AVAIIABILITY AND UTILIZATION OF ASSISTIVE TECHNOLOGY TOOLS BY STUDENTS IN NIGER STATE SCHOOL FOR SPECIAL EDUCATION, MINNA, NIGER STATE.

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2015/1/57953BT

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ABSTRACT

This study assessed of the availability and utilization of assistive technology tools by students in Niger state school for special education, Minna, Niger State. The study adopted descriptive research survey design. The study population comprised all the five hundred and ninety-seven (597) students in the Niger State school for special education Minna, Nigeria. The sample consisted of eighty (80) students drawn randomly from the study population. The instrument used to collect data for the study was a questionnaire titled "Questionnaire on the Availability and Utilization of Assistive Technologies" (QAUAT)" while the data collected was analysed using mean and percentage. The findings showed that assistive technologies are not available and are not utilized in special education school, Niger State. The null hypotheses developed for the study were accepted at 0.05 level of significance. The finding revealed that, there was a significant difference on gender and the utilization of assistive technologies; The study recommended among others that, assistive technologies be made available and adequately utilized for teaching and should be made compulsory in all the special schools in Nigeria.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURE

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

It is a well-known fact that no country can progress above its level of education (Onyebueke, 2014). As a result, the Nigerian government has stressed the importance of providing quality education services to all people. To accomplish this, comprehensive incorporation of Information and Communication-based Technologies (ICT) as an integral part of the teaching and learning process, as well as other educational needs, is needed. Individuals with special needs benefit from using ICT resources to complete tasks and it alleviates their challenges. Adoption of information and communication-based technology in special education programs would enhance special education growth in Nigeria (Drigas & Ioannidou, 2013). McLaughlin (2021) opined that a special education program is a customized education program designed to meet the unique needs of persons with special needs that the general education programme cannot provide. Students with disabilities' learning are concerned with when and how the instruction is delivered or accessed. As a result of the mandate for an adequate school curriculum in the special environment, a separate educational framework has been developed to meet the educational needs of people with special needs (Hayes, 2017).

Managing disabled children presents difficulties for both families and educators at home and in school. With an effort to find solutions to these challenges of today's world, one of the major challenges confronting teachers and other professionals in meeting the social, behavioural, cognitive, perceptual, and motor needs of children with learning disabilities in the classrooms is the use of technology, the appropriate use, how to choose assistive technology, where to get it, how to use it, and how to evaluate it (Liman *et al*, 2015). Assistive Technology (AT) is a subset of Information and Communication Technology (ICT)

that has its roots in computers. Assistive technology is an umbrella term for assistive, adaptive, and rehabilitative technologies and related services that are specifically designed or tailored to provide technological support to students and individuals with disabilities (Chukwuemeka & Samaila, 2019). Technology, especially the Internet, has taken on a significant role in the social and educational lives of a generation of young people (Owobi, 2008). The incremental inclusion of Nigeria in this global trend, on the other hand, is highly commendable as the internet has resulted in access to materials relevant to students with special needs. Adebisi (2014) maintained that Section 11, subsection 101 of the National Policy on Education mandated the branches of government to provide educational resource centers, which shall offer appropriate Inaformation and Communication Technology (ICT) facilities to make assistive technology tools readily available.

ICT has become an essential component of educational delivery and management processes, and it greatly encourages the development and integration of information. As a result, developing countries will benefit greatly from exceptional opportunities to improve their educational systems, especially for children with special needs. To truly implement these measures, children with special needs must use ICT in their home and school lives. As a result of these, the implementation and utilization of Assistive Technology (AT) is increasingly widespread and requiring the attention of families and professionals due to its ability to improve the lives of children with learning disabilities (Adebisi *et al.*, 2015). From the widespread use of computers and multimedia technologies to environmental controls, technology provides many children with disabilities with the opportunities they need to be more effective in education, at work, and in gaining independence in everyday life (Dikusa, 2018). Certainly, with the assistance of modern and evolving technologies, possibilities today abound for some children with disabilities, creating new dreams that were formerly unavailable (NPE, 2009). As essential as Assistive Technologies (AT) have become to

learners at all levels of education, the use of computer and other technologies, as extended to children with learning disabilities, has enriched and enhanced lives, giving many students with learning disabilities options for intervening in their various educational and cognitive problems, with available resources to assist both teachers and learners overcome classroom teaching and learning challenges.

Chege *et al.* (2018) argued that the major determinants affecting the usage of assistive technology technologies include: insufficient time for syllabus coverage, high AT system costs, quality of teacher training in the use of AT devices, rigid curriculum, and pessimistic attitudes of teachers and learners alike. Variations in experience, philosophy, and values had a substantial effect on the use and selection of assistive technologies. The teacher has a direct impact on the selection and utilization of assistive technology, which can affect how students use those technologies while learning. As a result, Chukwuemeka and Samaila (2019) emphasized the importance of teachers' perceptions in deciding the degree to which assistive technologies are used. The teaching method, experience, and attitudes of the teacher all play a part in deciding the use of assistive technology (AT).

Nkwoagba (2011) opined that technology will unlock doors and break down barriers for disabled children, teenagers, and adults. Both in the classroom or the workplace, assistive technology, which includes computers, software, recordings, and many more, will help individuals with learning disabilities enhance, sustain, or develop their skills. Also, technology that is used for children with learning disabilities, such as spell check, can be principally useful to people with learning disabilities. Consequently, the variety of accessible technology, the sophistication, its dynamism, and the decisions to select the types of technology that would meet the needs of children with learning disabilities pose various questions on its usage, adaptability and availability. At the moment, much information does

exist on all issues related to the choice, accessibility and purchase of any piece of technology; but much of the information is, nonetheless, of varying degrees of affordability and readability, especially in the developing or third world countries, which requires the expertise and necessary skills to use them on children with disabilities. Therefore, in today's learning environments, a wide range of technologies are creating new options for making a distinction in instruction and supporting the participation of all children, including children with learning disabilities. Learners and professionals need to be informed on the importance of providing learners with learning disabilities with the technology tools they need to be successful learners (Ahmed, 2018).

Today, the teaching and learning of individuals with special needs is one area of education that is attracting a universal concern and great pull of technologies towards its enhancement and efficiency. Special education technologies are those technologies that are provided to enhance functional capabilities and encourage individuals with special needs to participate in education, thereby helping them to improve their academic achievement (An *et al*, 2014). Integrating emerging technologies into special education will not only offer help but increase the opportunities for students with special needs to meeting their educational aspirations.

1.2 Statement of the Research Problem

Special education teachers are faced with different challenges of attending to the diverse learning needs of students with physical disabilities in the classrooms. While some of these students cannot read a print document, others experienced difficulty receiving spoken information. To others, communication is the greatest challenge they face while at the same time, the movement to classrooms is the greatest challenge others face. The teachers' role in special education is consistent and significant to students' progress. Consequently, educationists have been working tirelessly to ensure that these students access learning in

ways that take care of their learning differences. This involves the use of assistive technologies in planning instruction, classroom presentation and assessment. Furthermore, the potential of assistive technologies for students with special needs is likely to be found not in the technologies themselves but in the way these technologies are used by the teachers and students as teaching and learning tools. Onivehu *et al*, (2017), opined that the extent of use of assistive technologies in the classroom is determined by the attitude, experience and quality of teachers. This will require both teachers and students to get familiar with assistive devices and software available in their schools which they can use to provide needed accommodation, substitution, modifications, adjustment, and adaptations that will help special needs students to access the environment, curriculum, instruction, or assessment practices. Thus the determinants of the utilization of assistive technology tools within the special education ecosystem cannot be underestimated which has necessitated this research.

1.3 Aim and Objectives

The aim of this study is to examine the availability and utilization of assistive technology tools by students in special schools.

The objectives are to:

1. To investigate the availability of assistive technology in special school in Minna.
2. To determine the use of assistive technologies by students.
3. Investigate if students' gender plays a role in the use of assistive technologies.

1.4 Research Questions

The following are the research questions raised to guide this study:

1. To what extent are assistive technologies readily available in special school, Minna?

2. Is How adequate is the utilization of assistive technologies in special school, Minna?

3. Does the gender of the students play a role in the utilization of assistive technologies?

1.5 Research Hypothesis

The following null hypothesis were formulated to guide this study

HO_1: There is no significant difference in the gender of students and the utilization of assistive technologies in special schools in Minna.

1.6 Significance of the Study

The findings of this study will also be of great benefit to students, parents, school administrators, counsellors, policymakers, government, researchers and other concerned adults to better understand the influence of assistive technologies in the lives of people living with disabilities.

The findings of this research study could be of great benefit to students in special schools, they will be able to effectively use assistive technologies since the research is aimed at discovering the availability and utilization of assistive technologies (AT) in schools.

Parents will also be able to consult this study and gain valuable knowledge and information regarding the utilization of assistive technologies in the lives of their wards.

The findings of this study will prove to be beneficial to school administrators, the study will serve as a guide in the provision and usage of assistive technologies in special schools.

This study will be of importance to school counsellors in the selection of assistive technologies in special schools, they can consult this study to discover the types of assistive technologies and their availability in special schools.

This study will also serve as a reference guide to the government, agencies, parastatals and relevant stakeholders on the importance of assistive technologies in schools especially those that cater towards students living with disabilities.

Other concerned adults such as those who are in contact with people living with disabilities can make use of this study as a guide to further their understanding on the necessary assistive technologies that can be made available to persons with disabilities.

1.7 Scope of the Study

This study investigates the determinants of utilization of assistive Technology tools among students in special school in Minna, Niger State Nigeria. Therefore, the study shall be carried out among students in the special school in Minna, Niger State, Nigeria, and is expected to last for ten (10) weeks.

1.8 Operational Definition of Terms

Assistive: Assistive is a piece of equipment designed to aid a person with a disability.

Technology: Equipment developed from the application of scientific knowledge.

Assistive technology (AT): Assistive technology is an umbrella term that is made up of assistive, adaptive, rehabilitative technologies and related services which are specifically made or adapted to serve as technical assistance for students and professionals with disabilities.

Special Education: Special education are specially designed instruction designed to meet the needs of children with disabilities.

Special education technologies: Special education technologies are those technologies that are provided to enhance functional capabilities and encourage individuals with special needs participation in education, thereby helping them to improve their academic achievement

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Conceptual Framework

2.1.1 Concept of ICT

Information and Communication Technology (ICT) is commonly referred to as technology that supports activities involving information, such activities include gathering, processing, storing and presenting data (Owusu-Ansah, 2021). Kingsley and Patience (2019) defined ICT as any hardware and software technology that contribute in the educational information processing. In the context of present era, ICT mainly comprises of Computer technology with its hardware, like, Personal computer machine, infrastructure required for setting up Internet facility and also software like, CD ROM including various programme packages, E-learning strategies etc. Increasingly these activities also involve collaboration and communication. Hence, information and communication technology (ICT) involves communication and collaboration amongst its users. ICT involves any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form. For example, personal computers, digital television, email, robots. Information and communication technology (ICT), is defined as the combination of informatics technology with other, related technologies, specifically communication technology (Freeman, 2010). ICT is being utilized in every part of life. Due to the increasing importance of the computer, students; the future citizens cannot afford to keep themselves aloof from this potential medium.

2.1.2 ICT in Education

In education, use of ICT has become imperative to improve the efficiency and effectiveness at all levels and in both formal and non-formal settings (Mikre, 2011). Education even at school stage has to provide computer instruction. Profound technical knowledge and positive attitude towards this technology are the essential prerequisites for the successful citizens of the coming decades. ICT encompasses all those gadgets that deal with the processing of information for better and effective communication (Pratt, 2019). In education, the communication process takes place between teachers, students, management and administrative personnel which requires plenty of data to be stored for retrieval as and when required, to be disseminated or transmitted in the desired format.

The hardware and software like OHP, Television, Radio, Computers and related software are used in the educational process. However, ICT today is mostly focused on the use of Computer technology for processing the data. In this context, Ugwu and Kingsley (2019) listed some of the advantages of ICT in education:

Quick access to information: Information can be accessed in seconds by connecting to the internet and surfing through Web pages;

Easy availability of updated data: Sitting at home or at any comfortable place the desired information can be accessed easily. This helps the students to learn the updated content. Teachers too can keep themselves abreast of the latest teaching learning strategies and related technologies in recent times, life has become easier, due to the invention of ICT.

In the last few decades, there have been a tremendous growth in the use of ICT in all fields such as education (distant learning via electronic networks, open learning through students controlled learning pathways, the process of changing teaching and learning styles by using a

narrow range of Information Technology based), facilities; industries, businesses, societies, lives of people (Mallika, 2018). Currently, the educational institutions all over the world are integrating ICT with the teaching and learning process in order to provide knowledge and skills to the learners to meet the challenges of educational environment. Adu and Olatundun (2013) noted that "It is only through the integration of ICT in education that one can teach students to be participants in the growth process in this era of rapid change". Prasad (2018) describes ICT as having revolutionized the way people work today and are now transforming educational systems. Otherwise, if schools train children in yesterday's skills and technologies they may not be effective and fit in tomorrow's ICT world. This is a sufficient reason for ICT to be globally recognized.

Sometime in the year 2002 Kofi Annan, the former United Nations secretary general pointed out that, in order to attain the goal of Universal Primary Education by the year 2005, that Information and Communication Technology must unlock the door of educational systems, which indicates the growing demand and important place that ICT could receive in education (Ugwu & Kingsley, 2019).

Information and communication technology (ICT) has become, within a very short time, one of the basic building blocks of modern society (UNESCO, 2020). Many countries now regard understanding ICT and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing and numeracy (Oyebolu, 2013). UNESCO aims to ensure that all countries, both developed and developing, have access to the best educational facilities necessary to prepare young people to play full roles in modern society and to contribute to a knowledge nation (UNESCO, 2020). The benefits of ICT in education is of such that students in the classroom can all learn from the curriculum material. Students with special needs are no longer at a disadvantage as they have access to essential material and

special ICT tools can be used by students to make use of ICT for their own educational needs. Despite this, it opens up new issues related to the 'digital divide' and providing access to ICT tools and resources for those who are less fortunate (ICTE, 2021).

Keeping pace with technological development and the changing competencies required of both students and their teachers requires a state-of-the-art curriculum and appropriate teacher development. Advancement in ICT increasingly replaces conventional teaching pedagogy. Face-to-face classroom interaction is giving way to online chat, conventional white or blackboards are getting replaced by interactive whiteboards, and books or handwritten materials are being replaced by online resources (Suryani, 2010).

It is expected that technology would usher our education system out of the dark ages and into the light. This is due to the fact that implementing ICT in schools has the ability to have certain gains. However, in order to reap these opportunities, we must first conquer tremendous obstacles. These difficulties may differ from one school to the next, from one region to the next, and from one country to the next (Suryani, 2010). Information and communication technology, or ICT, is defined as the combination of informatics technology with other, related technologies, specifically communication technology.

2.1.3 Assistive Technologies in Teaching and Learning

Young and MacCormack (2014) described assistive technology as "devices and services used to increase, maintain, or improve the capabilities of a student with a disability" (Dell, Newton, & Petroff, 2012). Although the term "assistive technology" can conjure up images of computers and computerized equipment, assistive technology may also be very low-tech. For example, pencil-grips (moulded plastic grips that slide over a pencil) are called assistive technology. Computer programmes and tablet applications that include text-to-speech (e.g., Kurzweil 3000), speech-to-text (e.g., Dragon Naturally Speaking), expression prediction

capability (e.g., WordQ), and visual organisers are examples of assistive technology that assists students of learning difficulties (e.g., Inspiration).

In contrast to other approaches, assistive technology can have a huge impact on assisting students with disabilities in achieving the targets outlined on their Individual Education Plans (Watson et al, 2010). Assistive technology can help students in two ways: it can assist them on how to accomplish a task and it can help them navigate a complex environment. For example, when a student chooses to listen to a digital version of a book, they are bypassing an area of difficulty. However, if the student remains on the computer screen as highlighted words are read aloud, they will be able to understand new words.

We may not think of word processor default functions as groundbreaking, but for students with learning disabilities, features like spell check and text-to-speech can be a huge help when composing and decoding words.

2.1.4 Classification of Assistive Technology

Nsofor and Bello (2015) classified assistive technology into three categories: low, medium, and high technologies.

i. Low Assistive Technologies

Low-tech devices and tools are common and affordable devices and tools that are purposefully built or modified to assist in various areas of difficulty. To name a handful, they include clear pencil grips, magnificent eyeglasses, and large-print cardholders. However, researchers have observed that, as technology advances, low-tech AT is becoming more of a crutch than academic support resources (Rowlands, 2015).

ii. Medium Assistive Technologies

Simple electronic devices (sometimes battery operated) and some relatively complex mechanical devices such as a wheelchair, audiotape recorder, and ordinary calculator are examples of medium technology (Mid-Tech) (Nsofor *et al.*, 2015). Earlier research findings within the special education ecosystem, like the low-tech, showed that these technologies cannot adequately promote student-centered learning. As a result, there is a need to integrate cutting-edge technology into classroom teaching and learning.

iii. High Assistive Technologies

Advanced electronic and digitized computers are examples of high technology (High-Tech). It entails using hardware and software to translate speech to text and text to speech, as well as a portable dictionary, spelling checker, and reading pen, among other things (Nsofor *et al.*, 2015).

2.2.5 Types of assistive Technologies

1. Text-to-speech - Text-to-speech software, such as the Kurzweil 3000, can read digital or written text aloud. This is advantageous because students are able to comprehend text when foreign words are read to them. Text-to-speech can help in encoding and word recognition, as well as reading fluency and comprehension. Text-to-speech software may be particularly beneficial for students who learn better by listening than hearing (Jackins, 2017). This type of software and applications can help students track and revise their typed work because hearing the text read aloud can help students spot grammatical mistakes that might otherwise go unnoticed.

Figure 2.1 Text to Speech Device

Source: LivingMadeEasy (2021)

Strangman and Dalton (2005) concluded from a study of the literature that the use of text-to-speech tools would enhance students' sight reading and decoding skills. Furthermore, text-to-speech applications can increase the reading ability of people who have unique phonological processing difficulties (difficulty recognising letter-sounds), so students can learn to interpret unfamiliar words as they are illuminated as they are read aloud (Fasting & Halaas Lyster, 2005; Holmes & Silvestri, 2009). Students who have trouble reading or writing will benefit from Kurzweil 3000's reading, learning, researching, and organizational assistance. Kurweil 3000 software also increases students' understanding of their work as well as their ability to compose expressively (Chiang & Jacobs, 2009). Text-to-speech services, such as Kurzweil

3000, can reduce the negative emotions students associate with reading and provide students with a fuller comprehension of the text (Young, 2012), and as a result, they are recommended for use alongside research-supported reading intervention activities.

2. Speech-to-text –Writing necessitates both low-level transcription expertise (such as typing, pronunciation, punctuation, and grammar) and high-level composition abilities (e.g., planning, generating content, and revising). Speech-to-text programme converts spoken words into machine text, enabling students to avoid the demands of typing or handwriting; freed from these laborious activities, students may write stories that are longer, more nuanced, and have fewer mistakes (Collins, 2021). The accuracy of speech recognition increases with use; however, inexperienced users may get dissatisfied with the training process and may lack the ability to edit the program's text output effectively. Software applications such as XpressLab can be used to improve expressive oral language for students (LDAOeng, 2019).

Students with learning disabilities can benefit from voice recognition software to improve their word recognition, spelling, and reading comprehension (NCTI, 2010). Essays dictated using Dragon Naturally Speaking outperformed handwritten essays for students with learning disabilities, but essays dictated to a scribe outperformed both (Arcon, 2015). Researchers discovered a difference in impact between students with and without disabilities, demonstrating that this technology removes a disability-based barrier.

3. Word Prediction -Word prediction software was developed initially for students with physical difficulties who had trouble typing. Word prediction with text-to-speech, on the other hand, is useful for students with learning disabilities because it decreases the need for handwriting while improving spelling precision and writing skills. Furthermore, students will

find it fun to have the words suggested by word prediction and to be able to shape sentences without worrying about spelling and word choice (Evmenova *et al.*, 2010).

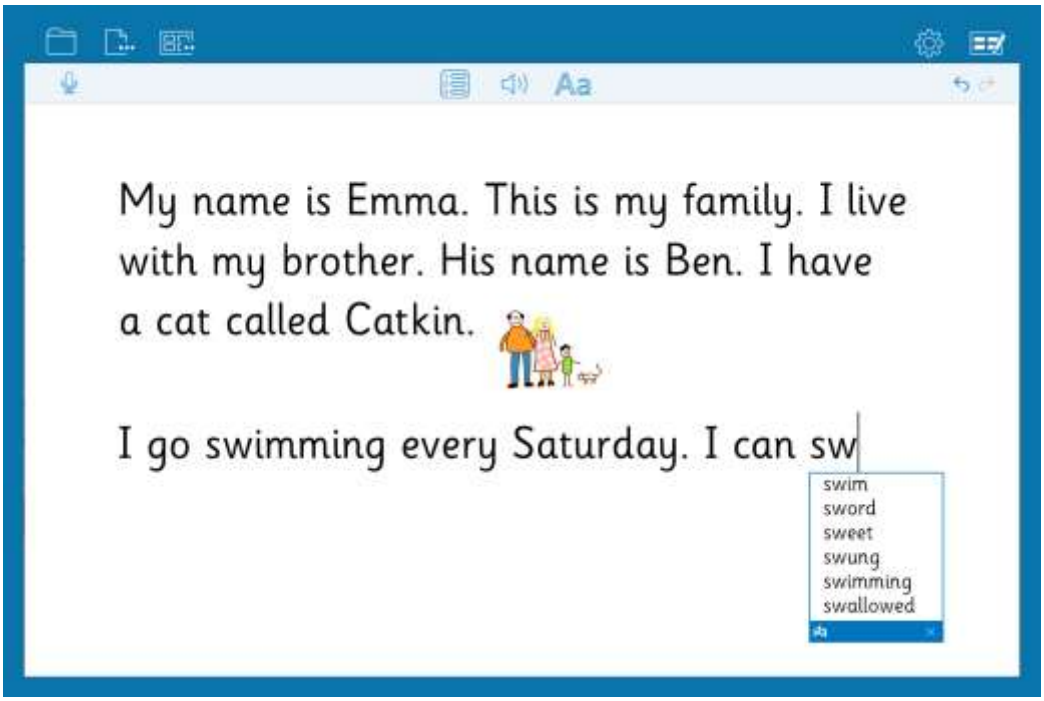


Figure 2.2 Word prediction software

Source: CrickSoftware (2021)

A review of 25 years of study discovered that word prediction improves transcription accuracy and can also improve word fluency and writing compositional ability for students with learning and academic difficulties (Peterson-Karlan, 2011). In one study, children and their families reported better vocabulary usage as well as increased flexibility, efficiency, and desire to write after using WordQ. (Tam et al, 2005). Although there are possible advantages of using WordQ, students who are unable to recognize the beginning sound of words will not benefit from using word prediction software because the user would have the first letters of the word (LDAOeng, 2019). Furthermore, word prediction necessitates a relatively high level of focus in order to use the recommended terms (LDAOeng, 2019); as a result, each child must be evaluated on an individual basis in order to choose the best technology for his or her

learning needs. Adebisi *et al.* (2015) stated that by offering computer-assisted resources, assistive technology will help students with learning disabilities compensate for difficulties in learning, especially in the field of writing. Furthermore, assistive technology can reduce anxiety, increase motivation, promote a sense of peer recognition, and increase success in the classroom and at home.

4. Magnifiers and Screen Magnifiers

Turbet and Gudgel (2020) observed that low vision aids such as magnifiers are optical aids using magnifying lenses to make objects look larger and easier to see. This type of low vision assistive device combines the increased magnification of microscopic view lenses, and a specialized head apparatus for securing the lenses before your eyes. Having access to a magnifier or magnifying glass can be helpful for people who frequently look at small details of objects or read short amounts of text. Magnifiers come in all shapes and sizes, as well as magnification powers. Some are small enough to fit in the user's hand, while others can be supported with a stand. A sheet magnifier can magnify an entire page and handheld magnifiers can be used for reading and exploring outside the classroom (Veronica, 2020).

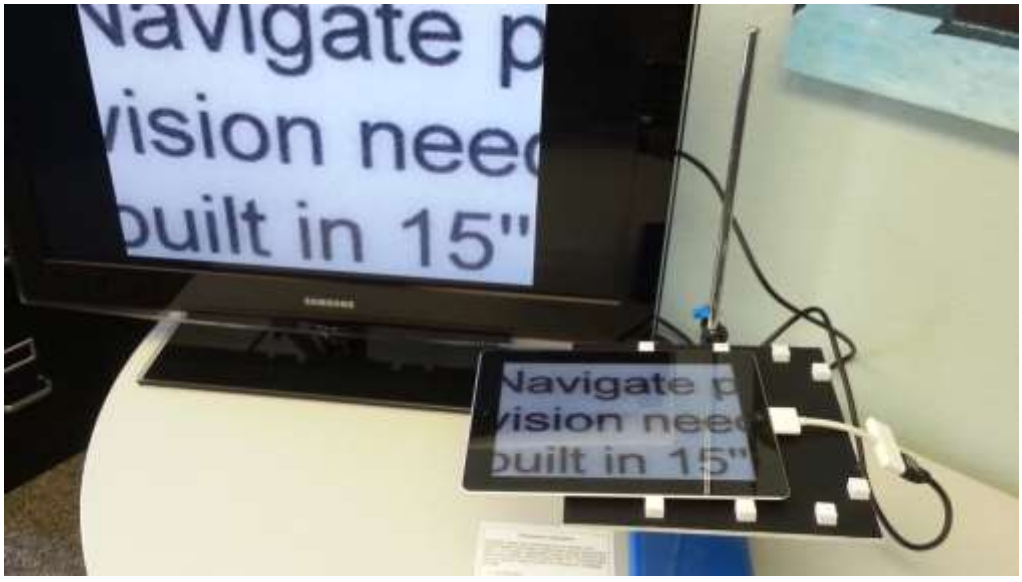


Figure 2.3 Magnification system

Source: Chausee (2013)

This may be a useful low vision aid for hobbies, reading, and other close-up visual tasks. A screen magnifier is a software that interfaces with a computer's graphical output to present enlarged screen content. This type of assistive technology is useful for people with some functional vision; people with visual impairments and little or no functional vision usually use a screen reader (Wikipedia, 2021). Magnifying spectacles are worn like eyeglasses to keep your hands free. They can be used for reading and other close-up tasks. Putriani and Kurniawan (2016) defined screen magnifier or screen enlargers are the tools attached to computers like Windows (Microsoft), Mac OS, and Linux which works like a magnifying glass which the main function is to enlarge computer screen partly so that the objects or writing on the screen more eligible and easier to see. This allows the user to zoom in and out on specific areas of the screen. A screen magnification system enlarges text and graphics on a computer screen. It is loaded into the computer’s memory and functions similarly to a magnifying glass moving over a page, following the cursor, and magnifying the area around it. Using a mouse or keyboard commands, a user positions the cursor on the section of the screen to be magnified or has the cursor move automatically across and down a magnified page at a preset speed. The magnified area may also be emphasized with color and shading, so that users who lose their place on screen may easily locate a magnified area. Fonts used in magnification programs are usually designed to smooth out the jagged or “stair-step” appearance of computer-produced diagonal or curved lines. Today’s full-featured screen magnifiers can magnify all items on a screen, including the mouse pointer, text cursor, icons, buttons, and title bars. The magnifiers also provide a set of mouse tracking features.

Both the magnifier and screen magnifiers employ the same principle and work in a similar fashion, the magnifiers such as the magnifying spectacles and magnifying glasses make use

of magnifying lenses to enlarge objects while the screen magnifiers make use of computer programs to enlarge words and graphics on screens.

5. Voice Amplification Systems

Voice amplification systems consist of a microphone and speakers, there are portable ones that come with a microphone, speakers and batteries attached to each other that can be hung over the user's neck. The systems have a microphone/transmitter, amplifier, and one or more loudspeakers placed at strategic locations in a room (Anderson, 2018). **Amplifiers** are useful in places in which the above systems are unavailable or when watching TV, being outdoors, or traveling in a car. About the size of a cell phone, these devices increase sound levels and reduce background noise for a listener. Some have directional microphones that can be angled toward a speaker or other sources of sound. As with other assistive listening devices, the amplified sound can be picked up by a receiver that the listener is wearing, either as a headset or as earbuds (NIH, 2019).

6. Memory Aids

Memory aids may provide cues to alert someone to the fact that something needs to be done at a particular time and place, or they may act as systems to store information independent of a particular temporal or spatial context. Alarms, timers, and pagers to help people to remember to take medication or take a cake out of the oven belong in the former category, while journals and tape recorders belong in the latter category. Although external memory aids may well be the most efficient strategies for memory-impaired people, it is not always easy for them to use such aids. The use of such aids involves memory, so the people who need them most typically have the greatest difficulty learning to use such aids (Wilson, 2013). Memory aids provide students with an equal opportunity to demonstrate their competence, knowledge, and understanding of course content. They are approved only for

those students who have a well-documented functional limitation related to memory. It is essential to consider whether or not you are evaluating your students' ability to memorize or apply the material. memory aids for severely memory-impaired patients started with the introduction of calendars and "memory books" (Hildebrandt, 2019)

A memory aid is a resource that is used during test-taking. It is designed by and for the student to support the recall of information that has already been learned. Its main purpose is to allow a student to access their learning. A Memory Aid does not replace the need to study or the mastery of a course learning outcome.

7. Mobile Devices

GSMA (2019) opined that mobile devices such as smartphones enable people with hearing loss to access a wide range of tools that can support them in different aspects of their lives. Applications of mobile phones as assistive technologies range from speech-to-text translators, to sign language translators and tools for learning sign language. Action on Hearing Loss offers a search platform that has 37 recommended apps for a variety of functions, including learning signs, enabling communication in a noisy environment, translating from speech-to-text or sign-to-text, alerting apps, video subtitling, and more. For example, Sound Amplifier is an app that filters noise and augments and amplifies environmental sound to provide a more natural hearing experience for people hard of hearing. Another example is Live Transcribe, a real-time speech recognition tool that helps deaf people to participate in conversations. There are around 24,000 people in the UK that use sign language as their first language. Signing text is a strategy that can support sign language users to understand information better. Signly is an app that, combined with augmented reality, offers pre-recorded sign language videos to make information more accessible to sign language

speakers. For the Network Rail, Signly has produced a set of videos with information on safety at level crossings.

Other digital technologies have evolved and their function expanded to serve as and enable assistive technologies to support people hard of hearing and with hearing loss. For instance, gloves are being designed that translate sign language in real-time and display the words in text onto a smartphone or computer. These types of technologies will open new opportunities for a sign language speaker to communicate with those who do not understand.

Augmented reality (AR), when combined with mobile phone applications, can also aid sign language speakers to read books. Baby BSL is an AR storybook that helps hearing parents teach and communicate with their children using sign language. The storybooks use videos, audio narratives and AR to create an interactive pop-up storybook, while supporting communication between parents and children. StorySign, designed by Huawei, is an app that reads books to children in sign language to help them learn how to read.

Hearing aids are devices that help make sounds clearer and louder, and can improve the quality of lives of many people hard of hearing or with hearing loss. In recent years, machine learning has been used to improve noise cancellation in hearing aids, for instance, hearing aids can improve the capacity of the device to filter and remove background noise from people's speech. While these technologies are still being developed, machine learning can improve the clarity of words heard by a hearing aid's user from 10% to 90%. Similarly, Goshawk Communications uses machine learning to improve call quality for users with hearing loss, by adjusting to the speech requirements based on an individual's hearing needs.

8. Communication Boards

Communication between someone who's nonverbal and someone who uses spoken language can be difficult. Communication boards may cut down on some of this difficulty by providing simple, recognizable images and symbols to understand one another.

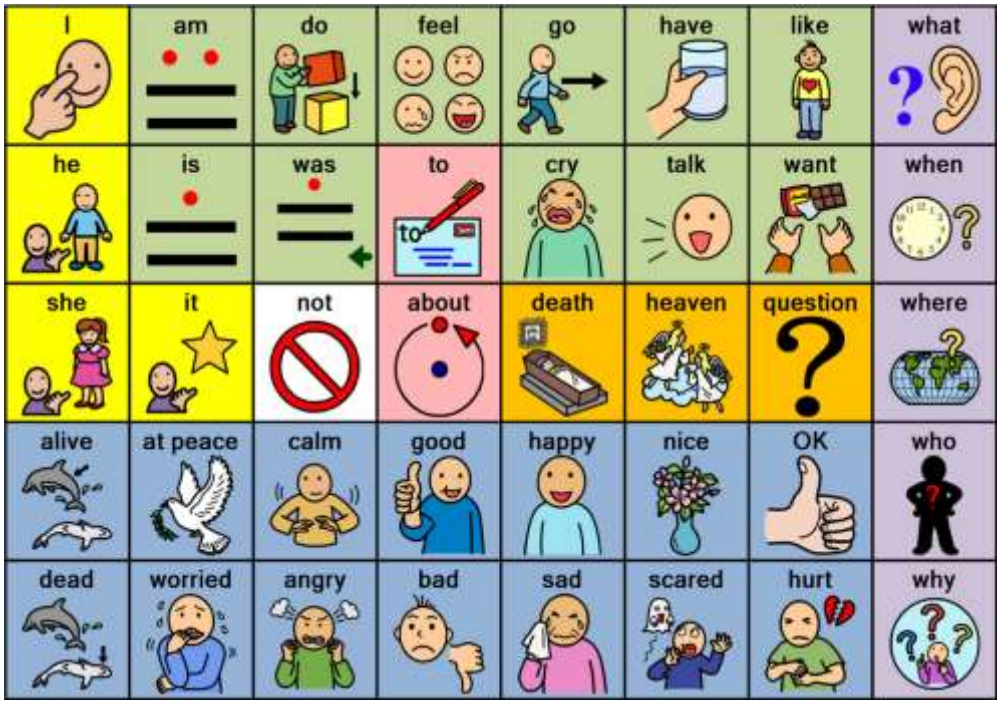


Figure 2.4 Communication Board
Source: Santaniello (2020)

Communication boards can be used to; express a simple message, such as "I need to use the bathroom", ask questions, offer choices and display a schedule or structure. Communication boards help users express their immediate needs and preferences. These boards may increase autonomy by allowing users to make decisions about their own lives, as it allows them to communicate their needs to others more effectively (Healthline, 2020).

Communication Boards are devices that are used to help those who have trouble verbally communicating. A communication board is a device that displays photos, symbols, or illustrations to help people with limited language skills express themselves. The user can gesture, point to, or blink at images to communicate with others.

Communication boards are one type of augmentative or alternative communication (AAC) device. They can be simple, handmade boards or computerized programs. They can be useful in schools, homes, healthcare environments, or any community setting.

The boards are sometimes categorized into two topics: low-tech and high-tech. Low technology boards could be just a sheet of paper broken up into rows and columns with different commands, verbs, adjectives, nouns, etc. with pictures (see Figure 1). High technology boards can be sometimes seen on IPads, where you can press on a button and the device speaks for you (see Figure 2). These devices can be seen and used in various different settings. They are very portable and easy to use! You can purchase pre-made boards or you can personalize them yourself. A communication board can simply consist of a yes/no board or a pencil and piece of paper. The main goal is allowing the child to communicate her needs (Lustik, 2020)

9. Large Print Material

Students with low vision will frequently need materials to be increased in size. It should not be assumed that all students need large print books or enlarged photocopies of worksheets and handouts. Large print is invaluable for people who cannot read standard sized print due to a print disability. Large print is typically size 18 font or larger, though it is up to personal preference as to what font size is best. For best results, pair with a print disability friendly font (Veronica, 2020). Large print materials can be incorporated in both print and digital accessible materials; a larger font size may be required depending on the different types of fonts used.

Careful consideration must be made when choosing to use large print. Some advantages and disadvantages need to be considered when deciding as to whether or not to use large print books (Willings, 2021). Some students will, however, need large print in some or all

situations. Students with poor muscle control, for example, may not be able to have the muscle control to operate optical devices. For students who cannot read regular print at close distances and cannot use low vision devices for motor or other reasons, large type is helpful.

Math workbooks are one area that is perhaps best accessed using large print as they provide a larger area for students to write their responses. It may also be more ideal to provide large print for map worksheets and other diagrams that need to be labeled to allow enough space for the student to write.

If the educational team decides that large print is appropriate, remember its quality and typeface is as important to legibility as is its size. Spacing between letters and lines is also important. If you do choose to use large print, it should be at least 16 to 18 points, but keep in mind that the relationship between readability and point size differs somewhat among typefaces. This is very individualized, and some students will need a larger size print. It is also helpful as a transitional tool for students who are switching from print to braille. It may also be necessary to temporarily use it until the student can be evaluated for the potential use of low vision devices and the necessary instruction can be provided with these devices.

10. Braille Displays

Braille has become much more accessible, of particular note are braille displays (Dan, 2018). These are assistive technology (AT) devices provide access to information on a computer screen. On top are 40 or more braille cells or characters; each one has the six dots, which the display raises and lowers to represent each letter of the alphabet and the numerals 1 through 0 (the last being combined with other numerals to create multiples of 10). Where they differ from braille on paper and other hard surfaces is that change (refresh) continuously as the user moves the cursor around on the screen though any input apparatus, including screen reader commands (e.g., JAWS). It is worth noting the advantages of braille displays have over

synthetic speech: they provide direct access to information; allow the user to check format, spacing, and spelling; and are quiet.

Willings (2021) noted that a braille display device operates by lowering and raising different combinations of pins electronically to produce in braille what appears on a portion of the computer screen. A braille display device connects to a standard computer with a special cable. It takes information appearing on the computer screen, translates it and displays it in braille, a line at a time. A line of refreshable braille consists of a series of electronically-driven pins that pop up to form braille characters. As the cursor on the screen moves across a line or down the page, the line of braille characters changes to reflect what is currently under or near the cursor. This ever-changing line of braille is called refreshable. Refreshable Braille is available on some portable Braille Note talking devices, or on a full 20, 40, or 80-character device that attaches in front of the keyboard on a standard computer. The refreshable braille display provides direct access to information, giving the student the ability to check format, spacing and spelling and is quiet in comparison to a braille writer or embosser.

2.1.6 Importance of the use of Assistive Technology Tools

Aiken and Whitney (2009) studied the use of technology in the curriculum. In their study, students in the School of Business rated their comfort with using technology in the classroom and also using a specific software program in their studies during their academic life and beyond. The study examined participants' level of comfort in using technology in the classroom through the use of software in the classroom. The programs used were the Comfort Scale (CCS) and an Excel-based assessment to determine computer proficiency. The results indicated that students used the software successfully, and it helped them to participate in the School of Business and understand the statistical programs without difficulty. Assistive technology in the classroom is one of the most important accommodations that educational

agencies have to provide; moreover, teachers should be aware of their students' needs (Watson & Johnston, 2007). Additionally, Watson and Johnston report that high–tech computers and software can be helpful tools for students with mild disabilities such as dyscalculia, dyslexia, or dysgraphia. One of teachers' major responsibilities is to provide children, regardless of their disabilities, with successful learning experiences and assistive technology can help teachers to reach this goal giving their students an opportunity for a brilliant future (Netherton & Deal, 2007).

However, accessibility to assistive technology devices is still difficult for financial reasons and prevents some students with disabilities from having access to them in the classroom (Watson & Johnston, 2007).

In schools, millions of students with learning disabilities are not able to access the technology and information available, while in the same school the rest of the students can access the information they need with the click of a mouse (Bausch & Hasselbring, 2006). Through the use of assistive technology and digital technologies, students with learning disabilities are able to gain the same benefits as their peers in the classroom (Bausch & Hasselbring, 2006). Additionally, using software and assistive technology in the home, students with learning disabilities can learn alongside their typically developing peers in the classroom (Bausch & Hasselbring). Typically, students with physical disabilities face difficulties that prevent them from accessing and participating in regular education programs. However, assistive technology allows them to be included in the regular classroom (Raph, 2011). Assistive technologies also provide students with disabilities opportunities for learning independence. There is a great deal of software and assistive technology that can open a bright future for students with disabilities (Hopkins, 2006).

Students with disabilities are one of the user groups benefitting from the opportunities provided by this technology explosion. Assistive technology can provide many possibilities for students with disabilities to experience opportunities which had previously been nonexistent or, at best, limited to them. These students rely on their teachers to provide the necessary assistive technology devices and services to access the available resources (Nyavor, 2020). The importance of assistive technology cannot be over-emphasized to enhance participation and performance of students with disabilities. The use of assistive technologies by students in schools have been endorsed by many countries in the world. Some of the countries have Conventions and Acts in support of its use. For instance, in United States of America, the passage of the Technology Related Assistance for Individuals with Disabilities Act (The Tech Act) in 1988, has made the general education curriculum accessible to students with disabilities. Other countries also have policies such as inclusive education as in the case of Ghana that endorsed the use of assistive technology and the government course in the supply of these technologies (Nyavor, 2020). One of the strategies to achieving the inclusion of assistive technologies in teaching is by ensuring relevant equipment and assistive devices are made available to school children where needed to enable them access quality education. Another strategy is by reviewing all instructional materials and assistive devices for the teaching and implementation of inclusive education in schools to keep abreast of current trends; and new ones developed, printed and made available to schools as appropriate (Nyavor, 2020). This is a clear indication that each country in the bid of practicing inclusive education recognises the relevance of assistive technology.

Assistive technology can help students with physical disabilities tremendously; similarly, Bateni and Maki (2005) found that assistive technology also has many clinical benefits, such as improving people's mobility and their ability to complete daily tasks through the use of

canes and walkers. Mobility aids can increase people's self-confidence and feelings of safety, which helps them to achieve the highest level of independence in their lives. Ahmed (2018) demonstrated that teachers used cooperative learning in the classroom to promote academic achievement and social acceptance of students with and without learning disabilities. Cooperative learning is of interest to classroom teachers because it can provide an opportunity for more instruction and feedback by classmates than that which is provided by teachers to individual students who require additional assistance. Bryant stated that students with learning disabilities may need assistive technology allowing them to engage and interact with their typically developing peers during cooperative learning activities in the classroom. Barriers to the use of assistive technology.

2.1.5 Availability and utilization of assistive technologies

The acquisition of new knowledge and skills is referred to as learning. Children begin learning to read, write, and do arithmetic according to their age and intellectual ability during their early years of development. Despite possessing natural intellectual ability and normal vision, auditory, or physical capacities, it appears that certain children are specifically unable to develop language and arithmetic skills, particularly though appropriate learning resources are offered (Dhanda & Jagawat, 2013). Students with disabilities may use assistive technologies to improve their access to the curriculum and the consistency of their learning environment (Alkahtani, 2013). Many assistive technology technologies are available to help teachers improve their students' cognitive skills by increasing their interest in learning experiences and engagement in events (Starcic & Istenic, 2010). Computer-assisted teaching includes a variety of technological applications that can help students improve their academic performance and reach their full potential. Easy spellcheckers to more advanced speech recognition systems and educational applications are among the innovations available.

Speech recognition, word prediction, spell checker, and mathematics software, among others, have been shown to be useful in meeting the needs of children with unique learning difficulties (Rufus *et al.*, 2015). When students with learning disabilities are unable to meet academic and behavioural goals in school, teachers must understand the need to include appropriate technological tools and support to allow them to accomplish the necessary assignments successfully. As a result, assistive technology is an essential factor in the preparation and development of educational programmes for children with disabilities.

Martin (2021) noted that smartphone devices such as iPhones and androids come with assistive technology features for reading issues he observed iOS has two text-to-speech (TTS) options that are useful for kids with reading issues. Speak Selection lets your child select blocks of text to be read aloud. And Speak Screen reads entire pages of text. For both TTS options, your child can choose to have the words highlighted as they are spoken. This feature can help your child follow along with her eyes as she reads. The voice and reading speed for the TTS can also be changed. If a word isn't read correctly, the way it's said can be adjusted using the Pronunciations feature.

Samaila et al (2020) concluded in their study that assistive resources required for quality teaching and learning in special education schools across North-West Nigeria were not available. The few high-tech assistive resources found in special education schools were not adequate. This inadequacy of assistive devices necessary for teaching and learning of students with special needs could be attributed to poor funding of special education and lack of regular supply of assistive technology by the government. The study also concluded that the few high-tech assistive resources found in special education schools were in good condition. Ahmed (2018) in his study noted that there is an urgent need to make avail assistive technologies in schools for students with disabilities.

2.1.6 Factors that determine the use of assistive technologies

By implementing assistive technology as an integration to school curriculum, the educators can assist children with special needs by providing remedies to solve specific learning problems and can promote independent learning. However, the selection, acquisition and use of AT depends up on the evaluation of the needs of the child and the adequate level of the professionals, who work students with learning disabilities (Campbell *et al.*, 2016). Despite the numerous benefits assistive technologies offers, there are some factors that determine their usage in the classroom, some which have been listed below:

1. **Teachers Awareness:** One of the obstacles is that many educators are unaware of the opportunities that assistive technology can provide students (Messinger-Willman & Marino, 2010). Many "teachers are generally unaware of most AT devices and services available," or have been advised that the cost of providing the equipment to the school is prohibitively expensive, so assistive technology might not even be discussed as an alternative (Messinger-Willman & Marino, 2010). Educators and parents should be vigilant about learning of available assistive devices and insisting on them whether they will help the student. It is up to educators and parents to be advocates for the student to receive the best education possible. To facilitate learning opportunities for children with Specific Learning Disorders (SLD), teachers should use appropriate teaching strategies and materials to reduce or eliminate children's deficits in specific learning areas. The major responsibility of a teacher is to provide children with successful learning experiences regardless of their disabilities, in order to reach their goal for a brilliant future (Kumar & Raja, 2010). As a result, teachers should use appropriate technological devices for these students and determine how, for whom, when, and when these devices will be most efficiently delivered. They may be knowledgeable about instructional strategies and how to develop lessons to meet the needs of students, all of which

are critical components of children's academic achievement (Netherton & Deal, 2007). However, teachers continue to be concerned with a lack of knowledge and pedagogical techniques for integrating assistive technologies into the regular curriculum. To illustrate this, the research study (Keetam & Alkahtani, 2013), demonstrated teacher concerns about their training programs that do not provide sufficient coursework and field experience to enable them to support students with special educational needs. Despite teacher's knowledge and training, the use of technology in school settings varies based on children's preference as well as their interest and readiness toward technology use (Bagon, 2018). The individualized Education Plan (IEP) can determine the child's strengths as well as their weaknesses, their likes and dislikes and what strategies are helpful in interacting with the child (Campbell *et al.*, 2006). Furthermore, through personalized learning the teacher can enhance students' motivation and engagement by increasing their autonomy and self-direction. Bronfenbrenner's bioecological model (Bronfenbrenner & Morris, 2006) is useful for personalized learning because it describes the experiences that children have that aid in their growth and learning. The bio-ecological model is arranged and conceptualized into different structures that children and teachers occupy, including the microsystem, mesosystem, exosystem, macrosystem, and chronosystem. The microsystem, or the nearest layer, consists of a child's connections and experiences in his or her immediate surroundings (family, peers, school, or neighbourhood). The mesco system provides the connection between the structures of the child's microsystem (family–school, peers–family, neighbourhood–peers). The exosystem consists of the linkages and processes between settings in which the child does not function directly. However, the structure of this layer may impact the child's development by interacting with some structures in the microsystem. The macrosystem is the outer layer of the child's environment comprised with cultural values, customs and laws. Finally, the chronosystem is also relating to a child's environment, might be internal or external. Urie

Bronfenbrenner's theory of child development has provided a comprehensive conceptual rationale of how central social contexts in a child's life interact and influence key outcomes, including social and emotional adjustment and school performance and engagement (Bronfenbrenner & Morris, 2006).

2. **Teacher's perspective**s Teachers' perceptions toward assistive technology will influence how much technology is used in the teaching and learning process (Lindeblad, *et al.*, 2016). To improve the usage of assistive technology as a tool, teachers must understand which methods and tactics are useful in various types of learning conditions, as well as how to use the technique as an effective intervention that can help children become more systematic, effective, and lifelong learners. Alper and Raharinirina (2012) What teachers do and know about assistive technology, on the other hand, is determined by their expertise, training, understanding, and level of maturity in inclusive activities (Cope & Ward, 2009). Teachers who see learning as an aggregation of knowledge, for example, are more likely to see teaching as a transmission of information, which means they are more likely to use exams and evaluations to route learning. Teachers who perceive school as a mental change, on the other hand, are more likely to be facilitators and to often allow children to think independently. Their perceptions and attitudes will have great influence on their acceptance, style of implementation, and the outcome of using assistive technology for teaching children with learning disabilities.
3. **Training and Professional Development:** Another challenge for educators, teachers, and families is a lack of career learning resources (Messinger-Willman & Marino, 2010). "In most settings, teachers in both general and special education are still not receiving the necessary pre-service and in-service training,". When career learning resources are made available, they often provide either too much or not enough detail all at once (Messinger-Willman & Marino, 2010). Since professional development is not always necessary, teachers

may choose not to participate (William & Marino, 2010). If professional development is needed, it is normally conducted after school in the form of a conference (Messinger-William & Marino, 2010). Many professional development opportunities present material that is elusive or contradictory, and it is insufficient for an instructor to be proficient with the assistive device (Messinger-William & Marino, 2010). Assistive technology can provide support for students and teachers" in the classroom, but both the student and the teacher must understand and know how to use the devices" for this to work (Education Business, 2021). If the teacher or student is unaware of how to use the computer to help the student navigate the material, the technology can never be completely integrated into the curriculum (Bruinsma, 2011). To integrate assistive technology into the classroom, teachers can receive instruction that includes simulation and hands-on experience of the technology. "The training should provide structured feedback, and teachers require ongoing training, coaching, and support" to effectively incorporate assistive technology and continue to use it to its full extent in the classroom (Messinger-Willman & Marino, 2010). The lack of technology training and technology support services both in the classroom and at home can also be a deterrent to implementing assistive technology (Tony, 2019). This will result in educators not effectively implementing assistive technologies in the classroom, and can hinder student learning for those students who use the technology to be effective in the programme (Bruinsma, 2011). If the parents are not trained in the assistive technology used in the classroom the child may have difficulty completing any assignments at home (Bruinsma, 2011). This can also hinder student successes because the parent cannot help the child with assignments when he or she is outside the classroom (Messinger-Willman & Marino, 2010). However, if appropriate training is provided for educators and parents then it will likely result in functional daily use of a device that promotes the child's overall development of independence in their environment (Tony, 2019). Although there has been a higher emphasis of training educators

on specific assistive technologies there is still a high need for further training for both the educators and parents (Alkahtani, 2013). Having parental support with the technology outside the classroom will increase the incorporation of the technology into the life of the child and help him or her be successful inside the classroom and in the community (Bruinsma, 2011). Many of the skills that assistive technology aides are used outside the classroom environment in the community so some students could also benefit from using the assistive technology while in the community. Therefore, until technology training is significantly improved, young children with disabilities may often continue to be mismatched with devices that do not meet their communicative, educational, and independent learning needs (Smith, 2020).

4. **Funding and Cost:** The funding of assistive technologies is a significant issue for many people and technologies can be prohibitively costly. However, funding alternatives are not intended to preclude students who would profit from using such technology in the classroom or in the community. It is important that teachers and parents understand that if assistive devices are used in a student's Individualized Education Plan (IEP), they must be provided (Sze, 2009). When assistive technology is listed in a student's IEP, the "assistive technology, as well as training in its use, must be provided at no cost to the parents" by the public department (FCTD, 2010). While the law requires that assistive technology be given to students at no expense to the parents as identified in the IEP, certain schools will attempt to exclude assistive technology from being used in the IEP if the cost is prohibitively high (Bruinsma, 2011). This ensures that caregivers and special educators must stay up on the new assistive devices to be able to campaign for the individual who will benefit from its use (Sze, 2009). Educators may also lobby for parent preparation so that they can help integrate technologies into the classroom, family, and culture. Despite its availability, however, there remain numerous barriers to the timely acquisition and use of assistive technology devices and services (Bruinsma, 2011). One of the barriers that exists is schools may tell parents that

funding for assistive technology does not exist. However, there are many options for funding and the district may not want to hassle trying to find the way to incorporate the assistive technology into the student's IEP. "Funding for high-tech devices can come through the school system, the insurance provider, or civic organizations" and just because it can be difficult to find a funding option does not mean that the school can leave the technology out of the students IEP if they would benefit from its use (Bruinsma, 2011). On the other hand, there are many assistive technologies that are low cost or low-tech options that can benefit students with disabilities and other students within the general education classroom. Educators should investigate all options on a daily basis and see if there are any technologies that could enhance learning for all students in the classroom (LSU, 2020). Although financial resources are often scarce, funding does not limit a child's need for assistive technology, and funding does not limit the availability of suitable assistive technologies because the law still requires AT to be considered for students with disabilities (Jacobsen, 2012). If an assistive technology device would benefit the student then it is the educator's obligation to fight for it to be placed in the IEP and provided to the student at no additional cost to the parents (Bruinsma, 2011).

2.1.7 The Role of Gender in the Utilization of assistive technologies

Niiranen (2017) noted that technology-oriented fields are still mostly male dominated, whereas Zhou and Xu (2007) suggested that females were more likely to use technologies in teaching such as ICT in contrast to their male counterparts who preferred teach and learn from their own experience. Girls especially tend to benefit from the inclusiveness of educational tools such as assistive technologies (Heemskerk, 2009). Ilomäki (2011) noted that in schools, there are gender-related differences in the usage of ICT. Teachers use it differently: more male teachers use ICT than female teachers, and male teachers use it more

often than female teachers (Manyilizu & Gilbert, 2015). In a study among students in Helsinki, girls and boys wished for more computer usage in teaching. However, boys had a considerably more positive view on being able to use ICT in their class and they found the use of ICT more motivating. Even though girls at all school levels used ICT as much as boys, they found it less motivating than boys. Boys considered that they had been able to use computer technology as a support for their learning, girls thought this more seldom.

Colon (2019) noted trends in gender differences revealed that women reported more barriers to AT use for instrumental activities of daily living and men for self-care. Women mostly reported barriers related to technology cost, appearance, and social attitude. There are several gender-based differences in teachers' ICT competence. One reason for the insufficient skills of female teachers is probably a lack of motivation and interest. In addition, female teachers less often have a computer in their own classrooms, and thus they do not have the possibility for informal learning by doing. To increase ICT use among female teachers it is essential to support access to meaningful usage (Dijk & Hacker, 2003): pedagogical support to understand new applications and their affordances and benefits. Male students are active in surfing and downloading (forms of recreational use), male teachers are active in searching and sending e-mails. Females use all Internet applications less than males. Teachers and other adults use ICT as a tool, whereas students and young peoples in general see ICT as a way of life. Adults use ICT primarily to do "something useful", and this is also typical of school use of ICT. The use of ICT cin the classroom is still on a quite low level, from both teachers' and students' perspectives, and students still use seldom ICT for their studies (Ilomäki, 2011).

2.2 Theoretical Framework

This study adopted two theories/models that support the use of technology in teaching and learning, one of which is the Technology Acceptance Model (TAM) and the Constructivism Theory.

2.2.1 Technology Acceptance Model (TAM)

The technology acceptance model (TAM) build the theoretical framework in this research. The Technology Acceptance Model (TAM) states that the perceived ease of using a system and the perceived usefulness are the key components of technology acceptance (Charness & Boot, 2016). However, with increasing diversity of users as well as diversity of technical systems (visible vs. invisible, local vs. distributed) and using contexts (fun and entertainment, medical, office, mobility) the end-users are confronted with, more aspects might be relevant for understanding their acceptance patterns – beyond the ease of using a system and the perceived usefulness.

The Technology Acceptance Model (TAM) is a theory of information systems that models how people come to adopt and use technology (Cruz-Cunha *et al.*, 2013). The technology Acceptance Model (TAM) was proposed by Davis in 1989, the model stresses the importance of technological use for all individuals (Charness, 2016). It should be recognized that there must be a behavioural intention (BI), which is a phenomenon that pulls people to use technology. This model's proponents observed that behavioural intention (BI) is determined by attitude (A), which is described as the overall perception of technology.

According to the model, as consumers are offered modern technologies to use, a variety of considerations affect their choice to use those technologies. Some of which include:

1. Perceived usefulness (PU): this is seen as the length at which a person feels using a certain technology will improve his or her job efficiency. This means that students

who will most likely use assistive technologies will understand how effective they are in completing a specific task.

2. Perceived ease-of-use (PEOU)- this factor describes how easy or difficult it will be to use a certain piece of technology. If a technology is relatively simple to use, consumers may have a favourable outlook toward it.

People using assistive technologies, for example, may often use their phones or applications whether they are simple to use and do not need a lot of effort.

Other influences, such as social impact, age, and gender, may influence individuals' use of technology and their overall understanding of it.

2.2.2 Constructivism Learning Theory

Constructivism learning theory emphasizes the importance of learners developing their comprehension and skills from their own experiences (Suhendi, 2018). The constructivism theory was proposed by Jerome Bruner in 1960, constructivists conclude that information from the world interacts with ideas from the person, resulting in internalized constructs formed by learners (InstructionalDesign, 2018).

Constructivists have identified the assimilation and accommodation mechanisms that are critical in this relationship as people construct new insights from their interactions (Ultanir, 2012). They assume that as people assimilate new content, it becomes part of an already established body of information or expertise. Constructivism seeks to understand how learners learn by drawing on prior experiences and constructing their own knowledge from those experiences (Shah, 2019). This suggests that constructivism promotes constructive learning, in which students regularly participate in the classroom and contribute to the teaching and learning process. Aside from learning by doing (active learning), constructivism

promotes social interactions and peer interactions among learners (Hurst, 2013). This learning philosophy supports various ways of communication and engagement.

Assistive technology enables for student to become active participants in the teaching and learning process as they become actively engaged with the learning content instead of mere passive listeners, the theory of constructivism advocates for students to participate and contribute to the classroom teaching and learning experience.

2.3 Empirical studies

Chukwuemeka and Samaila (2020) investigated teachers' perception and factors limiting the use of high-tech assistive technologies resources in special education schools in North-West Nigeria. The study adopted a descriptive survey design using a questionnaire to sought data from 120 respondents who were drawn using a multi-stage sampling technique from special education schools within the region. Three research questions were raised to guide the study. The questionnaire was subjected to expert validation and reliability was established through a pilot study using 20 teachers from two special education schools within the study area, but not part of the sampled schools. The reliability coefficient of 0.81 was obtained for the questionnaire using the Cronbach Alpha formula. The data collected were analyzed using percentage, mean and standard deviation. Findings revealed that teachers do not use high-tech assistive devices regularly to teach students with physical disabilities. However, teachers perceived positively that there are great benefits to the use of these resources.

Liman et al (2015) investigated how assistive technology can be effectively used as part of the educational programmes of students with learning disabilities in an inclusive classroom setting-by investigating the teachers' perceptions regarding the use of assistive technology. Using a cross-sectional survey, the sample includes the teachers of the students with learning disabilities from three selected schools that consisted 40 respondents. The result from the

study, using descriptive and inferential statistics of mean and chi-square respectively, revealed that assistive technology can be used to improve the educational programme of students with learning disabilities in an inclusive setting when it is being used for remediation and intervention services and as instructional material as well. It equally revealed that bond exited between assistive technology and inclusive education as regards to students with learning disabilities. The analysis carried out showed that indeed the success of educational programmes of students with learning disabilities was dependent on the use of assistive technology.

Olugu (2020) assessed the availability and utilization of assistive technology devices for improved teaching and learning among students with learning disabilities in Ohafia, Abia state. The study adopted a survey research design. To achieve the purpose of this study, three research questions and one hypothesis were posed to guide the study. Literature review was carried out according to the variables of the study. Sixty-four (64) respondents were used for the study. Simple random and purposive sampling techniques were used to arrive at the sample. Checklist and questionnaire were the main instruments for data collection. Simple percentage and Pearson moment correlation were employed to test the research questions and the hypothesis. The result of the analysis revealed that a good number of assistive technology devices are not available for student with learning disabilities in Ohafia in Abia State just the utilization of assistive technology devices for improve teaching and learning of students with learning disabilities in Ohafia in Abia State is poor. It was revealed that there is a significant relationship between teachers' competence and utilization of assistive technology devices for improved teaching and learning of students with learning disabilities in Ohafia in Abia State. It was then concluded that there is unavailability and poor utilization of assistive technology devices for students with learning disabilities in Ohafia. Based on the findings of the study, it was recommended, among others, that government, NGOs, parents, immediate community,

rehabilitation centres and the school should partner with key stakeholders in education and make available assistive technology devices for improved teaching and learning of students with learning disabilities.

Rowlands (2015) determine the efficacy of Assistive Technology in promoting the educational support of all learners in a mainstream school. This use of AT thus benefiting inclusion and inclusive practices and enhancing learning and support for all students in a mainstream school. The study was embedded in an interpretivist paradigm and used a qualitative research approach. Sampling was purposive and participants were selected based on the researcher's pre-defined purpose for the study. Ethical approval was sought from the University of South Africa and prior to conducting research consent forms were signed by all participants. Data were collected using questionnaires with open-ended questions, face to face interviews and document analysis. Data analysis was done through thematic coding (noting recurring patterns of information) and the development of major themes based on qualitative data collected. Findings revealed the need for more technology in the research site (such as iPads and laptops), as well as the need for staff training in order to effectively use the technology. Furthermore, having more educational assistants to support students with more complex needs was also highlighted.

2.4 Summary of Literature Reviewed

From the literature reviewed, the researcher discovered that ICT plays a vital role in the provision of assistive technologies as they are defined as the hardware and software on which assistive technologies heavily relies on, the impact of ICT on education was also reviewed; detailing the use of computers in teaching and learning. Assistive technologies were grouped into three; low, medium and technologies from the literature reviewed. Text-to-speech, word prediction, magnifiers, braille displays, etc. were some of the examples of assistive

technologies that were reviewed from literature by several authors. The importance of assistive technologies was highlighted upon since they accommodate student's disabilities and allow partake during classroom teaching and learning. From the literature reviewed, the researcher discovered that some of these assistive technologies were available in schools and utilized by teachers but also noted some of the factors barring the use of assistive technologies such as teacher's awareness, teacher's perspectives, funding, and cost, etc. Gender was also found to play a role in the utilization of assistive technologies, from the literature reviewed, it was disclosed that women were likely to use technologies in teaching which is in contrast to their male counterparts but women faced challenges relating to the cost of technology, appearance, and social attitude. The constructivism theory and Technology Acceptance Model (TAM) were the theories/models that supported the study as they advocated for the use of technology in teaching and learning. The constructivism theory emphasizes the need for learners to develop their comprehension skills from their own experiences. From the empirical studies, it was proven that assistive technologies are crucial to support the learning of students with disabilities but it was also discovered from the empirical studies that a good number of assistive technologies were unavailable not properly utilized.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Design

Research design according to Wilson (2013) entails considering the type of evidence required and how it is to be collected and interpreted. The descriptive survey research design was used for the study. A survey according to Nwodu (2006) is a research method which focuses on a representative sample derived from the entire population of the study. This design is considered apt because it enables the researcher to generate data through standardized collection procedures based on highly structured research instruments and well-defined study concepts and related variables.

3.2 Population of the Study

The population for this study therefore comprised of all the five hundred and ninety seven (597) students in the Niger State school for special education Minna, Nigeria.

3.3 Sample and Sampling Technique

The sample for the study consisted of eighty (80) students. SS1, SSII and SSIII were purposively selected for this study as they must have been exposed to assistive technologies, the sample was used to determine the availability and utilization of assistive technologies in Niger State School for Special Education, Minna.

A sampling technique has to do with specifying how elements are to be drawn from the population. The simple random sampling technique was used because it gives the elements of the population equal opportunity of being part of the sample. A total of 80 respondents were randomly sampled, which is a sum total of eighty (80) students.

3.4 Research Instrument

In carrying out this research, a well-constructed and self-developed checklist and questionnaire was used to get the desired information from the students. A questionnaire according to Ndukwu (2020) is a research instrument constructed such that respondents answer questions about their opinion, attitudes, preferences, activities in a written form and is usually structured based on a scale adequate enough to obtain quantitative analysis. The questionnaire was titled "Questionnaire on the Availability and Utilization of Assistive Technologies" (QAUAT). The questionnaire was divided into two sections (A and B). Section A was for the collection of information on personal data of respondents while Section B consisted of questions that elicited responses about the dependent variable and the independent variables from the respondents with response options: Strongly Agree(SA), Agree (A), Undecided (U), Disagree (D), and Strongly Disagree (SD). Anonymity was ensured in this process to ensure confidentiality for all participants. Students were also reminded not to write their names and that their response was completely voluntary.

3.5 Validity of the Instrument

The content of the questionnaire was validated by experts to ascertain its validity. The instrument was validated by three experts, one (1) expert from the Department of Educational Technology, School of Science and Technology Education, Federal University of Technology Minna. An expert from the Niger State Special Education School also validated the instrument and a rater from the Federal University of technology model secondary school. These experts made some recommendations for adjustments before final drafts were made. The decision by the researcher to employ the services of experts was based on the remark of Rikichi (2011) who stated that validation by specialists is an effective method of content

validation of a research instrument. After a thorough evaluation, it was suggested that the instruments were appropriate, and relevant to the study.

3.6 Reliability of the instrument

The test-retest method was used to test the reliability of the instruments. The questionnaires were administered to a sample of 30 students within the population but outside the sample of the students to collect their responses and after two weeks the same test was administered on them again and their responses were correlated with the previous one and a reliability coefficient of 0.78 was obtained using Spearman Brown's formula.

3.7 Method of Data collection

The researcher collected data using the questionnaire. Copies of the questionnaire were administered by the researcher to the respondents. All the respondents were expected to give maximum co-operation, as the information on the questionnaires are all on the things that revolve around their study. Hence, enough time was taken to explain how to tick or indicate opinion on the items stated on the research questionnaire.

3.8 Method of Data Analysis

Responses from the questionnaire were analyzed using the Statistical Packages for Social Science version 25. Descriptive statistics of frequency counts and percentages were used in analyzing demographic variables and research questions while the t-test was used to test the stated hypotheses at a 0.05 level of significance.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION OF DATA

4.1 Introduction

The purpose of the study is to determine the availability and utilization of assistive technology tools by students in Niger state school for special education special, Minna, Niger State. This chapter discusses the data analysis, presentation of the results of data analyzed and discussion of the results. The data were analyzed using the Statistical Package for Social Sciences (SPSS) Version 25. The biodata of the respondents was analyzed using a bar chart, while the research questions were analyzed using mean and standard deviation. A satisfactory scale was set to infer disagree and agree for the availability of assistive technologies; 1.0-1.9 disagree, 2.0-3.0 agree while for utilization of assistive technologies, a scale of 1.0 – 2.4 disagree, 2.5 – 4.0 agree. Disagree and strongly disagree were merged while agree and strongly agree were merged.

4.2 Description of Study Variables

A total of eighty (80) questionnaire was retrieved out of the eighty (80) questionnaire distributed.

Table 4.1 Gender Distribution of students

Gender	Frequency	Percent
Male	46	57.5
Female	34	42.5
Total	80	100.0

In Table 4.1, the respondents are classified by gender. The table shows the respondents by their gender. The male respondents are greater than that of the female respondents, with the

males making 57.5% of the sampled population and females making up the remaining 42.5% of the population.

4.3 Response to Research Questions

This research determined the Availability and Utilization of Assistive Technology Tools Among Students in Special School, Minna, Niger State. In the analysis of the variables, the researcher made use of the descriptive analysis. These variables are assessed independently with specific research questions and objectives as follows:

Research Question One: Are assistive technologies readily available in special school in Minna? The answer is shown below on table 4.2

Table 4.2 Availability of Assistive Technologies

S/N	Availability of assistive technologies	N	Mean	Std. Deviation	Decision
1	Text-to-speech are available in the classroom for teaching and learning	80	1.32	.471	Disagree
2	Speech-to-text are available in the classroom for teaching and learning	80	1.22	.420	Disagree
3	Word Prediction are found in the classroom for teaching and learning	80	1.74	.775	Disagree
4	Magnifiers are found in the classroom for instructional delivery	80	1.33	.471	Disagree
5	There are voice Amplification Systems in the classroom for teaching and learning	80	1.34	.655	Disagree
6	Memory Aids are available in the classroom for teaching and learning	80	1.25	.666	Disagree
7	Mobile Devices are available to use when teaching in the classroom	80	1.65	.658	Disagree
8	There are communication Boards in the classroom during instructional delivery	80	1.46	.711	Disagree

9	Large Print Materials are found in the classroom for teaching and learning	80	2.05	.940	Disagree
10	Braille Displays are available in the classroom for teaching and learning	80	1.73	.856	Disagree
	Grand Mean		**1.51**		**Disagree**

Decision mean: 2.00

Table 4.2 shows the Mean and Standard Deviation of student's response on the availability of assistive technology Tools Among Students in Special School, Minna, Niger State. The table reveals the computed mean score of 1.32 with Standard Deviation of 0.471 for item one, 1.22 with Standard Deviation of 0.420 for item two, 1.74 with Standard Deviation of 0.775 for item three, 1.33 with Standard Deviation of 0.471 for item four, 1.34 with Standard Deviation of 0.665 for item five, 1.25 with Standard Deviation of 0.666 for item six, 1.65 with Standard Deviation of 0.658 for item seven, 1.46 with Standard Deviation of 0.711 for item eight, 2.05 with Standard Deviation of 0.940 for item nine, 1.73 with Standard Deviation of 0.856 for item ten. The table revealed further that, the grand mean score of responses to the ten items was 1.5087 which was less than the decision mean score of 2.00. This implies the unavailability of assistive technologies Tools Among Students in Special School, Minna, Niger State.

Research Question 2: Is there adequate utilization of assistive technologies in special schools in Minna? The answer is revealed in Table 4.3

Table 4.3 Utilization of assistive technologies in special schools in Minna

S/N	Utilization of assistive technologies	N	Mean	Std. Deviation	Decision
1	Text-to-speech are used during teaching and learning	80	1.69	.851	Disagree
2	Speech to text are used to teaching and watch educational videos in the classroom	80	1.70	.802	Disagree
3	Word Prediction are used during teaching and learning	80	2.18	.742	Disagree
4	Mobile Devices are used for teaching in the classroom	80	1.85	.576	Disagree
5	Voice Amplification Systems are used for teaching in the classroom for teaching and learning	80	1.89	.574	Disagree
6	Memory Aids are utilized when teaching in the classroom	80	1.59	.706	Disagree
7	Magnifiers are used for classroom instruction	80	1.75	.803	Disagree
8	Communication Boards are used regularly during teaching and learning	80	2.18	.868	Disagree
9	Large Print Materials are used in the classroom for teaching and learning	80	2.52	1.312	Disagree
10	Braille Displays are used in the classroom to deliver instruction	80	2.76	1.046	Disagree
	Grand Mean	**80**	**2.0100**		**Disagree**

Decision Mean: 2.50

From Table 4.3, The table reveals the computed mean score of 1.69 with Standard Deviation of 0.851 for item one, 1.70 with Standard Deviation of 0.802 for item two, 2.18 with Standard Deviation of 0.742 for item three, 1.85 with Standard Deviation of 0.576 for item four, 1.89 with Standard Deviation of 0.574 for item five, 1.59 with Standard Deviation of 0.706 for

item six, 1.75 with Standard Deviation of 0.803 for item seven, 2.18 with Standard Deviation of 0.868 for item eight, 2.52 with Standard Deviation of 1.312 for item nine, 2.76 with Standard Deviation of 1.046 for item ten. The table revealed further that, the grand mean score of responses to the ten items was 2.0100 which was less than the decision mean score of 2.50. This implies the non-utilization of assistive technologies Tools Among Students in Special School, Minna, Niger State.

4.4 Hypothesis Testing

Hypothesis 1: There is no significant difference in the gender of students and the utilization of assistive technologies in special schools in Minna

Table 4.5 T-test for the gender difference and the utilization of assistive technologies

Group	N	Df	$\bar{x}$	SD	t-value	p-value
Male	46		2.0870	.44302		
		69.088			2.408	0.019
Female	34		1.9059	.21734		

Not Significant at 0.05 level

The t-test for table 4.5 revealed that there was a significant difference on gender and the utilization of assistive technologies. The p-value of 0.019 which was less than 0.05 which was the level of significance, confirmed that there was a significant difference in the gender of students and the utilization of assistive technologies in special schools in Minna. Hence, the null hypothesis was rejected.

4.5 Discussion of Findings

Findings revealed that assistive technologies are not available in special school in Minna as the responses gave a grand mean score of 1.5087 indicating the unavailability of assistive technologies, the data analyzed also revealed that there was inadequate utilization of assistive

technologies in special schools in Minna with the grand mean score of 2.0100 indicating inadequacy. The grand mean scores on the availability of assistive technologies was below the established mean of 2.00 and the grand mean scores on utilization of assistive technologies were below the already established decision mean of 2.50. The t-test statistics also revealed that there was a significant difference in gender and the utilization of assistive technologies as the p-value gave a score of 0.019 which was below 0.05 level of significance.

CHAPTER FIVE

6.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The research determines the availability and utilization of assistive technology tools among students in special school, Minna, Niger state.

However, the study is divided into five chapters in which each chapter is discussed extensively.

Chapter one of the research contains the background of the study, statement of the problem, research questions, significance of the study, scope of the study, methodology, limitations of the study and definition of the terms

Similarly, in Chapter two, many relevant literatures from several authors were used to expose what various writers have done in the area of instructional materials for teaching and learning.

In Chapter three of the study that based on research methodology, the descriptive survey research design was adopted in which questionnaires were administered. Simple random sampling technique was also adopted to select respondents.

Chapter four of the project revolved on the data analysis and interpretations of findings. The frequency and percentage method of data analysis was used. This chapter contains the summary, conclusion and recommendation of the study.

5.4 Conclusion

Having carefully examined the work, some logical conclusion can be arrived at, a good number of assistive technology tools were unavailable and the level of utilization of assistive technology tools is poor in Niger state school for special education, Minna, Niger state, as revealed by the data analysis

Answers to the research questions revealed that assistive technologies were unavailable and it was also revealed that assistive technologies were underutilized.

5.5 Recommendations

The following can be recommended after critical examination of the responses and review of the previous literature.

1. Assistive technologies should be made available and adequately utilized for teaching should be made compulsory in all the special schools in Nigeria.
2. Parents, NGOs, Schools and government should partner with key stakeholders and provide assistive technology tools to enhance teaching and learning of students with disabilities.
3. It is important to note that the current study utilizes quantitative research method and uses only a survey questionnaire to collect data. Therefore, it is recommended that for a more comprehensive study, other instruments such as interviews and class observations be conducted to get a more through picture on the availability and utilization of Assistive technologies.

REFERENCES

Adebisi, R.O. (2014). Using Information and Communications Technology (ICT) in teaching children with special needs in 21st century. Journal of Research in Science, Technology & Mathematics Education (IJRSTME), 2 (1), 129 – 138.

Adu, E. O. & Olatundun, S. A. (2013). The use and management of ICT in schools: strategies

Ahmed, A. (2018). Perceptions of using assistive technology for students with disabilities in the classroom. *International Journal of Special Education*, *33*(1), 129-139.

Akarowhe, K. (2017). Information communication technology (ICT) in the educational system of the third world countries as a pivotal to meet global best practice in teaching and development. *American Journal of Computer Science and Information Technology*, *5*(2).

Alnahdi, G. (2014). Assistive Technology in Special Education and the Universal Design for Learning. *Turkish Online Journal of Educational Technology-TOJET*, 13(2), 18-23.

Alper, S. & Raharinirina, S. (2006). Assistive technology for individuals with disabilities: A review and synthesis of the literature. Journal of Special Education Technology. 21 (2), 47–64.

An, F., Sharif, S., Wong, W. K., & Marriappan, M. (2014). Innovation of assistive technologies in special education: A review. IJERED*: International Journal of Enhanced Research in Educational Development*, 2(3), 25-38.

Anderson J.E (2018). Speak Up! AT for Voice Amplification. AT3. Retrieved from https://at3centerblog.com/2018/03/23/voice-amplification/

Arcon, N. (2015). Training the Dragon: Facilitating English Language Learner (ELL) Students' Persuasive Writing through Dictation.

Bagon, Š., Gačnik, M., & Starčič, A. I. (2018). Information Communication Technology Use among Students in Inclusive Classrooms. *International Journal of Emerging Technologies in Learning*, *13*(6).

Banerjee, A., & Chaudhury, S. (2010). Statistics without tears: Populations and samples. *Industrial psychiatry journal*, *19*(1), 60.

Bateni, H., & Maki, B. E. (2005). Assistive devices for balance and mobility: benefits, demands, and adverse consequences. *Archives of physical medicine and rehabilitation*, *86*(1), 134-145.

Beukelman, D. R. Hunt-Berg, M. & Rankin, J. L. (1994). Ponder the possibilities: Computer – supported writing for struggling writers. Learning Disabilities Research & Practice, 9, 169 – 178.

Bhakta, K., & Dutta, N. (2016). Impact of information technology on teaching-learning process. *International Research Journal of Interdisciplinary & Multidisciplinary Studies (IRJIMS), 7969*(131), 131-138.

Bronfenbrenner, U. & Morris, P. A. (2006). The bio-ecological model of human development. In W. Damon & R. M. Lerner (Eds.), Handbook of child psychology, Vol. 1: Theoretical models of human development (6th ed., pp. 793–828). New York, NY: John Wiley

Bruinsma, A. M. (2011). Implementation of assistive technology in the classroom.

Bryant, B., & Seay, P. (2012). The technology-related assistance to individuals with disabilities act: Relevance to individuals. Journal of Learning Disabilities, 40(1), 11-13.

Campbell, P., Milbourne, S., Dugan, L. & Wilcox, J. (2006). A review of evidence on practices for teaching young children to use assistive technology devices. Early childhood Special Education. 26 (1), 3-13

Campbell, P., Milbourne, S., Dugan, L. & Wilcox, J. (2006). A review of evidence on practices for teaching young children to use assistive technology devices. Early childhood Special Education. 26 (1), 3-13

Cauley, F. G., Aiken, K. D., & Whitney, L. K. (2009). Technologies across our curriculum: A study of technology integration in the classroom. *Journal of Education for Business*, *85*(2), 114-118.

Charness, N., & Boot, W. R. (2016). Technology, gaming, and social networking. In *Handbook of the Psychology of Aging* (pp. 389-407). Academic Press.

Chiang, H. Y., & Jacobs, K. (2009). Effect of computer-based instruction on students' self-perception and functional task performance. *Disability and Rehabilitation: Assistive Technology*, *4*(2), 106-118.

Chukwuemeka, E. J., & Samaila, D. (2020). Teachers' Perception and Factors Limiting the Use of High-Tech Assistive Technology in Special Education Schools in Northwest Nigeria. *Contemporary Educational Technology*, *11*(1), 99-109.

Collins. B. (2021). The Best Speech to Text Software for 2021: 8 Top Choices. Become A Writer Today. Retrieved 19th May, from https://becomeawritertoday.com/speech-to-text/

Colon, E. O. (2019). Gender differences in the adoption and use of assistive technology (at) among hispanics. *American Journal of Occupational Therapy*, *73*(4_Supplement_1), 7311505192p1-7311505192p1.

Cope, C. & Ward, P. (2012). Integrating learning technology into classrooms: The importance of teacher perceptions. Educational Technology and Society. 5 (1), 67-74

Dan (2018). Old Meets New: Braille and Assistive Technology. Advancing Opportunities. Retrieved 19th May, 2021 from https://advopps.org/old-meets-new-braille-assistive-technology/

Dell, A. G., Newton, D. A., & Petroff, J. G. (2012). *Assistive technology in the classroom: Enhancing the school experiences of students with disabilities* (p. 336). Boston (MA): Pearson.

Dhana, A. &Jagawat, T. (2013). Prevelence and Pattern of Learning Disabilities in School Children. Journal of Delhi Psychiatric Society. 16 (2), 386-390

Dhanda, A., & Jagawat, T. (2013). Prevalence and pattern of learning disabilities in school children. *Delhi Psychiatry Journal*, *16*(2), 386-390.

Dikusar, A. (2018). The Use of Technology in Special Education. E-learning industry. Retrieved 18th May, 2021 from https://elearningindustry.com/use-of-technology-in-special-education

Drigas, A. S., & Ioannidou, R. E. (2013). Special Education and ICTs. *International Journal of Emerging Technologies in Learning*, *8*(2).

Education Business (2021). The support from assistive technology. Education Business. Retrieved 20th May, 2021 from https://educationbusinessuk.net/features/how-can-assistive-technology-support-%C2%A0student%E2%80%99s-education

Evmenova, A. S., Graff, H. J., Jerome, M. K., & Behrmann, M. M. (2010). Word prediction programs with phonetic spelling support: Performance comparisons and impact on journal writing for students with writing difficulties. *Learning Disabilities Research & Practice*, *25*(4), 170-182.

for school leaders. European journal of computer science and information technology

Freeman, I., & Hasnaoui, A. (2010). Information and communication technologies (ICT): A tool to implement and drive corporate social responsibility (CSR). In *15th International Conference of the Association Information and Management*.

GSMA (2019). The State of Mobile Internet Connectivity 2019. GSMA. Retrieved 19th May, 2021 from https://www.gsma.com/mobile fordevelopment/wp-content/uploads /2019/07/GSMA-State- of-Mobile-Internet-Connectivity-Report-2019.pdf

Hasselbring, T., & Bausch, M. (2005). Assistive technologies for reading. Educational Leadership, 63(4), 72-75.

Hayes, A. M., & Bulat, J. (2017). Disabilities inclusive education systems and policies guide for low- and middle-income countries.

Healthline (2020). What Is a Communication Board and How Does It Help? Healthline. Retrieved 19th May, 2021 from https://www.healthline.com/health/communication-board

Heemskerk, I., ten Dam, G., Volman, M., & Admiraal, W. (2009). Gender inclusiveness in educational technology and learning experiences of girls and boys. *Journal of Research on Technology in Education*, *41*(3), 253-276.

Hetzroni, O., & Shrieber, B. (2013). Word processing as an Assistive Technology tool for enhancing academic outcomes of students with writing disabilities in the general classroom. Journal of Learning Disabilities, 37 (2), 143-154.

Hildebrandt, H. (2019). Treatment of Severely Impaired, Amnestic Patients. *Cognitive Rehabilitation of Memory*. pp. 161-177, ISBN 9780128169810. Academic Press

Hopkins, J. (2006). Assistive technology: Ten things to know. Library Media Connection, 25(1), 12-14

Hurst, B., Wallace, R. R., & Nixon, S. B. (2013). The impact of social interaction on student learning. *Reading Horizons*.

ICTE (2021). Why schools should invest in ICT. ICTE. Retrieved 20th May, 2021 from https://www.ictesolutions.com.au/blog/why-schools-should-invest-in-ict/

Ilomäki, L. (2011). Does gender have a role in ICT among Finnish teachers and students?. *Scandinavian Journal of Educational Research, 55*(3), 325-340.

InstructionalDesign (2018). Constructivist Theory (Jerome Bruner). Instructional Design. Retrieved 19th May, 2021 from https://www.instructionaldesign.org/theories/constructivist/

Jackins T. (2017). Research Shows Text to Speech For eLearning Beneficial To Students. E-learning Industry. Retrieved 20th May, 2021 from https://elearningindustry.com/text-to-speech-for-elearning-beneficial-students

Jacobsen, D. L. (2012). Assistive technology for students with disabilities: Resources and challenges encountered by teachers.

Judge, S. (2000). Accessing and funding assistive technology for young children with disabilities. Early Childhood Education Journal, 28(2), 125-131.

Keetam, D. & Alkahtani, F. (2013). Teachers knowledge and use of Assistive Technology for students with Special Educational Needs. Journal of studies in Education. 3 (2), 65-85. doi:10.5296/jse.v3i2.3424

Keetam, D. &Alkahtani, F. (2013). Teachers knowledge and use of Assistive Technology for students with Special Educational Needs. Journal of studies in Education. 3 (2), 65-85. doi:10.5296/jse.v3i2.3424

Kumar, S. & Raja, B. (2010). Web-based Technology for children with learning difficulties. Journal of Educational Technology. 7 (1), 8-13

LDAOeng. (2019). Technology for Writing. LDAT Retrieved 20th May, 2021 from https://www.ldatschool.ca/technology-for-writing/

Liman, A. N., Adebisi, R. O., Jerry, J. E. & Adewale, H. G. (2015). Efficacy of assistive technology on the educational programme of children with learning disabilities in inclusive classrooms of Plateau State.

Lindeblad, E., Nilsson, S., Gustafson, S. & Svensson, L. (2016). Assistive technology as reading interventions for children with reading impairments with a one-year follow-up. Disability and Rehabilitation: Assistive Technology. 12 (7), 713-724. DOI: 10.1080/17483107.2016.1253116.

Logsdon (2020). How Do Communication Boards Help Children? Verywell Family. Retrieved 19th May, 2021 from https://www.verywellfamily.com/what-is-a-communication-board-2161739

LSU (2020). How Instructional Technology Can Improve the Learning Process. LSU. Retrieved 20th May, 2021 from https://online.lsu.edu/newsroom/articles/how-instructional-technology-can-improve-learning-process/

Manyilizu, M., & Gilbert, M. G. (2015). The use of ICT between male and female teachers in secondary schools in Tanzania: A case of Dodoma municipality.

Martin J. (2021). Assistive Technology that's Built into Mobile Devices. Understood. Retrieved 19th May, 2021 from https://www.understood.org/articles/en/assistive-technology-thats-built-into-mobile-devices.

Mary McLaughlin *(2021)*. What is Special Education? Masters in Special Education. Retrieved 20th May 2021 from https://www.masters-in-special-education.com/what-is-special-education-2/

Merbler, J., Hadadian, A., & Ulman, J. (1999). Using assistive technology in the inclusive classroom. Preventing School Failure, 43(3), 113-120.

Messinger-Willman, J., & Marino, M. T. (2010). Universal design for learning and assistive technology: Leadership considerations for promoting inclusive education in today's secondary schools. *Nassp Bulletin*, *94*(1), 5-16.

Mikre, F. (2011). The roles of information communication technologies in education: Review article with emphasis to the computer and internet. *Ethiopian Journal of Education and Sciences*, *6*(2), 109-126.

Ministry of Education (2009). National policy on education. Abuja: NERDC.

Musgrove M. (2021). Who Pays for Assistive Technology? Parents or School? Understood. Retrieved 18th May, 2021 from https://www.understood.org/articles/en/who-pays-for-assistive-technology-parents-or-schools

NCTI (2010). Speech Recognition for Learning. LDOnline. Retrieved 20th May, 2021 from http://www.ldonline.org/article/38655/

Netherton, D. L., & Deal, W. F. (2006). Assistive technology in the classroom. *Technology Teacher*, *66*(1), 10-15.

Nigeria. Journal of Educational Policy and Entrepreneurial Research, 2 (2), 23 – 25.

NIH (2019) Assistive Devices for People with Hearing, Voice, Speech, or Language Disorders. NIH. Retrieved 20th May, 2021 from https://www.nidcd.nih.gov/health/assistive-devices-people-hearing-voice-speech-or-language-disorders#:~:text=Some%20have% 20directis%20earbuds.

Niiranen, S., & Rissanen, T. (2017). Learning by Doing and Creating Things with Hands: Supporting Students in Craft and Technology Education. *PATT: proceedings.*

Nkwoagba, O. S. (2011). Independent living for persons with special needs through assistive technology. In A. Olabisi (Ed.), Child Care and Special Needs Education in Nigeria, (Vol.3(1), Pp. 16 – 25). Jos: Centre for Learning Disabilities and Audiology.

Nsofor, C. C., & Bello, A. (2015). Emerging trends in educational technology. Ibadan: Emmi Pres.

Nyavor, M., & Amaniampong, P. (2020). Factors Influencing Students'choice of Assistive Technologies in Ghana National Inclusive Basic School. *European Journal of Special Education Research*, *6*(1), 123 – 141.

Olugu, F. (2020). Availability and Utilization of Assistive Technology Devices for Improved Teaching and Learning Among Students with Learning Disabilities in Ohafia, Abia State. *Abia State (April 1, 2020).*

Onivehu, A. O., Ohawuiro O. E., & Oyeniran B. J. (2017). Teachers' attitude and competence in the use of assistive technologies in special needs schools. Acts Didactica Napocensia, 10(4), 21-32. https://doi.org/10.24193/adn.10.4.3

Onyebueke, E. (2014). The relevance of primary education in promoting national security and development. *Journal of teacher perspective*, *8*(2).

Owobi, A. E. (2008). Role of information and communication technology in the education of children with special needs. *Jos Journal of Education*, *1*(1), 87-94.

Owusu-Ansah, S. (2013). Application of information and communication technology (ICT): a comparative analysis of male and female academics in Africa.

Oyebolu, S., & Lemo, O. (2013). The impact of information and communication technology (ICT) on vocational and technical students' learning. *Journal of Education*, *4*(7), 56 -69.

Peterson-Karlan, G. R. (2011). Technology to support writing by students with learning and academic disabilities: Recent research trends and findings. *Assistive Technology Outcomes and Benefits*, *7*(1), 39-62.

Pratt M. K. (2019). ICT (information and communications technology, or technologies). Tech Target. Retrieved 18th May, 2021 from https://searchcio.techtarget.com/definition/ICT-information-and-communications-technology-or-technologies

Putriani Z. & Kurniawan, R. (2016). Assistive Technology in Education: Screen Magnifier. *Indonesian Journal of Integrated English Language Teaching*, *2*(1), 61 -76.

Quinlan, T. (2011). Speech recognition technology and students with writing difficulties:

Raph, J. (2011). Assistive technology for students with mild disabilities. Intervention in School & Clinic, 23(2), 60-63.

Rowlands, T. (2015). The utilisation of assistive Technology to enhance education support for all learners in a mainstream school (PhD Thesis), University of South Africa. Zhang, Y. (2009). Technology and the writing skills of students with learning disabilities. Journal of Research on Computing in Education, 32 (4), 467-478

Rowlands, T. (2015). The utilization of assistive Technology to enhance education support for all learners in a mainstream school (PhD Thesis), University of South Africa.

Roy, S. D. (2015). Application of ICTs in teaching-learning process. *IRJIMS(International Research Journal of Interdisciplinary and Multidisciplinary Studies)*, *1*(7), 72-84.

Rufus, A., Liman, O., Abubakar, N. &Kwalzoom, L. (2015). Using Assistive Technology in Teaching children with Learning disabilities in the 21st C. *Journal of Education and Practice.* 6(24), 14-20

Rufus, A., Liman, O., Abubakar, N. &Kwalzoom, L. (2015). Using Assistive Technology in Teaching children with Learning disabilities in the 21st C. *Journal of Education and Practice*. 6(24), 14-20.

Russell, J. N., Hendershot, G. E., LeClere, F., Howie, L. J., & Adler, M. (1997). Trends and differential use of assistive technology devices: United States, 1994. Advance data from vital and health statistics, 292, 1-10.

Santaniello S. (2020). Communication Boards & AAC Devices. Assistive Technology. Retrieved 20th May, 2021 from https://assistedtechnology.weebly.com/communication-devices-elena-dellis.html

Schock, R. E. (2011). Curb cuts for writing: Students with learning disabilities' perceptions as learners and writers using assistive technology. *Unpublished master's thesis). Queen's University, Kingston, ON*.

Shah, R. K. (2019). Effective Constructivist Teaching Learning in the Classroom. *Online Submission*, *7*(4), 1-13.

Starcic, A. I. (2010). Educational technology for the inclusive classroom. *Turkish Online Journal of Educational Technology-TOJET*, *9*(3), 26-37.

Starcic, S. & Istenic, A. (2010). Educational Technology for the Inclusive Classroom. *Turkish Online Journal of Educational Technology*, 9 (3), 26-37.

Suhendi, A. (2018). Constructivist learning theory: The contribution to foreign language learning and teaching. *KnE Social Sciences*, 87-95.

Suryani, A. (2010). ICT in education: Its benefits, difficulties, and organizational development issues. *Jurnal Sosial Humaniora (JSH)*, *3*(1), 13-33.

Susan, S. (2009). The effects of Assistive Technology on students with disabilities. *Journal of Educational Technology*, 37 (4), 419-429.

Tony, M. P. (2019). The effectiveness of Assistive Technology to support children with Specific Learning Disabilities: Teacher Perspectives.

Turbet & Gudgel (2020). Low Vision Assistive Devices. AAO. Retrieved 19th May, 2021 from https://www.aao.org/eye-health/diseases/low-vision-assistive-devices

Ugwu, N. P., & Nnaekwe, K. (2019). The Concept and Application of ICT to Teaching/Learning Process. *International Research Journal of Mathematics, Engineering and IT*, *6*(2), 45 -59.

Ültanir, E. (2012). An epistemologic glance at the constructivist approach: Constructivist learning in Dewey, Piaget, and Montessori.

UNESCO. (2021). Access to Information And Knowledge Sharing. UNESCO. Retrieved 19th May, 2021 from https://www.unesco.org/archives/multimedia/subject/55/access+to+knowledge

Van Dijk, J., & Hacker, K. (2003). The digital divide as a complex and dynamic phenomenon. *The information society*, 19(4), 315-326.

Veronica (2020). A TO Z OF ASSISTIVE TECHNOLOGY FOR LOW VISION. Veroniiica. Retrieved 19th May, 2021 from https://veroniiiica.com/2020/01/28/a-to-z-of-assistive-technology-for-low-vision/

Watson, A. H., Ito, M., Smith, R. O., & Andersen, L. T. (2010). Effect of assistive technology in a public-school setting. *American Journal of Occupational Therapy*, *64*, 18-29.

Watson, S. & Johnston, L. (2007). Assistive technology in the inclusive science classroom. Science Teacher, 74(3), 34-39.

Williams, S. (2014). How speech-feedback and word-prediction software can help students write. Teaching Exceptional Children, 34 (3), 72-78.

Willings, C. (2021). Large Print. Teaching Visually Impaired. Retrieved 20th May, 2021 from https://www.teachingvisuallyimpaired.com/large-print.html

Wilson B. A. (2013). Memory deficits. Handbook of Clinical Neurology. Newnes. Elsevier, Vol. 110, pp. 357-363, ISSN 0072-9752,

Wood, S. G., Moxley, J. H., Tighe, E. L., & Wagner, R. K. (2018). Does use of text-to-speech and related read-aloud tools improve reading comprehension for students with reading disabilities? A meta-analysis. *Journal of learning disabilities*, 51(1), 73-84.

Wood, Surah, G., Moxley, Jerad, H., Tighe, Elizabeth, L. & Richard, K. (2017). Does use of text –to-speech and related read aloud tools improve reading comprehension for students with reading disabilities? A Meta-Analysis. *Journal of Learning Disabilities.* 51 (1), 73-84.

Young, G., & MacCormack, J. (2014). Assistive Technology for Students with Learning Disabilities: An Evidence-based Summary.

Young, M. C., Courtad, C. A., Douglas, K. H., & Chung, Y. C. (2019). The effects of text-to-speech on reading outcomes for secondary students with learning disabilities. *Journal of Special Education Technology*, 34(2), 80-91.

Zhou, G., & Xu, J. (2007). Adoption of Educational Technology: How Does Gender Matter?. *International Journal of Teaching and Learning in Higher Education*, 19(2), 140-153.

APPENDIX A

QUESTIONNAIRE ON THE AVAILABILITY AND UTILIZATION OF ASSISTIVE TECHNOLOGIES

Section A: BIODATA

Please tick (√) in the appropriate column and fill the assigned spaces

Gender: Male [ ] Female [ ]

Section B: Availability of Assistive Technologies

Kindly tick (√) the appropriate option of your selection that corresponds with your view

Available and Adequate (AD) Available but Inadequate (AI) Not Available (NA)

S/N	ITEMS	AD	AI	NA
1	Text-to-speech are available in the classroom for teaching and learning			
2	Speech to text are available in the classroom for teaching and learning			
3	Word Prediction are found in the classroom for teaching and learning			
4	Magnifiers are found in the classroom for instructional delivery			
5	There are voice Amplification Systems in the classroom for teaching and learning			
6	Memory Aids are available in the classroom for teaching and learning			
7	Mobile Devices are available to use when teaching in the classroom			
8	There are communication Boards in the classroom during instructional delivery			
9	Large Print Materials are found in the classroom for teaching and learning			
10	Braille Displays are available in the classroom for teaching and learning			

Section C: Utilization of Assistive Technologies

Fully Utilized (FU) Partially (PU) Rarely Utilized (RU) Unutilized (UU)

Hearing impaired

S/N	Utilization of Instructional Materials	FU	PU	RU	UU
11	Text-to-speech are used during teaching and learning				
13	Speech to text are used to teaching and watch educational videos in the classroom				
13	Word Prediction are used during teaching and learning				
14	Mobile Devices are used for teaching in the classroom				
15	Voice Amplification Systems are used for teaching in the classroom for teaching and learning				

Visually Impaired

16	Memory Aids are utilized when teaching in the classroom				
17	Magnifiers are used for classroom instruction				
18	Communication Boards are used regularly during teaching and learning				
19	Large Print Materials are used in the classroom for teaching and learning				
20	Braille Displays are used in the classroom to deliver instruction				

APPENDIX B

VALIDATION FORM

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION
DEPARTMENT OF EDUCATIONAL TECHNOLOGY

Dear Sir/Madam,

Instrument Validation Form

The bearer is a student of the above named University and Department. She/he is conducting a research and you have been selected as one of those with requisite expertise to validate his/her instrument. Kindly grant him/her all necessary assistance to make the exercise a success.

Your competency and expertise was considered as factors that will serve to improve the quality of his/her research instrument. We therefore crave for your assistance in validating the instrument. The completion of the form serves as evidence that the student actually validated the instrument

GENERAL
Dept of Educational Technology
Federal University of Technology
03 JUN 2021
P.M.B. 65 Minna, Niger State

Thanks for your anticipated assistance.

Dr. C.S. Tuvera

Head of Department (Signature, Date & Official Stamp)

Student's Surname. IDOWU ..... Other Names. AYOMIDE DANIEL

Registration Number. 2015/157953ET ..... Programme. EDUCATIONAL TECHNOLOGY

Title of the Instrument.....

ATTESTATION SECTION

Summary of the Remark on the Instrument..... V. Good .....

.....

.....

I hereby attest that the above named student brought his instrument for validation

Name of Attester. Muhammad Adamu Alhaji

Designation..... H.O.D. Blind unit

Name and Address of Institution. NIGER STATE School For Special Education

Phone Number. 07036240785 ..... E.- Mail.....

Please comment on the following

1. Appropriateness of the instrument for the purpose it's design for.....appropriate.....
2. Clarity and simplicity for the level of the language used.....It's appropriate.....
3. Suability for the level of the targeted audience .....Suitable.....
4. The extent in which the items cover the topic it meant to cover.....appropriate.....
5. The structuring of the Questionnaire.....appropriate.....
6. Others (grammatical errors, spelling errors and others.....No None.....
7. General overview of the Instrument.....Satisfactory.....

Suggestions for improving the quality of the Instrument

1. .....
2. .....
3. .....
4. .....
5. .....

Name of Validator.....Muhammad Adamu Alhaji.....

Area of Specialization.....Visual Impairment.....

Name of Institution.....Niger State School for Special Education Minna.....Designation.....H.O.D.....

Signature.....Date.....22/6/2022.....

Thank You

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION
DEPARTMENT OF EDUCATIONAL TECHNOLOGY

Dear Sir/Madam,

Instrument Validation Form

The bearer is a student of the above named University and Department. She/he is conducting a research and you have been selected as one of those with requisite expertise to validate his/her instrument. Kindly grant him/her all necessary assistance to make the exercise a success.

Your competency and expertise was considered as factors that will serve to improve the quality of his/her research instrument. We therefore crave for your assistance in validating the instrument. The completion of the form serves as evidence that the student actually validated the instrument

Thanks for your anticipated assistance.

GENERAL
Dept of Educational Technology
Federal University of Technology
03 JUN 2021
P.M.B. 65 Minna, Niger State

Dr. C.S. Tuvera
Sign:.....

Head of Department (Signature, Date & Official Stamp)

Student's Surname. IDOWU ..... Other Names. AYOMIDE DANI

Registration Number. 2015/157953BT ..... Programme. EDUCATIONAL TECHNOLOGY

Title of the Instrument.....

ATTESTATION SECTION

Summary of the Remark on the Instrument..... Satisfactory .....

.....

.....

I hereby attest that the above named student brought his instrument for validation

Name of Attester..... ILUFOYE Timothy .....

Designation..... Teacher .....

Name and Address of Institution..... Model Secondary School, F.U.T Minna .....

Phone Number..... 07062304600 ..... E.- Mail..... ilufoye timothy@yahoo.com

Please comment on the following

1. Appropriateness of the instrument for the purpose it's design for.....Appropriate.....
2. Clarity and simplicity for the level of the language used.....Clear and Simple.....
3. Suability for the level of the targeted audience .....Suitable.....
4. The extent in which the items cover the topic it meant to cover.....Satisfactory.....
5. The structuring of the Questionnaire.....Good.....
6. Others (grammatical errors, spelling errors and others.....Minimal Correction.....
7. General overview of the Instrument.....Satisfactory.....

, Suggestions for improving the quality of the Instrument

1. .....little Correction ~~th~~ in the content.....
2. .....logical arrangement of the question.....
3. .....
4. .....
5. .....

Name of Validator..IHUEOJE Timothy Olaoluwa.....

Area of Specialization.....Educational Technology.....

Name of Institution..Model Secondary School.....Designation....Teacher.....

Signature.....Date..30/06/2021

Thank You

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION
DEPARTMENT OF EDUCATIONAL TECHNOLOGY

Dear Sir/Madam,

Instrument Validation Form

The bearer is a student of the above named University and Department. She/he is conducting a research and you have been selected as one of those with requisite expertise to validate his/her instrument. Kindly grant him/her all necessary assistance to make the exercise a success.

Your competency and expertise was considered as factors that will serve to improve the quality of his/her research instrument. We therefore crave for your assistance in validating the instrument. The completion of the form serves as evidence that the student actually validated the instrument

Thanks for your anticipated assistance.

GENERAL
Dept of Educational Technology
Federal University of Technology
03 JUN 2021
P.M.B. 65 Minna, Niger State
Sign:..........

Dr. C. S. Tukura
....
Head of Department (Signature, Date & Official Stamp)

Student's Surname.....IDOWU..... Other Names.....AYOMIDE DA

Registration Number.....2015/1/57953BT..... Programme.....EDUCATIONAL TECHNOLOGY

Title of the Instrument..

ATTESTATION SECTION

Summary of the Remark on the Instrument.....STANDARD.....

....

....

I hereby attest that the above named student brought his instrument for validation

Name of Attester.....Mr. ADAMU LUBAIRU EMITI.....

Designation.....SENIOR LECTURER.....

Name and Address of Institution.....FUT. MINNA.....

Phone Number.....08036328687..... E.- Mail..........

Please comment on the following

1. Appropriateness of the instrument for the purpose it's design for..... APPROPRIATE.....
2. Clarity and simplicity for the level of the language used..... CLEARLY.....
3. Suability for the level of the targeted audience ..... SUITABLE.....
4. The extent in which the items cover the topic it meant to cover..... COVERED.....
5. The structuring of the Questionnaire..... STANDARD.....
6. Others (grammatical errors, spelling errors and others..... MINOR.....
7. General overview of the Instrument..... OKAY.....

Suggestions for improving the quality of the Instrument

1. THE INSTRUMENT CAN BE REVIEWED
2. .....
3. .....
4. .....
5. .....

Name of Validator..... Dr. ADAMU ZUBAIRU ENATI.....

Area of Specialization..... EDUCATIONAL TECHNOLOGY.....

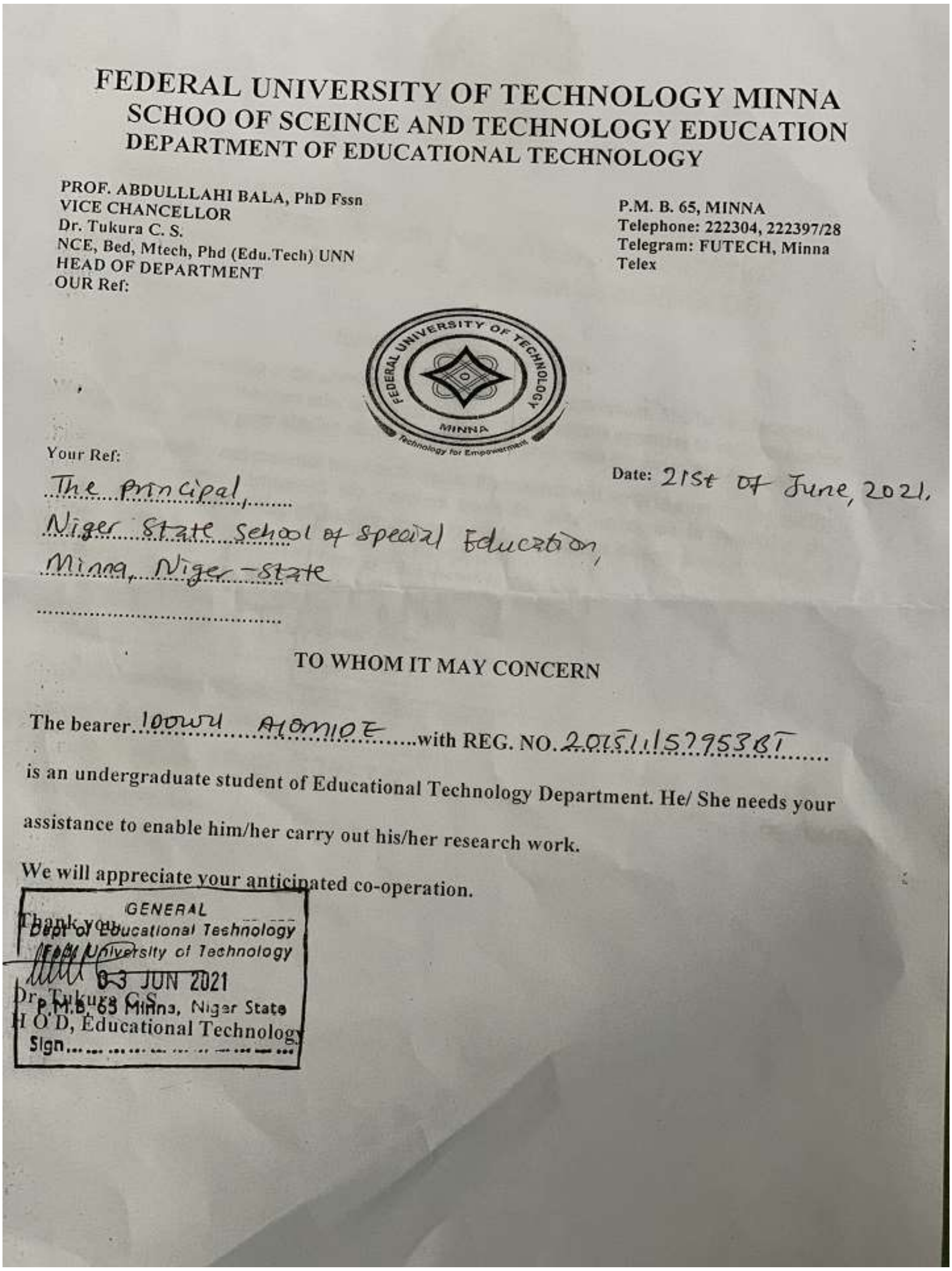
Name of Institution..... F.U.T. MINNA..... Designation..... SL.....

Signature..... Azbairu..... Date..... 9/07/2021

Thank You

APPENDIX C

PERMISSION LETTER



FEDERAL UNIVERSITY OF TECHNOLOGY MINNA
SCHOO OF SCEINCE AND TECHNOLOGY EDUCATION
DEPARTMENT OF EDUCATIONAL TECHNOLOGY

PROF. ABDULLLAHI BALA, PhD Fssn
VICE CHANCELLOR
Dr. Tukura C. S.
NCE, Bed, Mtech, Phd (Edu.Tech) UNN
HEAD OF DEPARTMENT
OUR Ref:

P.M. B. 65, MINNA
Telephone: 222304, 222397/28
Telegram: FUTECH, Minna
Telex

FEDERAL UNIVERSITY OF TECHNOLOGY MINNA
Technology for Empowerment

Your Ref:

Date: 21st of June, 2021.

The principal,
Niger State school of special Education,
Minna, Niger-state

TO WHOM IT MAY CONCERN

The bearer IDOWU AYOMIDE with REG. NO. 2015/1/57953BT is an undergraduate student of Educational Technology Department. He/ She needs your assistance to enable him/her carry out his/her research work.

We will appreciate your anticipated co-operation.

Thank you.

GENERAL
Dept of Educational Technology
Fed University of Technology
03 JUN 2021
P.M.B. 65 Minna, Niger State

Dr. Tukura C.S.
H O D, Educational Technology
Sign........................