiveness and guide necessary improvements.

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