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The Use of Assistive Technology for Students With Disabilities in Technical Colleges in Ondo State

Deborah Ahuoiza Vincent, MTech
University of Nigeria, Nsukka, Enugu, Nigeria
https://orcid.org/0000-0002-2785-0836

Rebecca Oyenike Okeowo, PhD
Lagos State University of Education, Oto/Ijanikin, Lagos State

Samson Ariyo, PhD
University of Nigeria, Nsukka, Enugu, Nigeria
https://orcid.org/0000-0002-1512-5645

Contact: *deborah.vincent@unn.edu.ng*

Abstract

The goal of this study was to explore the use of assistive technology (AT) for students with disabilities in technical colleges in Ondo State. Three research questions guided the study. A cross-sectional survey design was adopted and the survey included 104 participants (38 university lecturers and 66 students with disabilities) drawn from the three technical colleges in Ondo State. A structured questionnaire consisting of 54 items was also adapted and used in data collection. The reliability coefficient of the instrument was 0.86. The data collected were analyzed using SPSS Version 26. The findings of the study revealed that while there are ATs available for students with disabilities in technical colleges in Ondo State, their utilization is limited. The study recommends that technical colleges in Ondo State increase access to ATs in classrooms and laboratories for students with disabilities. The government and school management should also provide adequate, modern instructional facilities and human resources to enable the implementation of ATs and make them accessible and available to all.

Keywords: *assistive technology (AT), technical education, technical college, students with disabilities*
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Introduction

Education is a fundamental human right. Over the last decade, there has been increased focus on inclusive education, which aims to provide equitable access to education for all students, including those with disabilities (Dey & Bika, 2023). Assistive technology (AT) has been proven effective in enabling students with

Note: Special thanks to all authors whose work was cited in this research.

disabilities to access educational opportunities. AT consists of devices or software that help individuals work around challenges and enable them to learn, communicate, and function more successfully (Jamie, 2021). These special tools are designed to enhance the academic results, performance, and life-long learning of all individuals—not just learners with exceptional needs, but those in the general school system (Akpan & Beard, 2013). With the use of AT, people with disabilities and individuals who have specific educational or therapeutic requirements can function more effectively (Lancioni et al., 2013), overcome challenges, and be provided the opportunity to learn and communicate (Adebisi, 2015).

In the educational setting, AT offers numerous solutions to persistent problems, providing support to meet students' needs (McKnight and Davies, 2012). The reading, writing, visual, auditory, and communication aids that students are supposed to master within the educational system can be classified as assistive technologies (ATs) (Day et al., 2011; Coleman, 2011; Jamie, 2021). There are high-tech and low-tech ATs, including desktop and laptop computers (Hersh, 2020). The World Health Organization (2006) indicated that ATs that improve mobility, hearing, vision, or communication abilities include wheelchairs, prostheses, hearing aids, visual aids, and specific computer software and hardware. The use of ATs such as braille, audio texts, magnifiers, and screen reading software can help students with visual impairment improve their reading abilities (Muradyan, 2023). The functional performance and academic progress of students with disabilities are improved or maintained through the use of AT (Alnahdi, 2014). In the context of this study, ATs are any tools or devices that can serve as learning support for people with disabilities. AT allows students to access and participate cheerfully and autonomously in the educational process and is, therefore, a necessity for technical colleges.

Technical colleges, in particular, may need to prepare for a rise in the use of AT as it offers students with disabilities practical, hands-on experiences that can enhance their career prospects. Technical colleges are concerned primarily with imparting vocational and technical skills for employment or self-employment (Vincent, 2022): their educational programs include computers, business, agriculture, home economics, and technical fields. These programs also cover a variety of occupational trade fields, including auto mechanics, electrical and electronics jobs, carpentry and woodworking, bricklaying, agriculture, ornamental horticulture, forestry, catering, garment manufacture, cosmetology, and other areas of employ (Ariyo et al., 2020). Technical colleges contribute to increasing the effectiveness and efficiency of the educational system and provide young people with the skills and knowledge needed for employment in industry (Cong & Wang, 2012). In the face of unemployment and underemployment across Nigeria, technical education has become central, which implies the need to strengthen programs through the use of ATs and thereby enhance the functioning capacities of students with disabilities.

The goal of this study is to contribute to the ongoing efforts toward making vocational and technical education more inclusive and accessible to all students, irrespective of their disabilities. Therefore, we explored the use of ATs for students with disabilities in technical colleges in Ondo State, with a view to assessing the available ATs and the extent to which they were being utilized, as well as measures for effective implementation of ATs in technical college programs to enhance the functional capabilities of those with disabilities.

Literature Review

Understanding the Importance of Assistive Technology

The use of AT to promote inclusive education for students with disabilities has been shown to have tremendous potential. Researchers have defined AT as including a broad range of tools, gadgets, and software made to accommodate a variety of disabilities, such as visual, auditory, mobility, and cognitive impairments (Viner et al., 2020). Numerous studies have explored the importance of AT, which has completely transformed the learning experiences of students with disabilities, promoting personalized and engaging settings for learning (Alnahdi, 2014). Assistive technology can close the learning gap for students with

disabilities, allowing them to participate actively in the educational process (Akpan & Beard, 2013; Alnahdi, 2014). Specifically, AT can be adapted to individual requirements, allowing students to learn at their own pace and enhancing their academic performance (Adebisi et al., 2015). Moreover, the incorporation in schools of ATs, such as communication tools and adaptive software, has promoted peer relationships and better social inclusion (Dyzel et al., 2020). These beneficial effects go beyond the classroom, supporting students with disabilities in pursuing further education, fulfilling work, and lifelong learning (Dragana et al., 2014). Assistive technology is essential to improving quality of life for people with disabilities in the areas of healthcare and independent living. For people with limb impairment, advanced prostheses and mobility aids have helped them recover physical function and boost independence (Ward-Sutton et al., 2020). For people with hearing impairment, ATs such as hearing aids and cochlear implants have created new chances for social interaction and successful communication (Drelick et al., 2022). For people with visual disabilities, ATs such as screen readers and magnification software provide access to information and make involvement in many facets of contemporary life possible (Mishra, 2023).

However, despite the many advantages of AT, there are still obstacles to its broad adoption. Access to AT devices and services is frequently hampered by financial limitations, and lack of knowledge and training often results in the underuse of accessible technology by users and caregivers (Danemayer & Lim, 2023). Overcoming these obstacles will be crucial to the integration of AT into technical colleges, which is becoming a focus point for improving learning experiences and fostering equity in education as educators and policymakers become more aware of its potential.

Benefits and Challenges of Integrating AT Into Educational Settings

Numerous studies have investigated the benefits of using AT in educational environments. These studies (e.g., Amwe & Dommak, 2021; Delich & Roberts, 2017) show improved academic achievement, higher engagement, and improved social connections among students with impairments. With the use of AT, students may have individualized learning experiences and work at their own speed and level of proficiency (McNicholl, 2019). Dyzel et al. (2020), in their investigation on the effects of ATs such as communication tools and adaptive software, found they improved students' capacity for social interaction with classmates and teachers, thereby fostering a more inclusive learning environment. Increased self-esteem and confidence in students with impairments have been associated with the integration of AT (Areej, 2018). Delich and Roberts (2017) determined that AT encourages students to engage actively in both academic and extracurricular activities, enhancing their sense of accomplishment and belonging. Students' increased social involvement and communication have benefited greatly from the introduction of ATs in the classroom (Akpan & Beard, 2013).

The broad use of AT in educational contexts, however, is hampered by a number of difficulties, despite the benefits that seem promising. Chambers (2020) and Fernández-Batanero et al. (2022) indicated problems, including lack of knowledge, inadequate teacher preparation, and scarce financial resources. Financial limitations frequently make it difficult for schools to invest in AT equipment and services (Sami, 2016). The underuse of accessible AT tools by educators may be caused by a lack of knowledge and training on their part (Danemayer & Lim, 2023). Therefore, initiatives for professional development and teacher training are essential for assuring successful integration. Additional difficulties include compatibility and accessibility limitations with current technology. Schools may have trouble locating AT solutions that address a range of impairments and respond to the requirements of specific students (Drelick et al., 2022). The resources of educational institutions may be strained due to the upkeep and technical support requirements for AT devices.

When AT is efficiently integrated into technical colleges, the provision of tailored learning experiences, improvement in social relationships, and the encouragement of inclusion (Haleem et al., 2022) make AT an effective instrument for advancing educational equality. However, financial limitations, lack of knowledge,

and accessibility restrictions highlight the need for a holistic strategy that includes teacher preparation, stakeholder engagement, and increasing investment in AT resources. More research and understanding are needed with respect to the use and utilization of these instruments in practice.

Factors Influencing Integration of AT at Technical Colleges

Integration of assistive technology (AT) in technical colleges has become recognized as a key factor in advancing inclusive education and creating a welcoming learning environment for students with disabilities. According to Fernández-Batanero et al. (2022), institutional support is essential to such integration. Technical education must show dedication to diversity by putting in place the necessary infrastructure and resources to meet the requirements of students with disabilities (ILO, 2017). Ayodeji and Ayodele (2023) emphasized the need for training teachers with the knowledge and abilities to use ATs in their classrooms effectively. Training initiatives should concentrate on educating instructors on the many AT tools, applications, and approaches designed for diverse impairments (Ayodeji & Ayodele). An inclusive learning environment may be created by educators who are skilled in the application of AT. Fernández-Batanero et al. argued the importance of incorporating students in decision-making regarding the choice and customization of AT solutions. In such a collaborative process, AT tools are tailored to meet unique requirements and preferences, giving students a sense of responsibility and ownership (Alnahdi, 2014). A sustainable financing strategy is also required to enable continuing repairs on, improvements to, and replacements of AT devices (McNicholl et al., 2019).

The viability of AT programs is ensured by adequate financing (Areej, 2018). Additionally, as Chambers (2020) emphasizes, creating a culture of inclusion and support for students with disabilities requires educating and training all staff members. Technical colleges may develop an empowering and accessible learning environment that meets the various requirements of students with disabilities by collectively addressing these concerns.

Collaborative Approach to Integration of AT

The collaborative approach to integrating AT has drawn a lot of interest as a viable method for fostering inclusion and maximizing the advantages of AT for people with disabilities. As noted above, a study by Ayodeji and Ayodele (2023) emphasizes the value of giving instructors the guidance and assistance they need for successful implementation of AT in their classrooms. Participation in professional development programs guarantees that educators have the knowledge and ability to maximize the advantages of AT for students with disabilities. Dragana et al. (2014) emphasized the value of inclusive policies that place a high priority on accessibility and that support the funding of AT projects. To adopt AT in schools successfully, policymakers must work with educators and others to establish an enabling environment. Additionally, Amwe and Dommak (2021) stress the need for consulting with students to comprehend their particular requirements and preferences for AT solutions.

Involving families in the process also contributes to building a solid support network outside of the classroom, facilitating the smooth integration of AT at home and in the community. Baker and Pollard (2022) emphasized the significance of interdisciplinary teams cooperating to build and execute customized AT solutions. Through such cooperation, a thorough and all-encompassing strategy that covers the many requirements of students with disabilities is ensured. A distinguishing feature of the collaborative method is the multidisciplinary cooperation of educators, therapists, and assistive technology experts. Delich and Roberts (2017) indicated that the collaborative approach in schools leads to improvements in academic achievement, student involvement, and social connections among children with disabilities. A sense of ownership and buy-in from all stakeholders is also fostered by the collaborative approach, which results in ongoing support and effective long-term integration of AT in educational settings (McNicholl et al., 2019). A

more open and inclusive educational environment is made possible by the collaborative method, as it encourages multidisciplinary cooperation and gives power to all stakeholders.

Theoretical Framework

This study is anchored by the Universal Design for Learning (UDL) propounded by Meyer, Rose, and Gordon in the 1990s. Aiming to meet the many requirements of students, the UDL is a framework for education that attempts to develop inclusive learning environments by offering a variety of means of representation, action, and expression (Meyer et al., 1998). UDL theory places a strong emphasis on the value of creating curricula, teaching, and assessments that take into account learners' diverse needs, preferences, and skills. To accommodate a range of learning styles, interests, and levels of readiness, it advocates the notion that learning environments should be adaptive and flexible (Meyer et al., 2014).

Meyer et al. (2014) identified three primary principles guiding the UDL. These include 1) *multiple means of representation*: offering information in various formats, such as text, audio, and visual aids to enable learners to access and comprehend it through various modalities, 2) *multiple means of action and expression*: providing learners with a variety of ways to demonstrate their understanding and express themselves (such as written assignments, oral presentations, and multimedia projects) based on their strengths and preferences, and 3) *multiple means of engagement*: promoting learners' motivation, interest, and engagement in the learning process by giving options, personalizing learning opportunities, and limiting barriers. The UDL framework is focused on breaking down barriers and advancing fairness in education while acknowledging that every learner has different skills, problems, and histories (Quirke & McCarthy, 2020). It recognizes that an inclusive strategy that values variation and individual diversity may benefit all students (Hartmann, 2015).

In educational systems all across the world, the UDL has become widely recognized and adopted as a paradigm for creating inclusive curriculum and learning environments. To serve different learners successfully, its concepts have been incorporated into legislation, curriculum creation, teacher preparation, and educational technology design (Areekkuzhiyil, 2022). Applying UDL principles in this study thus includes taking into account the various requirements and preferences of students with disabilities while adopting AT in the context of technical colleges in Ondo State. This includes making sure that AT solutions are created with numerous modes of representation, action, and expression, in order to meet various impairments and learning preferences. Applying UDL principles to this study entails looking at how assistive technology in technical colleges provides a variety of means of representation, such as text-to-speech capabilities, alternative formats for visual content, or tactile representations, to support students with disabilities in effectively comprehending and accessing information.

Furthermore, offering learners a variety of opportunities for expressing themselves and proving their comprehension is encouraged by the UDL. This entails looking into how various tools and technologies help students with disabilities connect with the curriculum and convey their knowledge in the context of assistive technology in technical colleges. For instance, to engage in practical activities or finish assignments, students with physical limitations may use assistive technology like modified keyboards, adaptive switches, or speech recognition software.

Statement of the Problem

Changes in technology have continued to bring about advancements and specializations for the use of technology in improving teaching and learning. The demand for improved access to education and increased success in school has brought about the development and inclusion of AT devices and services in educational programs, which has made way for an increase in access to teaching and learning processes for people with disabilities or special needs (UNICEF, 2022). Nevertheless, despite the incorporation of AT in the delivery of

educational programs, there is still limited access to the use of AT in technical colleges. This limitation may hamper the smooth transmission of knowledge and services, thus hindering the quality of teaching and learning for people with disabilities in technical colleges. Research has demonstrated that the unavailability of learning resources and inadequate access to learning are major factors responsible for low achievement in educational programs by people with disabilities, especially in technical education programs that require practical skills for training (Okongo et al., 2015). While the issue of limited access to AT in educational programs is a global one, we chose to focus on Ondo State due to its distinctive educational context, its capacity to inform larger policy discussions, and the necessity of having a thorough understanding of localized factors that influence AT utilization. We believe the study provides critical insights that can be applied both locally in Ondo State and in the broader drive to provide inclusive and accessible education. It is imperative to assess the use of AT in technical colleges by identifying a) the available ATs in technical colleges, b) the extent to which technical college teachers and students make use of ATs in the delivery of technical education programs, and c) the measures necessary for effective utilization of ATs in technical colleges for educational improvement.

Purpose of the Study and Research Questions

The purpose of this study was to explore the use of AT for students with disabilities in technical colleges in Ondo State. The study was focused on investigating and analyzing the specific AT tools that were currently being used to support students with disabilities at these colleges and the measures required for the effective implementation of these tools in this context. Through this comprehensive examination, the study endeavored to contribute valuable insights into enhancing accessibility and inclusivity for students with disabilities within the technical college education system in Ondo State. The following research questions were formulated to guide this study:

1. What are the assistive technologies available for use for students with disabilities in technical colleges in Ondo State?
2. What are the assistive technology tools that are utilized for students with disabilities in technical colleges in Ondo State?
3. What are the measures for effective implementation of assistive technologies for students with disabilities in technical colleges in Ondo State?

Methods

The research design employed a cross-sectional survey. Setia (2016) described a cross-sectional survey design as one used to gather data from a sample of people or a population at a specific point in time. This study's design was appropriate since it aimed to identify assistive technologies and sought opinions from teachers and students with disabilities on the use of assistive technology in technical colleges. The use of a cross-sectional survey design allowed us to get a quick overview of the current state of AT usage in technical colleges. This allowed us to evaluate the situation, identify challenges, and make recommendations for improvement based on the most recent data. The study was conducted in Ondo state, one of the 36 states that make up Nigeria; situated in the southwest, its capital is Akure. The Yoruba ethnic group makes up the majority of the state's population, which is otherwise diverse. Through its colleges, polytechnics, and universities, the state offers various educational opportunities.

Participants

The three technical colleges in Ondo State made up the study's population: Federal Science and Technical College, Ikare Akoko; Government Technical College, Owo; and Government Technical College, Idanre. In all, 38 teachers and 66 students with disabilities participated in the study. Because the population was small enough to control, there was no sampling done.

Instrumentation

A standardized questionnaire served as the study's instrument. The questionnaire items were adapted from Nwahunanya et al. (2020) because their study advocates for inclusivity, integrates assistive technology, and increases knowledge of how technology can enhance educational opportunities for students with physical disabilities in vocational colleges. Thus, it correlates significantly with the current study. In addition, this adaptation permits comparative analysis, expands on earlier research, and adds to the body of knowledge in the fields of inclusive education and assistive technology. The questionnaire is divided into two sections, A and B. Section A elicited demographic information from the respondents, while Section B had 54 item statements that sought information to answer research questions 1 to 3. The responses in Section B were based on a 4-point scale that ranges from 4 to 1. Responses to Research Questions 1 and 3 were comprised of the following: Strongly Agree (SA) = 4, Agree (A) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1. Responses to Research Question 2 were comprised of: Highly Utilized (HU) = 4, Utilized (U) = 3, Not Utilized (NU) = 2, and Highly Not Utilized (HNU) = 1.

Data Collection

The study employed a cross-sectional survey design, with questionnaires serving as the primary tool for data collection. The questionnaires were administered to the teachers and students by the authors, who were conversant with the terrains of the study area. The respondents were allowed 2 weeks to fill out the questionnaire and return it to the authors. We, the researchers, then received the copies of the questionnaire and collated the data for coding and analysis. One hundred and six copies of the questionnaire administered were retrieved, representing a 100% return rate.

Data Analysis

The research questions were analyzed using descriptive statistics such as means and standard deviations. The data was analyzed using IBM Statistical Package for Social Sciences (SPSS) version 26. The decision rule was based on a mean benchmark of 2.50, where items with a mean response of 2.50 and above implied that they were utilized or agreed with, while items with a mean value below 2.50 were considered not utilized or disagreed with.

Results

Research Question 1

What are the assistive technologies available for use for students with disabilities in technical colleges in Ondo State?

Table 1. *Mean and Standard Deviation Analysis of Responses of Teachers and Students on Assistive Technologies Available*

S/N	Item statements	*X*	*SD*	Remark
1	AT for writing	3.40	0.77	Agree
2	AT for reading	3.45	0.72	Agree
3	AT for math	3.41	0.80	Agree
4	AT for listening comprehension	3.44	0.77	Agree
5	Academic and learning aids	2.88	0.94	Agree
6	Assistive listening devices and environmental aids	3.03	0.52	Agree
7	Mobility aids	3.21	0.62	Agree
8	Aids for daily living	3.35	0.91	Agree
9	Recreation and leisure aids	2.55	0.85	Agree
10	Prevocational and vocational aids	3.34	0.90	Agree
11	Environmental control aids	3.41	0.79	Agree
12	Computer access and instruction	3.48	0.69	Agree
13	Visual aids	3.56	0.63	Agree
14	Seating and positioning aids	3.52	0.75	Agree

Note: S/N = Serial Number; *X* = Mean; *SD* = Standard deviation.

In the data presented in Table 1, the mean rating of the responses of teachers and students ranges from 2.55 to 3.56, which are all greater than the cut-off point value of 2.50 on a 4-point rating scale. This indicated that the 14 items in the table are agreed upon by the teachers and students to be available ATs in their colleges. The standard deviation values of the 14 items in the table ranged from 0.52–0.94, which indicated that the respondents are not only close to one another in their responses, but also close to the mean.

Research Question 2

What are the assistive technology tools that are utilized for students with disabilities in technical colleges in Ondo State?

Table 2. *Mean and Standard Deviation Analysis of Responses of Teachers and Students on AT Tools Utilized*

S/N	Item statements	*X*	*SD*	Remark
15	Desktop and laptop computers	3.54	0.74	U
16	Mobile devices (includes smartphones and tablets)	3.75	0.77	U
17	Chromebooks	3.61	0.76	U
18	Text-to-speech (TTS)	1.98	0.74	NU
19	Dictation (speech-to-text)	2.00	0.72	NU
20	Word prediction	3.54	0.69	U
21	Optical character recognition (OCR)	1.86	0.72	NU
22	Graphic organizers	1.73	0.71	NU
23	Annotation tools	1.66	0.70	NU
24	Display control	1.57	0.73	NU
25	Dictionaries and thesauri	3.20	0.60	U
26	Handwriting tools (i.e., pencil grip)	3.60	0.72	U
27	Keyboards and touchscreens	3.61	0.54	U
28	Spellcheck and grammar check	3.57	0.59	U
29	Math notation tools	3.48	0.79	U
30	Electronic worksheets	3.45	0.87	U
31	Calculators (i.e., talking calculators)	2.09	0.77	NU
32	Graph paper	3.46	0.73	U
33	Graphing tools	1.60	0.80	NU
34	Drawing tools	3.58	0.92	U
35	Equation-solving tools	2.17	0.77	NU
36	Manipulatives	2.21	0.68	NU
37	Audio recorders	3.69	0.71	U
38	Sound field systems	1.59	0.83	NU
39	Noise-canceling headphones	2.37	0.77	NU
40	Personal listening devices (PLD)	2.12	0.81	NU
41	Captioning (i.e., closed captioning on television)	2.25	0.72	NU
42	Phonetic spelling software	1.99	0.77	NU
43	Variable speed recorder	2.42	0.67	NU
44	Videotaped social skills	1.59	0.81	NU

Note: S/N = Serial Number; *X* = Mean; *SD* = Standard deviation; U = Utilized; NU = Not utilized.

The data presented in Table 2 reveals that items 15, 16, 17, 20, 25, 26, 27, 28, 29, 30, 32, 34, and 37 are utilized, with mean values ranging from 3.20 to 3.75. This shows that the mean of each item was above the cut-off point of 2.50, indicating that the respondents agree that the items are AT tools utilized in the technical colleges. The table further shows that the standard deviation (SD) of the items was within the range of 0.54 to

0.92, indicating that the opinions of the respondents were not far from one another in their responses. The data presented in Table 2 also reveals that items 18, 19, 21, 22, 23, 24, 31, 33, 35, 36, 38, 39, 40, 41, 42, 43, and 44 are not utilized, with mean values ranging from 1.57 to 2.42, indicating that the respondents agreed that they do not utilize these items in the technical colleges. The table further shows that the standard deviation (*SD*) of the items was within the range of 0.67 to 0.83, indicating that the opinions of the respondents were not far from one another in their responses.

Research Question 3

What are the measures for effective implementation of assistive technologies for students with disabilities in technical colleges in Ondo State?

Table 3. *Mean and Standard Deviation Analysis of Responses of Teachers and Students on Measures for Effective Implementation of AT*

S/N	Item Statements	*X*	*SD*	Remark
45	Adequate provision of AT	3.71	0.63	Agree
46	Making AT accessible to users	3.59	0.58	Agree
47	Adaptation of AT into technical college curriculum	3.56	0.55	Agree
48	Integration of AT into technical college curriculum	3.74	0.49	Agree
49	Training students with disabilities on the use of AT to aid efficient learning process	3.53	0.72	Agree
50	Providing support and guidance to teachers on the use of AT	3.62	0.52	Agree
51	Orientating students and teachers on effective utilization of AT	3.50	0.73	Agree
52	Provision of adequate infrastructure or conducive environment to stimulate the utilization of AT	3.74	0.60	Agree
53	Effective monitoring and periodic review of AT utilization in technical college	3.51	0.63	Agree
54	Integrating different media to create awareness of AT for educational purpose in technical college	3.35	0.85	Agree

Note: S/N = Serial Number; *X* = Mean; *SD* = Standard deviation.

In the data presented in Table 3 above, the mean rating of the responses of teachers and students in the technical colleges ranges from 3.35 to 3.74, which are all greater than the cut-off point value of 2.50 on a 4-point rating scale. This indicated that all the items in the table are agreed upon by teachers and students to be the measures for effective implementation of assistive technologies for students with disabilities in technical colleges in Ondo State. The standard deviation values of the items in the table ranged from 0.49–0.85, which indicated that the respondents are not only close to one another in their responses, but also close to the mean.

Discussion

The study identified the AT available for use in three technical colleges in Ondo State. These technologies consisted of writing, reading, math, and listening comprehension; academic and learning aids, listening devices, and environmental aids; mobility aids; aids for daily living; recreation and leisure aids; prevocational and vocational aids; environmental control aids; computer access and instruction; visual aids; and seating and

positioning aids. The results of this study are consistent with those of Ahmad (2015), who indicated that ATs may be categorized according to their use in reading, writing, math, vision, hearing, computer access, augmentative communication, learning disabilities, and attention deficit hyperactivity disorder (ADHD).

We also identified the AT tools that are utilized in the three technical colleges, such as desktop and laptop computers, mobile devices (smartphones and tablets), Chromebooks, word prediction, dictionaries and thesauri, handwriting tools, keyboards and touchscreens, spellcheck and grammar check, math notation tools, electronic worksheets, graph paper, drawing tools, and audio recorders. We also identified ATs that are not utilized in the technical colleges, such as text-to-speech (TTS), dictation (speech-to-text), optical character recognition (OCR), graphic organizers, annotation tools, display control, calculators (i.e., talking calculators), graphing tools, equation-solving tools, manipulatives, sound field systems, noise-canceling headphones, personal listening devices (PLD), captioning (i.e., closed captioning on television), phonetic spelling software, variable speed recorder, and videotaped social skills.

Our findings concur with those made by other organizations, including those found by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) (2003) which identified laptop and desktop computers, audio cassette tapes, keyboards and touchscreens, Chromebooks, dictionaries, mobile phones, spellcheck and grammar check, drawing tools, and electronic worksheets as assistive technologies that are utilized in schools. However, the majority of the AT tools we identified are not utilized at the technical colleges we surveyed in Ondo State, which may be a result of a lack of awareness among teachers and students, accessibility, and resource constraints.

We identified measures teachers and students regard as necessary for the effective utilization of assistive technologies in the technical colleges. These include adequate provision of AT, adaptation of AT into the curriculum, integration of AT into the technical college curriculum, training students with disabilities on the use of AT to aid efficient learning process, provision of support and guidance to teachers on the use of AT, orientation of students and teachers to effective utilization of assistive technologies, provision of adequate infrastructure or conducive environment to stimulate the utilization of AT, effective monitoring and periodic review of AT, and integrating different media to create awareness of AT for educational purposes.

Our conclusions support Bruinsma's (2011) findings, which indicated that a lack of professional development or training for teachers and students, inadequate funding, and the failure to provide support and guidance to teachers and students could hinder effective utilization of AT. Coordinated efforts and strategic methods are needed to close the gap between the availability of and the actual use of AT at technical colleges. It is, therefore, essential to educate instructors, students, and parents about the available AT tools and their advantages in order to meet individual demands and make sure that the chosen ATs are successful and respond specifically to students with the learning challenges of disabilities. Furthermore, it should be noted that parental and home support is essential in complementing the measures for implementing AT effectively in technical colleges. Involving parents in the process facilitates understanding of individual needs, encourages consistency in AT use between school and home, and allows for ongoing student progress tracking (Haleem et al., 2022). Collectively, institutions, teachers, parents, and the government can help students holistically by utilizing the advantages of AT and fostering inclusive education.

Limitations

It is essential to note that our results may be susceptible to certain limitations. First, our reliance on the opinions of teachers and students could create a potential bias. Different perspectives and impressions may result from different teachers and students' diverse degrees of understanding and experience with AT. Some individuals could be more excited to use these technologies than others, who might be hesitant or have little experience with them. As a result, the findings could not reflect the entire situation with regard to the use of

AT in technical colleges. In addition, participants' responses could be influenced by factors such as social desirability or the desire to give solutions they think would be accepted or positive. This effect can encourage users of assistive technology to overstate its benefits or, equally, to underreport its drawbacks. For future research, triangulation could be employed to overcome the drawback of depending entirely on teachers and pupils. This would entail combining information from a variety of sources, including administrators, decision-makers, and technical support personnel, to present a more thorough and complete grasp of the issue and thereby increase the study's credibility and the validity of the results.

Implications for Theory and Practice

The findings of the study have significant implications that revolve around the need for inclusive education policies, increased funding, professional development for teachers, accessibility guidelines, collaboration, inclusive curriculum development, parental engagement and support, dissemination of best practices, and investment in research and innovation. These policy implications can help policymakers provide a supportive environment for the successful use of AT, thereby advancing inclusive education and providing students with disabilities at technical colleges with equal learning opportunities.

Conclusion

The use of AT in technical colleges has proven to be an effective means of facilitating equal opportunities for all learners. The study found that students with learning difficulties, such as physical, auditory, or visual impairments or disabilities, in technical colleges in Ondo State are using AT. The study findings show that ATs help people with special educational needs in a variety of ways, including listening, writing, reading, calculating, and everyday living. Nevertheless, the study indicates that the use of AT in technical colleges in Ondo State is still very low. Therefore, it is important for technical colleges and other educational institutions to continue to invest in the development and implementation of AT to ensure that all students have equal access to educational opportunities, to enhance the functional capabilities of people who are disabled, and to give them the chance to achieve their full potential.

Recommendations

Based on the findings of the study, we offer the following recommendations:

1. Technical colleges should ensure that assistive technology is routinely maintained and updated to ensure it continues to function effectively.
2. Technical colleges in Ondo State should increase access to AT for students with disabilities in classrooms and laboratories.
3. Technical colleges should provide financial support to students with disabilities to help them acquire the necessary assistive technology.
4. The government and school administrations should provide modern instructional facilities to enable AT utilization and should make it accessible and available to all.
5. Adequate human resources should be provided to foster its implementation.
6. Regular training and retraining should be given to teachers and learners for effective utilization of AT.

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