CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Technology in the 21st century is an indispensable tool for the enrichment of the quality of human life and their future prospects. Technology has become a vital component of our everyday lives; communication, work, entertainment, and Education among others. Advances in technology and Education has greatly influence human communication and learning (Sagnak, & Baran, 2021). Therefore, the effective adoption of technology has become a critical issue in today's knowledge-based economy especially in the classroom to prepare human resource that will take advantage of opportunities in the global market. Consequently, there has been an increase in the advocacy for the integration of technology for learning. Research has shown that technology enhances meaningful learning of instructional contents. These technologies, on its own, cannot make student acquire relevant skills required for success in the 21st century.

In response to 21st century teaching and learning, teachers had to act as facilitators because, Education is dynamic and is subject to changes inflicted by external forces such as globalization (Blackwell, *et al*, 2014). Thus, technologies used in special Education have significantly changed over time ranging from low electrically powered, to medium powered to highly electrically powered technologies. These technologies are now serving the roles of assistance to the specialty needs of students and complementation to their various physical challenges (Abani, 2015).

In a more encompassing term, technologies for students with special needs are generally known as Assistive Technology (AT). This is to qualify their roles in assisting students with physical challenges to do their activities as normal students. Assistive technology

devices have the potential to positively influence the Educational possibilities of students with special needs. Assistive technologies are devices created to enhance the learning capabilities of individuals with special needs through speech communication, text to voice and mobility. Similarly, Clark, Griffiths and Price, (2016) refer to assistive technology as equipment that assist students to cope or make up for certain physical deficiencies, learning inconsistencies and mobility issues.

Assistive technology is part of the technologies used in aiding students with special needs. As a device, it refers to any item, piece of equipment, or product system, whether bought off the shelf, modified, or customized, used to increase, maintain, or improve the functional capabilities of students with special needs. It is also defined as any product, primarily produced or generally available, that is used by or for persons with special needs: for participation; to protect, support, train, measure or substitute for body functions/structures and activities; or to prevent impairments, activity limitations or participation restrictions (Abubakar, Sani, & Sani, 2019).

Assistive technology is a generic term that includes assistive, adaptive, and rehabilitative devices for individuals with special needs and includes 'virtually anything that might be used to compensate for lack of specific abilities, ranging from low-tech devices like crutches or a special grip for a pen, more advanced items like hearing aids and glasses, to high-tech devices such as computers with specialized software for helping people with dyslexics to read (Abani, 2015). Assistive technology includes devices, equipment, instruments and software directed to assist people with special needs.

Special needs are defined as conditions or function judged to be significantly impaired relative to the usual standard of an individual or group. The term is used to refer to

individual functioning, including physical impairment, sensory impairment, cognitive impairment, intellectual impairment, mental illness, and various types of chronic disease (Abani, 2015). A special need may be seen or noticeable (visible special needs) others may be hidden (invisible special needs). Students with special needs in this research work, therefore, refer to those students that bear one kind of impairment or the other as the ones mentioned above. Siyam, (2019), asserts that people may look at assistive technologies (AT) as tools that lead students with special needs to succeed, while others believe that assistive technologies makes them dependent and not be able to do tasks on their own.

Assistive technologies also provide students with special needs opportunities for learning independently. Mcnicholl, Casey, Desmond, and Gallagher, (2019) reported that if Assistive Technology are effectively used it will support the learning of individual with special needs. The use of assistive technologies in teaching and learning could be of importance to students with special needs; but their usage depends on the adequacy, lecturers' acceptance and utilization. It is evident that successful adoption of technology has become critical in our world, and in our classrooms. School standards are being reformed and implemented to support the integration of technology into our curricula. It is also important to consider that for many students with special needs, technology integration is critical to their learning and the benefits of technology and specifically assistive technology have been highlighted in enhancing meaningful learning among students with special needs.

The literatures on the integration of technology among normal students are numerous (Yelland, 2011). On the other hand, there is little literature, especially in Nigeria, on the integration of assistive technologies among students with special needs, indicating that

there is limited research to the best knowledge of this researcher especially in North-West Nigeria and this is one of the justifications for this research. Therefore, given the critical role of technology-enhanced learning using assistive technology among pre-service lecturers, their perception, acceptance, and utilization could be an important construct.

The adoption of assistive technologies for teaching and learning depends on the lecturer's perception (Williams-Buffonge, 2021). Lecturers perception is influence by several factors such as perceive usefulness, perceive ease of use, technological self-efficacy, intension to use AT and accessibility. Other factors include; demographic factors such as gender, and years of experience. Perception is closely linked to an individual experience and emotions, it influences the way individuals view phenomenon and object. Therefore, two individuals in the same condition may view the situation differently. An individual's perception can largely be governed by his background knowledge of the phenomena (Williams-Buffonge, 2021). Perception of assistive technology is viewed from its perceive usefulness, ease of use, self-efficacy and intention to use.

Perceive usefulness of technology (AT) is the extent to which an individual lecturer sees assistive technology as a useful device that will enhance his job performance. Perceive usefulness can also be seeing as a perception of instructor or teachers to use suitable assistive technology devices (ATDs) in order to make the needed impact for their different special need, this could influence how easy the ATDs is in teaching.

Perceive ease of use to AT is how the lecturers perceive the easiness of the devices. This rose to an easy diagnosis, transfer of easy skills using flexible software and creating an enabling environment for easy learning, these can confidently be done using

teacher's/lecturer's self-efficacy. Self-efficacy as a motivational and criterion construct that is based on how lecturers perceive their abilities rather than their actual levels of ability.

Self-efficacy is how a person views their capabilities through reflection, internalization, and actions (Bandura, 1977). Xia (2017) defined self-efficacy as the ability or belief that a person has to execute an action and achieve desired outcomes. Self-efficacy influences whether individuals perform specific tasks, which then causes their learning to be controlled by a specific behavior or environmental factor (Xia, 2017). Bandura (1998) aimed individuals who perform at high levels have high self-efficacy and engage and participate in projects faster and more willingly than those who have low self-efficacy and are slower and disengaged. Persons with high self-efficacy believe in their capabilities and are not afraid of new challenges or difficult tasks (Lemon & Garvis, 2016). However, individuals with low self-efficacy doubt their skills. All these constructs intended to support teaching and learning if the behavioral intention of the lecturers for special people with special needs are implemented.

Behavioural intention is a positive curiosity of a lecture to apply the suitable methods sing ATDs in teaching and training special need students. Intention of lectures to evaluate, monitor, offers, compensate and encourage well enough using variety of AT tools, this can also be determined by lectures experience in the process. Years of experience and gender as one of the moderating variables was used to determine the relationship on behavioral intention to use AT, years of experience could be the term, durations or period the lecturer or teacher stayed in performing the task of teaching and how is that related influence behavioral intention to use AT. Lecturers' perception of assistive technologies to teach students with special needs could also be gender related.

Gender, according to UNESCO, refers to socially and culturally constructed meaning and roles assigned to the person of different biological sexes. The concept also includes the expectation held about the characteristics, attitudes and behaviours of both men and women. Gender seems to influence individuals' perception or opinions of phenomena and thus affects their attitudes. Lecturers perceive usefulness and perceive ease of use of assistive technology could be influence by their technological self-efficacy.

Efficacy expectation is dependent on how much exertion is necessary to complete a task and how much time is spent working out challenges. If an individual's perceived self-efficacy is strong, they will put forth greater efforts to accomplish a task than individuals with low self-efficacy. Persisting with activities perceived to be challenging allows individuals to gain experiences strengthening their self-efficacy. Teacher self-efficacy beliefs, the teacher's belief in her and his ability to organize and execute the courses of action required to successfully accomplishing a specific teaching task in a particular context, this has been a topic of Educational research for decades.

1.2 Statement of the Research Problem

The prevalence of individuals with special needs is steadily increasing worldwide, posing a significant challenge in providing them with an education that enables them to achieve parity with their peers and lead balanced lives. In response to this challenge, various approaches have been implemented globally, including the establishment of special schools exclusively for students with special needs in the late 1990s, as well as the adoption of inclusive education models that integrate both regular and special needs students in a shared classroom environment. Despite the implementation of these approaches, numerous students with special needs in countries such as Nigeria continue to face considerable barriers to their learning, which perpetuate frustrating learning

conditions (Dafwat, 2018; Mcnicholl, 2019). These barriers encompass difficulties in reading, writing, and information reception, ultimately leading to a distressing phenomenon of increased school dropout rates among physically challenged students who resort to street begging as a means of survival (Pasha, 2020).

Moreover, even the few special needs students who successfully graduate from College of Education often lack the essential skills necessary for thriving in the 21st century labor market. Consequently, their integration into the workforce becomes challenging, hindering their ability to secure gainful employment (Yakubu, 2019). Furthermore, those who are fortunate enough to secure employment due to their special needs status face difficulties in performing their job responsibilities because they have not been adequately trained in the use of assistive technologies (Mcnicholl, 2019). A fundamental question arises: To what extent do College of Education lecturers incorporate assistive technologies in training students with special needs? The global practice of training students with special needs requires the integration of assistive technologies, provided that lecturers recognize their usefulness and ease of use. Additionally, lecturers' technological self-efficacy in utilizing assistive technology plays a crucial role in its successful incorporation into the college training program, particularly for students with special needs.

Owning to the slow integration of assistive technologies by college of education lecturers comes the pressing need to investigate their perceptions and technological self-efficacy regarding the use of assistive technology for teaching students with special needs. Understanding these factors is essential to uncover the underlying reasons for the slow integration of assistive technologies in teaching students with special needs. Similarly, such insights can provide valuable guidance in developing effective

strategies to promote the integration of assistive technologies, leading to the creation of an inclusive learning environment that caters to the diverse needs of students with special needs in Colleges of Education in Northwest Zone, Nigeria.

1.3 Aim and Objectives of the Study

The study aimed at assessing factors that influence lecturers' intention to use assistive technologies for teaching students with special needs in Colleges of Education in North-West Nigeria. Specifically, the study seeks to:

1. Examine lecturers' perception of the usefulness of assistive technology for teaching College of Education (COE) students with special needs.
2. Determine lecturers perceive ease of use of assistive technology for teaching COE students with special needs.
3. Surveys lecturers' technological self-efficacy of assistive technology for teaching COE students with special needs.
4. Determine the influence of lecturers' perceived usefulness on behavioral intention to use assistive technology for teaching COE students with special needs.
5. Examine the influence of lecturers' perceived ease of use on behavioral intention to use assistive technology for teaching COE students with special needs.
6. Ascertain the influence of lecturers' technological self-efficacy on behavioral intention to use assistive technology for teaching COE students with special needs.
7. Determine the relationship of years of experience and behavioral intention to use assistive technology for teaching COE students with special needs.

8. Examine the relationship of gender and Behavioral intention to use assistive technology for teaching COE students with special needs.
9. Investigate the influence of perceived usefulness, ease of use and self-efficacy on Behavioral intention to use assistive technology for teaching COE students with special needs.

1.4 Research Questions

The following research questions were answered in this study.

1. What is lecturers' perceived usefulness of assistive technology for teaching College of Education (COE) students with special needs?
2. What is lecturer's perceived ease of use of assistive technology for teaching COE students with special needs?
3. What is lecturer's technological self-efficacy in assistive technology for teaching COE students with special needs?
4. How lecturers influence the perceived usefulness on behavioral intention to use assistive technology for teaching COE students with special needs?
5. How does lecturer's perceived ease of use influence their behavioral intention to use assistive technology for teaching COE students with special needs?
6. What is the influence of lecturers' technological self-efficacy on behavioral intention to use assistive technology for teaching COE students with special needs?
7. Is there any relationship between years of experience and behavioral intention to use assistive technology for teaching COE students with special needs?
8. Is there any relationship between gender and behavioral intention to use Assistive technology for teaching COE students with special needs?

9. What is relationship between perceive usefulness, ease of use, self-efficacy and the behavioral intention to use assistive technology for teaching COE students with special needs.

1.5 Research Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance.

H_{O1}: There is no significant influence of lecturers' perceived usefulness on behavioral intention to use assistive technology for teaching College (COE) of Education students with special needs.

H_{O2}: There is no significant influence of lecturer's perceived ease of use on their behavioral intention to use assistive technology for teaching COE students with special needs

H_{O3}: There is no significant influence of lecturers' technological self-efficacy on behavioral intention to use assistive technology for teaching COE students with special needs.

H_{O4}: There is no significant relationship between years of experience and behavioral intention to use assistive technology for teaching COE students with special needs?

H_{O5}: There is no significant relationship between gender and lecturers' behavioral intention to use assistive technology for teaching COE students with special needs.

H_{O6}: Lecturers perceive usefulness, ease of use and self-efficacy are not significant determinants of their behavioral intention to use assistive technology for teaching COE students with special needs.

1.6 Significance of the Study

The findings of this study would have implication for the government, Educational administrators, curriculum planners, teachers, students and Non-Governmental Organizations (NGOs). The result would be of benefit to the government that will help initiate programmed and policies that will create conducive learning environment for the adoption and integration of assistive technology for learning at all levels of Education, specifically to disabled students. Consequently, lecturers' perspectives on assistive technology will contribute to the existing literature on the subject matter. Therefore, it is essential to investigate lecturers' perception of assistive technologies and the factors that influence lectures behavioral intention to use or not to use assistive technology.

Determining teachers' perspectives on assistive technology integration among pre-service teachers will expand the knowledge of policy makers and educators to strive for continual improvement. This research study is situated in the Northwest Nigeria to provide information that will assist and improve lecturers' ability to teach effectively and integrate technology effectively. Hence this study seeks to assess the adequacy, acceptance and utilization of assistive technology for teaching students with special needs in Colleges of Education in North-West Nigeria. Policy makers and curriculum planners will benefit from the results because the empirical findings could provide the necessary information for policy makers to leverage upon to make policies that encourage lifelong learning, especially on the special needs students.

The findings would also benefit lecturers of students with special needs by revealing the factors that will motivate them to use assistive technology for teaching. It is also hoped that the findings of the study would also encourage special Education teachers, who are

the main target of the study, to use assistive technologies in their future classrooms teaching and learning process. Continuous use of assistive technologies could enhance their perception and attitude towards other innovation platforms for teaching.

1.7 Scope of the Study

The scope of this study is limited to factors that influence lecturers' intention to use assistive technologies for teaching students with special needs in Colleges of Education (COE) in North-West Nigeria. The study covered all COE in North-West Nigeria, specifically, lecturers of students with special needs (Special Education lecturers). The Special Education lecturers who train students with special needs were selected to be respondents of the study because, they are responsible for the integration of assistive technology to students with special needs. The study was limited to the following variable perceive usefulness, perceive ease of use, and self-efficacy as predictor variable while the criterion or dependent variable is behavioral intention. The moderating variable includes; gender and years of working experience. The duration of the field work were two months and was slated while academic activities are ongoing. This was to enable the researcher to access the lecturers in their places of work.

1.8 Operational Definition of Terms

Operational definition of terms, involve the definition of major variables and terms as their used in this study. This variable includes:

Assistive Technology (AT): Assistive technology is a generic term that includes assistive, adaptive, and rehabilitative devices for individuals with special needs and includes 'virtually anything that might be used to compensate for lack of specific

abilities. Assistive technology includes devices, equipment, instruments and software directed to assist people with special needs.

Behavioral Intention to Use: It is the attitude or intention to adopt or integrate assistive technology in teaching students with special needs

Colleges of Education: *Refers to the institutions of higher learning that train teachers for Primary and junior secondary schools.*

Northwest Zone: *Refers to one of the six geo-political zones of Nigeria which is located at Northern part of the country, and comprises the following seven States such as Kano, Kaduna, Katsina, Kebbi, Sokoto, Jigawa and Zamfara.*

Perceived Ease of Use: Perceive ease of use is an individual view on a given object or phenomena that could be use with minimal effort. It is the relative ease of use of assistive technology for teaching among students with special needs it is a predictor in this study

Perceive Usefulness of Assistive Technology: is the extent to which an individual sees assistive technology as a useful device that will enhance his job performance.

Technological Self-Efficacy: This is one's beliefs and capabilities to organize and implement assistive technology. It is an action essential to produce a given attainment**.**

Gender: It refers male and female special needs lecturers in Colleges of Education North-West Nigeria

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Conceptual Framework

Conceptual frameworks are graphical illustration of key variables or construct being researched and are associated with the objectives of the research (Abani, 2015). In this study the Conceptual framework is build based on the relevant related literature reviewed later in this chapter. Hence in this study the major variables, Predictor or Independent variables are: Perceived Usefulness of Assistive Technology (PUAT), Perceived Ease of Use of Assistive Technology (PEUAT) and Technological Self-efficacy (TSE). The criterion variables or dependent variable includes Behavioral intention to use Assistive Technology (BIAT) while the moderating variables are gender, age, and year of experience. The conceptual framework is graphically illustrated i

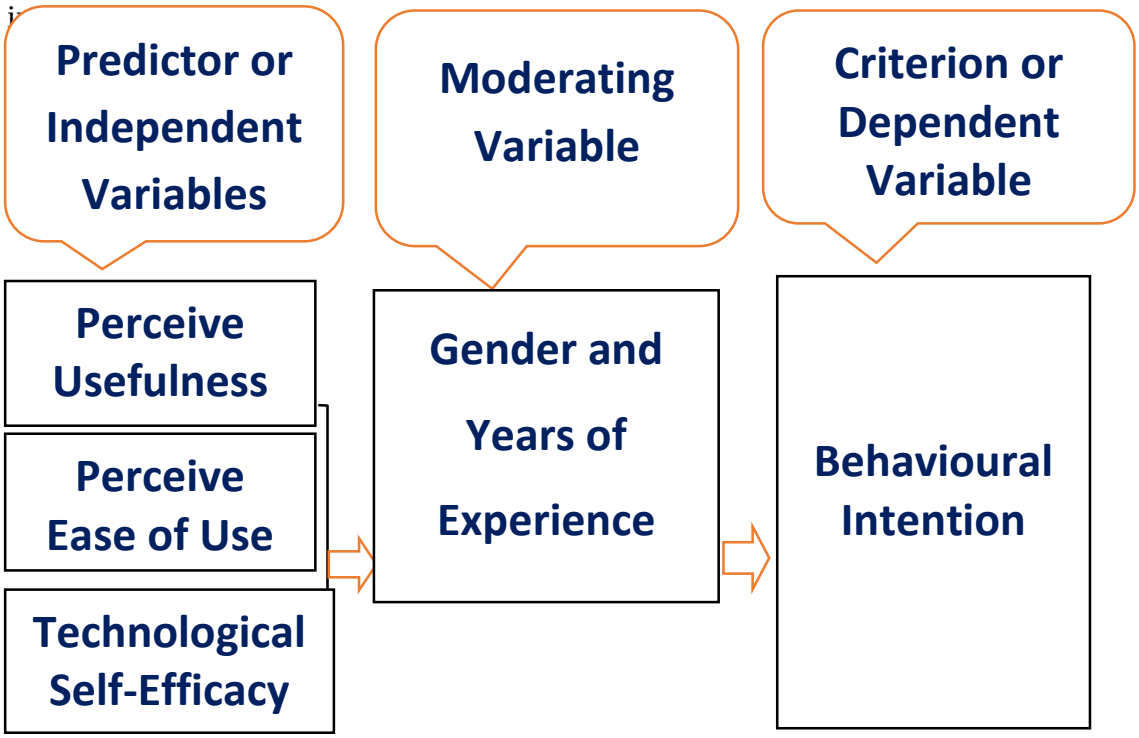


Figure 2.1: Graphical illustration of Conceptual framework of the study

Source: Researcher

Several research and Technology Acceptance Models (TAM) highlighted that psychological construct such as perceive usefulness, perceive ease of use could influence individual attitude or intention to adopt technology for teaching and learning; Literature is replete on the adoption of technology for instruction in normal Education. But there is limited literature on the adoption or AT among special Education teacher, especially in Nigeria

2.1.1 Concept of assistive technology (AT)

From the recent history Assistive Technology **(AT)** got its stands from the United States in 1988, with increasing awareness of how technology can provide assistance for individuals with special needs. The United States Congress established the Technology-Related Assistance Act for people with special needs with a primary purpose of providing Assistive Technology (AT) services and devices to people with special needs of all ages, all types of special needs, and in all environments (Center for Parent Information and Resources, 2016). **Rivera, (2017)** stated that students individualize dedication plans must indicate whether student with a special need. In 1996, the Senate Committee on Labor and Human Resources required IEP team members to adequately consider the required AT devices and services that lead to improve the Educational outcomes for students with special needs (Abend, 2017).

Moreover, the Individuals with Special Needs Education Act (IDEA, 2004) emphasize the importance of considering AT devices and for all students with an individualized transition plan as part of their required services (**Areej, (2018**). By the late 20th century, the laws of the United States have developed so that people with special needs can fully and equally participate and integrate in all aspects of Education and society (**Mcncholl, Casey, Desmond, & Gallagher, 2019)**. At this time, assistive technology has broad

acceptance by the nation, which is helpful for students with special needs in many different areas such as enhancing academic performance and personal goals (Tejasvee, Gahlot, Poonia, & Kuri, 2020**).**

Furthermore, the Office of Special Education Programs (OSEP) committed to using AT to improve outcomes for students with special needs by providing learning and communication opportunities so they may effectively engage in different environments (Alquraini, 2010**)**. OSEP ensures that AT is available and accessible for every child with special needs whether they need devices or assistive technology services, or both (Individuals with Special Need Education Act, 2017). Abani, (2015) define the term assistive technologies as "the equipment, devices, apparatus, services, systems, processes and environmental modifications used by disabled and/or elderly people to overcome the social, infrastructural and other barriers to independence, full participation in society and carrying out activities safely and easily". Assistive devices can be helpful tools to supplement and support students with special needs to achieve academic growth (Rivera, 2017). Moreover, Assistive technologies such as voice recognition applications, (Mobile devices, symbol-based interaction, tangible technology and virtual reality can provide equitable access for students with special needs to participate more fully in inclusive settings (National Association for the Education of Young Children, 2012). IDEA mandates all schools must provide services to assist students with special needs in selecting, evaluating, replacing and adapting AT devices and services **(**Sagnak, & Baran, 2021**).** According to IDEA (2004), assistive technology service is "any service that directly assists a child with special needs in the selection, acquisition, or use of an assistive technology device that is used to increase, maintain, or improve functional capabilities of a child with special needs."

Assistive technology is used as an umbrella term for both assistive (products) devices and related services which are largely used at home, school and community for students with physical and mental challenges. There are various definitions of assistive technology ranging from its conception as a device and as a service: two of them are presented here. Assistive technology devices refer to item, piece of equipment, or product system, whether bought off the shelf, modified, or customized, used to increase, maintain, or improve the functional capabilities of students with special needs. Drawing from this definition, assistive technology can be looked at more broadly as any product, especially produced or generally available, that is used by or for persons with special needs: for participation; to protect, support, train, measure or substitute for body functions/structures and activities; or to prevent impairments, activity limitations or participation restrictions. This includes devices, equipment, instruments and software directed to assist the needy persons.

Assistive technology is a generic term that includes assistive, adaptive, and rehabilitative devices for individuals with special needs and includes 'virtually anything that might be used to compensate for lack of certain abilities' ranging from low-tech devices like crutches or a special grip for a pen, to more advanced items like hearing aids and glasses, to high-tech devices such as computers with specialized software for helping dyslexics to read (WHO, 2011).

Assistive technology is also called 'technical aids', or 'assistive equipment' including information and communication technologies (ICT), universally designed technologies, Educational technologies, emerging and innovative technologies, and accessible technologies. Abani (2015) refer assistive technology as 'any item, piece of equipment or product system that is used to increase, maintain, or improve the functional

capabilities of individuals with special needs, and help them to work around or compensate for a special need's, in order to participate in the activities of daily life. From a simple device like a magnifying glass, to a complex computerized communication system; depending on their nature of use and application. To elaborate further on the definition: Assistive technologies include mechanical, electronic, and microprocessor-based equipment, non-mechanical and non-electronic aids, specialized instructional materials, services, and strategies that people with special needs can use either to:

i. *Assist them in learning*
ii. *Make their environment more accessible*
iii. *Enable them to compete in their workplace*
iv. *Enhance their independence, or*
v. *Otherwise improve their quality of life.* **Or**

Academic and Learning Aids: Electronic and non-electronic aids such as calculators, spell checkers, portable word processors, and computer/tablet-based software solutions and apps that are used by students who has difficulty in coping with learning task. **Aids for Daily Living:** Self-help aids for use in activities such a seating, bathing, cooking, dressing, toileting, and home maintenance.

Assistive Listening Devices and Environmental Aids: Electronic and non-electronic aids such as amplification devices closed captioning systems, and environmental alert systems that assist students who suffer from hearing impairment or deaf. **Augmentative Communication:** Electronic and non- electronic devices and software solutions that provide a means for expressive and receptive communication for students with limited speech and language.

Computer Access and Instruction: Input and output devices, alternative access aids, modified or alternative keyboards, switches, special software, and other devices and applications or software solutions that enable students with special needs to use the classroom computer or tablet.

Environmental Control: Electronic and non-electronic aids such as switches, environmental control units, and adapted appliances that are used by students with physical special needs to increase they're in dependence across all areas of the curriculum.

Mobility Aids: Electronic and non-electronic aids such as wheelchairs (manual and electronic), walkers, scooters and crutches that are used to increase personal mobility.

Pre-vocational and Vocational Aids: Electronic and non-electronic aids such as picture-based task analysis sheets, adapted knobs, adapted timers and watches that are used to assist students in completing pre-vocational and vocational tasks.

Recreation and Leisure Aids: Electronic and non-electronic aids such as adapted books, switch adapted toys, and leisure computer based software applications that are used by students with special needs to increase participation and independence in recreation and leisure activities.

Seating and Positioning: Adaptive seating systems and positioning devices that provide students with optimal positioning to enhance participation and access to the curriculum.

Visual Aids: Electronic and non-electronic aids such as magnifiers, talking calculators, Braille writers, adapted tape players, screen reading software applications for the computer, and Braille note-taking devices that assist students with visual impairments

or blindness in accessing and producing information that is typically present in a visual (print) modality. (Abani, 2015)

Assistive technology services on the other hand, refer to any service that directly assists an individual with special needs in the selection, acquisition or use of assistive technology. It may include an array of services and activities such as; Evaluating the technology needs of a child with a special need, including a functional evaluation of the child in the child's customary environment; Purchasing, leasing, or otherwise providing for the acquisition of assistive technology devices for children with special needs; Selecting, designing, fitting, customizing, adapting, applying, retaining, repairing, or replacing assistive technology devices; Coordinating and using other therapies, interventions, or services with assistive technology (AT) devices, associated with existing Education and rehabilitation plans and programs; Training or technical assistance for a child with a special need or, if appropriate, that child's family and Training or technical assistance for professionals including individuals providing Education services, or other individuals who provide services to, or are otherwise substantially involved in the major life functions of a child with special needs. (Abani, 2015)

Assistive technology evaluation team must give special consideration to the AT needs of the students across their Educational environment, which may include school, home, and community. Assistive technology, services are provided to assist in the selection, acquisition, and use of an assistive technology device. In most cases, a team of experts are saddled with the responsibility of conducting an evaluation in the student's customary environment. The evaluation report specifies an appropriate assistive technology device that has been selected to meet the student's needs, the next step or

"service" is to actually provide the assistive technology device for the student's use. After the device has been obtained and if appropriate, modified, all appropriate individuals should be trained in the use of the device and the device should be made available for the student's use a cross instructional setting as needed (Dallami, 2021).

2.1.1.1 *Assistive technology (AT) and students with special needs (SWSN)*

It is evident that successful adoption of technology has become critical in our world, and in our classrooms. While research supports that there are positive benefits of technology, and school standards are being implemented to support the integration of technology into our curricula, it is also important to consider that for many students with special needs, technology integration is not just beneficial, it is critical to learning. Providing technology to students with special needs to help remove barriers to increase access to learning and improve academic success (Isah, 2014). When considering technology with students with special needs, any item or product that is used to increase, maintain, or improve functional capabilities is considered assistive technology (AT)

Assistive Technology products are defined as "...any product (including devices, equipment, instruments, technology, and software) specially produced or generally available, for preventing, compensating for, monitoring, relieving or neutralizing impairment, activity limitations, and participation restrictions" (Isah, 2014.Assistive technology is technology used by individuals with special needs in order to perform functions that might otherwise be difficult or unfeasible. According to Nguyo, (2016) these new tools support implementation of a visual approach to everyday communication and language instruction in ways that were impossible prior to the digital technology revolution by enabling both access to visual content and creation of

better instruction materials". According to Isah, (2014), when technology is used with students with special needs, students can gain considerable benefits.

In general, technology can be a powerful tool in the improvement of the quality of life of individuals with special needs and can open door to endless opportunities (Isah, 2014). Abubakar, *et al*, (2019), explained that reason for the increase in the development of more advanced and specialized assistive technologies is a result of the increase in the number of classified students and educators need to adjust to this change since students with special needs are required to learn. Abubakar, *et al*, (2019), go on to explain:

"AT helps students with special needs develop independent thinking skills, maintain self-reliance, increase autonomy, develop problem-solving skills, facilitate a sense of continuity in living conditions as much as possible, and become more actively involved in their Educational activities at home, schools and communities."

Assistive technology can be considered low-tech or high-tech. Low-tech AT is a device or piece of equipment that does not require much training, may be less expensive, and does not have complex or mechanical features (i.e. pencil grips, enlarged print, slant boards). High-tech AT is the most complex device or equipment that has digital or electronic components. These components may be computerized and will likely require training and effort to learn how to use and will most likely be considered expensive (e.g., computers with specialized software, iPads, Chrome books, speech generating devices). For the purpose of this study, we will be considering high-tech assistive technology which will include devices that are more complex, will most likely be expensive, and will require effort to learn how to use

Assistive technology not only provides access for students with special needs to increase their accessibility to the curriculum, it also enhances the quality of the overall learning

experience (Alkahtani, 2013). Consequently, assistive technology can hold great promise in empowering individuals with special needs to be more functional in communicating, having access to leisure activities, and learning academic and social communicative skills.

Given the proceeding assistive technology helps students in two main ways: completing a task and bypassing an area of difficulty. It was observed that when students listen to a digital version of a book, they are bypassing an area of difficulty; however, when students focus on highlighted words on a computer screen, they are able to learn unfamiliar words (Abubakar *et al.*, 2019).

According to the American Psychiatric Association (Abani, 2015), a learning special needs is recognized when the progress of students is less than that expected on standard tests of reading, mathematics, and writing based on age, Education and intelligence level. Learning special needs are associated with problems in listening, reasoning, memory, attention, selecting and focusing on relevant stimuli, and the perception and processing of visual and/or auditory information (National Joint Committee on Learning Special needs, 2008). These processing difficulties are presumed to be the underlying reason why students with learning special needs experience one or more of the following characteristics: reading problems, deficits in written language, underachievement in math, poor social skills, attention deficits and hyperactivity, and behavioral problems (Danlami, & Isah, 2017).

Students with special needs utilize assistive technology devices when physical conditions of the task present obstacles (Murchland & Parkyn, 2013). In many cases, inadequate consideration of assistive technology devices has been noted (Murchland & Parkyn, 2013). It was not known how the perceptions of special Education teachers

concerning assistive technology within the school instructional program affected assistive technology usage. This study focused on factors that influence teacher's behavioral intention towards using assistive technology with students with special needs in Colleges of Education. Determining how assistive technology devices appropriately influence learning continues to require further reflection. Assistive technologies have enabled students with a special need to use operational or functional skills to join in routines and activities using maximum effort without the aid of others (Wilcox, Campbell, Fortunato, & Hoffman, 2013). However, several factors could influence the use of assistive technology.

Assistive Technology for Learners with Special Educational Needs. Assistive technology (AT) also refers to any item, piece of equipment, or product system whether acquired commercially from the shelf, modified or customized, that is used to increase, maintain or improve the functional capabilities of a student with special needs. Furthermore, assistive technologies refer to the special devices and software meant for educating special needs student and adults. Assistive technologies are used by individuals with special needs to perform functions that might otherwise be very difficult or impossible. AT enables them to acquire adequate and appropriate education as the normal student acquires.

Assistive technology is an integral part of many individual with special needs. It is the keystone of a fruitful, modern educational process for students with special needs. AT can help and support students with special needs in their learning process by overcoming the effects of their impairment and barrier that traditional education may create. AT is one of the most relevant elements in making education more inclusive.

ATs are used to compensate for functional limitations, facilitate independent living enable the elderly to reduce limitations and to help the youths to realize their potentials.

ATs enhance the ability of a disabled person to participate in major life activities and to perform tasks that would be otherwise difficult or impossible for the individual to carry out. The principle of enhancing ability includes an increased level of independent action, a reduction of time spent in activities of daily living, more choices of activities and greater satisfaction in participating in activities. AT is in favors of people with special needs who can now live autonomously and indecently thus enjoying a positive change in the social attitude toward special needs when appropriately chosen and made available, the right technology can maximize their autonomy promote participation academic and carrier success.

The term autonomy means independence but not necessarily doing things without help or restricted to persons with full cognitive ability only. It is rather an attitude towards life in some ways personal characteristics that an individual can achieve and develop. Within the international classification functioning (ICF) framework, the role of assistive technology is shifting from a more tool to facilitating the full participation so that they can live more independently. (Sagnak, & Baran, 2021).

According to Dada (2013), many classification of assistive technology have been made depending on the purpose which it is used for; such as teaching, information exchange, cataloguing, organization of counseling services, etc. The most widespread classification is a product oriented, cluster assistive device that is based on the main objective of the technology. This classification includes: Aids for training of skills, orthoses and prostheses, aids for personal care and protection, aids for personal medical treatment, aids for personal mobility, aids for recreation, aids for handling products and

goods, aids for communication information and signaling, aid and equipment for environment improvement, tools and machines, aids for housekeeping and Furnishing and adaptation to homes and other premises.

There are also activity oriented classifications like the matching person and technology (MPT) Which approaches assistive technology from the perspective of various task of daily living household activities, health maintenance, recreation and self-care employment communication, mobility vision, hearing, cognition, reading and learning (Abani 2015). However, these classifications perhaps may not realize educational objectives for persons with special educational needs. The best suited must be learning oriented, like the heart line e-classification. It classes assistive technology knowledge around three components as follows:

Technical: This includes communication, mobility, manipulation and orientation.

Human: This involves issues related to special needs, assistive technology acceptance and choice, advice on assistive technology, personal assistance and psychological aspects of the assistive technology.

Socio–Economic: This comprises of issues of accessibility and design assistive technology quality and standardization, supply, legislation and information sources on assistive technology.

Factors affecting the use of AT opines by Dada (2013), that issues of design, consumer preference, cost and policy can influence the use, disuse or abandonment of assistive technology. Multiple factors are related to the abandonment of assistive technology devices which includes: Failure by assistive technology providers to take consumer

opinions into account, lack of easy device procurement and poor device performance and changes in consumer needs or priorities.

AT devices, as Dada (2013) cited that, there are various types of assistive technology devices for different categories of persons with special education needs. A few among them are as follows:

Ubiduo deaf communication device: This is a communication device that enables deaf or hard of hearing to communicate instantly with anyone face to face when the interpreter is not available. The communication is done through the device on it screens, without using sign language, gestures, lip reading, finger spelling or partial expression. The two screens will be dismantled and each person will hold one for chatting.

Lifestyle candy: This is an electronic magnifier that helps the low vision student or elderly people to read small letters on books or document. It can also perform simple magnification functions. Lifestyle can change the text color and background color so that the user can read texts comfortably. You can select preferred color mode out of 5 color modes. The user can change the magnification rate from 1.5 X to 22X as he/she want and it unto focus feature helps user to read anything that he/she want read.

Magnification S/W: 1.1x to 36x**,** bulls eye for aiming, screen split, large print keyboard, change in background colors, inversion of colors for persons with negative vision, network based system are available.

The smart Perkins braille: is a manual brailing device it can be used to create Braille document even if there is no electricity available. Smart Perkins Brailler uses the six key entry methods for braille input. The Perkins Brailler it takes one step further by allowing individuals to see and hear what letters are being brailed this makes the device

an excellent one for teaching students Braille. It also allows non-Braille reading teachers to assess the progress of their students by following along in print.

Braille coach: it is a Braille teaching device to the beginner braille learner. The device is designed to introduce the user to grade 1 and grade 2 Braille, allowing the user to practice both independently of their instruction. Headphones can be used where privacy is needed. The device can play sounds, words, or phrases. It can play one sound tag at a time the user can select the sound tag he/she likes to play user can also place the sound tag on the target area and when she/he is ready to play a sound the user can press down on the activation button.

Braille embosser is a hardware device used for printing computer generated text in Braille format.

Braille EDGE 40: The Braille edge 40 is a 40 cell Braille display developed and manufactured by HIMS for use by the blind and the visually impaired. The device can be used to do the following; use the device as a Braille display terminal for your windows, mac, ios, or android screen reader use built in "notepad" to create and edit Braille and text – document, or read BRF books on the go, utilize several built in utilities including schedule manager, calculator, alarm/clock, stopwatch and countdown timer, connect a USB mouse and use the wheel to quickly scroll documents and click to open menus.

WYNN/Kurzweil 300; this is a device which provide audio and visual support for learning to persons with dyslexia (i.e. persons with reading difficulties)

Braille sense on and: is a Braille note taker developed and manufactured by HIMS, for people who are visually impaired, partially sighted, or low vision. The device has

many powerful capacities which include the following: use the word processor and the Perkins style keyboard to create Braille documents, print text document using any compatible Bluetooth or USB ink printer, create hard copy Braille documents by connecting the unit to a Braille embosser, open Microsoft word document and read them in contracted Braille, send email messages to sighted colleagues and friends while reading e-mail messages in Braille without the need for translation, listen to music, audio books your own personally recording or even videos with the Braille senses integrated media player, listen to and record FM radio content, calculate algebraic equation, trigonometric functions and other scientific calculations with built in calculator etc.

Other functions of Braille sense on Hand include: View the flash disk of the Braille sense on Hand as a USB drive on your computer and transfer files, use the Braille sense on Hand as a Braille display with a compatible screen reader. Such as Window-Eyes, Jaws, or voiceover and copy, move, and delete files on the Braille sense on Hand with it intuitive, windows like file manager. Also; adjust the volume, speed, and pitch of the speech on the fly, use the database manager to create your own database for storing important information, use MSN messenger, Google talk, and twitter to keep up with what is happening and stay in touch with friends, family and colleagues, if you are a sighted teacher or parent, use the optional USB LCD accessory to view what a student is doing without needing to know Braille. (Dada, 2013)

Frog – pad; This is a keyboard for persons with one hand it has 15 keys with three different level overlays.

Quali key, look keys and adaptive keyboard: This is a keyboard with different names such as keyboard, intel keys, and head/mouse stick keys.

Foot petal keyboard: This is called programmed 3 keys keyboard

AT Software; Assistive technology software is used for helping people with special needs for studying and gaining knowledge. The following are few AT software used by people with special needs as listed by (Dada 2013): Dragon Naturally Speaking (Voice Recognition Software**);** Dragon naturally speaking software is a voice recognition programme that allows a user to navigate through and transcribe speech into text on, computer programmes such as Microsoft, word excel and internet explored. This software can be used to teach student with learning special needs e.g. dyslexic student.

Duxbury brailing software; this software is a Braille translator. The primary function of DBT software is translation between prints and braille. DBT can translate into grad 1 (unconstructed braille) or grade 2 (contracted braille) literary braille for many languages, and also translate from braille into the equivalent print for several languages and braille codes. DBT can also provide for formatting of Braille documents, along with translation of the text. This generally implies reworking the format to a certain extent as braille format is not always similar to print format.

Window eyes software (screen reader); this is software that reads the computer screen out loud. This allows visually impaired, partially sighted or low vision Computer user to hear what is happening on their computer or read it through special refreshable Braille displays. This allows them to use standard windows software, like micro soft office, internet explorer, email programmes, and even specialized industry cooperated software.

Tobii eye tracking system; this is a specialized eye tracking and eye control technology. This technology makes it possible for computers to know exactly where users are looking. Tobii's eye tracking technology works on principles of advanced

image processing of a person's face by using eyes and reflections in the eyes of near – infrared reference lights to accurately estimate the 3D position in space of each eye. It finds the precise target to which each eye gaze is directed. It is a fully automatic eye tracking technology with high tracking accuracy and tolerance of head motion.

Refreshable Braille Display Software; this software provides tactile output information presented on the computer screen. Unlike conventional Braille which is permanently embossed onto paper. Refreshable display is mechanical in nature and lift small, rounded plastic pins as need to form Braille characters. The display contains 20, 40 or 80 Braille cells, after the line is read, the user can "refresh" the display to the next line.

Text help system; this is software that provides literacy software solution. The software is developed to help struggling readers and writers those with literacy difficulties, learning special needs such as dyslexia, mild special needs and also those for whom English is a second language. It helps to improve users reading, writing and research skills at school, in the work place, and at home.

Grid Software; A grid is a page of buttons, called cells each cell can be used to perform a number of actions. The actions include talking, writing sentences, jumping to other grids, or carrying out special tasks. This software enables people with physical and sensory special needs to communicate and access a computer without a keyboard and mouse. The computer can be used for voice output communication and other computer-based tasks such as email and internet browning.

Grid has a number of workspaces, which are like small programmes, or applications. The most commonly used workspaces are for composing sentences for voice output

communication. There are also workspaces for email, web browsing, Skype, playing music or DVDs, accessing other software on your computer and more. (Dada, 2013).

I -Communication; this is an assistive technology tool for people with learning impairment. It assists in independent communication for persons who are deaf or hard of hearing. It translates contents in real – times like speech to text, video, sign language and speech/text to computer generated voice. Content once translated can be use by the user for obtaining definitions, synonyms and antonyms with the help of in-built dictionary in the system

Audis: is assistive technology software that is developed and aids the persons with special needs in their reading materials. It provides comfortable access for students with special needs to their textbooks. It maximally pays attention to the special needs of others and allows for flexible customization.

JAWS; this is the most powerful and popular screen reader worldwide. A jaw is very powerful software that provides accessibility solution for the visually impaired. It reads information on computer screen using synthesized speech. It provides many useful commands that make it easier to use programmes, edit documents and read web pages with a refreshing Braille display, Jaws can also provide Braille output in addition to, or instead of speech. Jaws can be customized as per individual needs and preference.

Eye – trackings: It is an on-screen cursor in controlled by simple body movement. A standard USB web can capture user movement and software translate it into mouse movement.

Quail – World; this is software for accessing computer without conventional keyboard and mouse.

Golden point computer braille system; is a software that includes such functions as Braille input and output, which enables students with special needs to read information board appearing on the computer screen. It is capable of converting what appears on the computer screen to Braille touch board that the students with special needs use to read information. It also allows them to send e-mail or conduct information search and retrieval.

Math daisy; It is an application developed for making math accessible to the student with special needs. It enables us to save documents in the DAISY digital talking book format with accessible math. The students can use math player TM – enable DAISY player software to read classroom materials in the manner that suits to the disabled learners.

Head – mouse extreme; Head mouse extreme is an innovative solution for wireless head pointing on personal computer, Macintosh system and alternative and augmentative communication (AAC) devices. The head mouse extreme replace the standard computer mouse for people who cannot use or have limited use of their hands when controlling a computer or augmentative communication devices. The head mouse translates natural movements of a user's head into directly proportional movement of the computer mouse pointer. The head mouse has a wireless optional sensor which tracks a tiny disposable target that is conveniently placed on the user's forehead, glasses, hat, etc. it works just like a computer mouse with the mouse pointer being moved by the motion of the user's head. It is very useful for disabled suffering with arthritis, spinal and injury as well.

Scanning and character recognition software; This software allows a visually impaired user access to text in combination with an integral screen reader, some of the

software also have built-in low vision accommodation, user can change the appearance of the text to suit his/her vision needs. In the field of sciences, the software can help them to recognize mathematical signs, equations and symbols.

Screen magnification software; this is software designed to manipulate the appearance of text and images on the computer. The software gives the user vast control over the size of text, icons and images and it often has a speech component. Thus, mathematical and scientific equations and symbols can be boldly displayed for their manipulation for better understanding and application with the assistance of speech component.

Educational Technology Programmes Designed for the Blind and Visually impaired; Programs such as talking typer and math flash from the American printing House. It makes it possible for the blind to navigate lessons without the use of vision. They are often self-paced. Thus, they can effectively study mathematics and science-based subject personally.

Software for educating gifted and talented student

According to Danlami (2021), the software that could be useful towards the education of gifted and talented student includes:

Content-Free software; This software allows students to enter the subject contents of their own choice to enhance learning in many different areas of curriculum. This helps the students to make a choice thereby overcoming barriers in learning. Students are free to choose contents of their own choice, it is likely that, the curriculum contents will be explored. Teachers too can benefit as it gives them chance to develop materials to meet individual needs of the students.

Reference software; Reference software is designed to present wide range of information in a multi-media, graphics, video sequences. This type of software includes encyclopedias, Students may have the opportunities to access and retain information which can be presented in a variety of ways.

Exploratory software; Gifted students like to explore the environment in which they live or belong. With the exploratory software such individuals would be put into the real-life setting using a combination of graphics and digitalized speech. The simulation requires the user to face challenges, make decisions and provide opportunities in sequence to overcome obstacles. This can help to meet the needs of individuals in a class or in a given situation. Students who are gifted can also explore modeled environment without constraints.

Software for educating student with physical and health impairment

Physical and health impaired student experience difficulties due to injuries in motion, physical strength coordination and communication with instruction materials, (Danlami (2021). He further states that, the following are some software that could be used in the education of student with physical and health impairment:

Switches Access software: This software is used by many students with physical special needs, the mouse or keyboard cannot be used, due to limited manual control. In this case, switches can be used in conjunction with a scanning system e.g. a grid with a number of words can increase speed when the user hits the switch, the word is highlighted at that moment and quickly transfers it to a word processor. It may be slow, but sentences can be gradually built up and read back to the students.

Access software tools: This software can be used either to compliment a wide range of peripherals while others can be used on their own.

Using AT for daily activities

AT is assisting people with special needs to successfully complete everyday tasks of self-care. These include: Devices that can be used to assist a person with memory difficulties to complete a task or to follow a certain sequence of steps from start to finish in such activities as making a bed or taking medication, devices can assist a person to become more independent by regulating and controlling many aspects of living environment. An environment can be computerized to give cues and auditory directions for successfully performing tasks or navigation, directional guidance system with auditory cues can assist a person to travel from one location to another e.g. laser cane, technology can assist a person with special needs to shop, write a cheque, pay bills, or use an ATM machines.

Using AT to help people with special needs in sports and recreation

Computerized games can be adapted for the user with physical limitation. Adaptations can be made to computer games that allow the game activity to be slowed down for the user who cannot react as quickly to game moves and decision making. Specially adapted sports equipment is available to compensate for functional limitations and allow an individual to participate more fully. For example, individual with special needs can participate in bowling using specially designed ball ramps.

2.1.1.2 *Categories of assistive technology*

In the last 30 years, technology has produced a wide variety of devices and tools to meet the needs of persons with special needs (DePountis, *et al*, 2015). Abubakar, *et al*, (2019), states that assistive technologies can significantly contribute to helping individuals with special Educational needs in learning, building self-esteem, being independent, and achieving a high quality of life. AT devices ranges from low-tech to

high-tech devices or equipment (Georgia Tech Tools for Life, 2018). From experience, children, parents, and teachers find that it is best to use the simplest technology that will meet the identified need. When many people think of assistive technology, they think primarily about computers or sophisticated electronic devices. However, it is important to realize that assistive technology applications can be viewed as a continuum that ranges from "no-tech' to "high- tech".

No-Tech (no special devices): No-tech solutions are those that make use of procedures, services, and existing conditions in the environment that do not involve the use of devices or equipment. These might include services such as physical therapy, occupational therapy or the services of other specialists (Nsofor & Bello 2015).

Low-tech AT includes devices or equipment that is most commonly used, less expensive, do not require much training, and do not have complex features. For example, a student who has difficulty remembering assignments and organizing materials might need a low-tech tool (e.g., index tabs, colored folders) to aid him/her in finding the needed materials (Nsofor & Bello 2015) indicate that writing is one of the most challenging skills that students with mild special needs have difficulty. For example, students with mild special needs struggle with text production skills (e.g. handwriting, spelling, and punctuation) which interfere with the quantity and quality of their writing (Nsofo & Bello 2015). However, there are a number of low-technology writing tools that hold promise for helping students with mild special needs such as pencil grips, raised line paper, and line guides. These are "easy to use, inexpensive, are widely available, and require little training to use effectively" (Erdem, 2017).

In addition, adapted math tools are designed to assist students who have difficulties using standard materials (Erdem, 2017). For example, a calculator that has buttons with

large numbers and symbols is an example of a low-tech tool that is simple to use and widely available for those who struggle to use typical calculators (Erdem, 2017). The use of a calculator itself is an example of a technology accommodation for student switch processing difficulties who understand multiplication and division, but who may have difficulty performing the algorithms when solving a word problem. Using a calculator allows the student to attempt the higher-level skill. Several studies show that assistive technologies help facilitates communication for students with special needs in a variety of environments (Erdem, 2017). According to Hill and Flores (2014), The Picture Exchange Communication System (PECS), is a picture based, low-tech augmentative and alternative communication strategy that can effectively help students with autism spectrum disorder (ASD) increase social interaction skills. Hill and Flores (2014) found that the participants of the study were able to make independent initiations and independent requests using the low-tech picture exchange. In another way, Low-Tech has been explained and elaborates by Nsofor and Bello (2015) in these ways: Low-Tech refers to (simple adaptation devices with no batteries or electronics): Low-tech items are less sophisticated and can include devices such as adapted spoon handles, non-tipping drinking cups, and Velcro fasteners. Other low-tech items can also be the following:

Self-opening scissors: use for cutting and trimming art papers during student's co-curricular programmed. It grips hand firmly while cutting and trimming paper edges.

***Standard Pencil*:** It has a rough surface and it work with hand brace to write. It is a low-tech device specially made for physically challenged students.

***Binder*:** Use as a slant board to hold in place with rug which helps to stabilizes students work on a plane writing surface. It has a gum-like material that does not stain paper or writing surfaces.

Large-Print cards with card holder: Large print cards are specially designed for physically challenge students especially those that have long or short sightedness to help in reading and writing.

Pencil Grip: The image here present various pen grippers that can be use in different situations. They were purposively made indifferent colors to attract student's attention.

Plastic Writing Guide: It helps to guides the writer's hand and keeps them within lines. it also used to frame text in a logical manner as read.

Raised Line Paper: Raised line paper issue to guide primary or elementary pupils to write well in a paper ruled with Red/Green lines which indicates Start/Stop points.

Portable FM sound loop: This is a device use for personal listening FM, MP4 audiophiles. It has USB enable which allow the incorporation of lesson content in form of audio file. It's portable and uses batteries for its operations.

Medium-tech: Medium-tech devices are complicated mechanical tools, battery or electronic powered, and may require some training, and are more expensive than low-tech devices (Georgia Tech Tools for Life, (GTTL) 2018). According to Boston Public Schools Access Technology Center (2005), Speaking Homework Wiz and Talking Photo Album are medium-tech devices that help to promote reading and speaking skills to support students. In addition, Time Timer device is a visual depiction of elapsed time. This device helps students to see a visual depiction of the time remaining for a task as the clock counts down (Boston Public Schools Access Technology Center, 2005) in

(GTTL 2018). Audio recording device stores several of hours of audio in lectures which can provide meaningful access to academic content for those who have difficulties making written notes and listening to the lecture content at the same time (Accessibility Resources & Service, 2018). Screen-reading software such as JAWS, NVDA, or Voice Over pronounces the words, letters, and numbers of written documents properly. Those software's programs can assist students with special needs in navigating the contents more easily during lessons (Danlami 2021).

In the same vein, Nsofor and Bello (2015) indorsed more on medium tech as; *Mid-Tech (battery powered) is classified in the followings:*

Medium-Tech (battery operated or simple electronic devices or adaptations); Medium-tech devices are relatively complicated mechanical devices, such as wheelchairs, CCTV with portable key word, ABC order keyboards, Portable keyboard dictionary and spelling assistant, Document Reading Software and Programmable Watch among others

High-Tech (complex electronic or computer driven devices): High-tech devices these devices are usually complex and programmable and include items that require computers, electronics or microchips to perform function, it also incorporates sophisticated electronics. In applying technology continuum or making decisions about the type of technology tools a particular student might require, a good approach is to start with the no-tech solutions and then work up then work up the continuum, as needed. For example, in teaching a student with one arm to use a mixing bowl to prepare ingredients for cooking, it might be better for a home economics teacher to teach that student how to wedge the bowl into a drawer and hold it with a hip while stirring, rather than request the purchase of an expensive 'medium- 'tech electric mixer that is equipped stabilize the mixing bowl while it is being operated. Too often, when making technology

decisions, there is a tendency to start at the upper end of the technology continuum when, in fact, it is better to start at a. lower point. For example, when making decisions about a person whose hand writings difficult to recognize, it is not uncommon to hear recommendations that a laptop computer should be provided. In reality, an electronic keyboard with memory that can be downloaded into a desktop computer later in the day may be more appropriate and cost less. Although the student in this example may eventually require a laptop computer, the electronic keyboard may be a better place to start. Below are examples of low to high technology continuum with graphic illustrations.

Abubakar, *et al,* (2019) gives more on High-tech as AT devices that are the most complex, and require training and effort to learn how to use them, and can be expensive. For example, a person with cerebral palsy and expressive language delay may be assisted by a high-technology device (e.g., iPad, iPod, Samsung tablet etc.) to independently communicate with others. An iPad is now a ubiquitous device in Educational classrooms and is used as instructional tool to improve teaching and learning across curriculums (O'Malley, Lewis, Donehower & Stone, 2014). Chai, Vail and Ayreos (2015) investigated the effects of using an iPad application to teach young children with developmental delays how to identify initial phonemes. The results of the study showed that all students were able to demonstrate a high level in receptively identifying initial phonemes when using the iPad application "Touch Sound."

Furthermore, all teachers in this study indicated that using the Touch Sound application led students to become more confident and focused during reading activities in class (Chai, *et al*, 2015). Connor and Beard (2015) state that, "a product is designed in a way that it can be used by people with special needs, whether it is high-tech or light-tech, it

will be a better product for everybody". It is no longer relevant to argue whether high-tech or light tech assistive technology is most beneficial for students with special needs, instead, we should focus on which technologies best match the student's needs (Abani, 2015). Over the past 30 years, the use of assistive technology devices in classrooms has had positive effects on students' academic achievement and engagement. For instance, computer-based instruction helps teachers set goals for each student's progress and provides feedback based on their individual needs. As technology has increased in sophistication, mobile devices (e.g., smart phones, iPods, and tablets) have become easier to use in special Education settings due to a variety of advanced features including inexpensive downloadable applications, touch screen displays, and widespread internet access (Ok & Kim, 2017).

2.1.1.3 The Importance of assistive technology in teaching and learning

Importance of assistive technology in teaching and learning cannot be over emphasized, as; One of the greatest potentials for the use of emerging technologies is in the Education of children with physical challenges. These potentials have taken a variety of technological devices developed to enhance the learning independence of students with a variety of special needs. Devices such as computer assisted instruction, adjustable electronic text magnifier, touch sensitive response pads, specialized switches, and auditory displays are available, among others. Emerging technologies has great potential in providing access to general Education curriculum for all learners irrespective of their learning condition. (Danlami, 2021)

Assistive technology devices can be used by students with special needs on their own or with assistance, in and outside the learning setup. Some of the examples of assistive technology devices are - touch control devices, alternative keyboards and mouse,

speech-to-text word recognition tools, word prediction programs, word processors, grammar checkers, scanners, compact disc recording (CD-R and CD-RW) drives and spellcheckers. Assistive technology bridges the learning gap; by educating children in the same classroom, including children with physical, mental and developmental special needs, by helping them to learn the material in a way that they can understand, by eliminating barriers that had been preventing them from being at the same level as their peers (Abubakar, *et al*, 2019)

Using practical tools for application of the principles of cognitive theory to teaching and learning, assistive technology connects a student's cognitive abilities to an Educational opportunity that may not be accessible due to their special needs; like a student facing difficulty in decoding text can make use of text-to-speech screen reader as a link between the written text and the ability to process the information aurally and cognitively; while a student who has difficulty sequencing thoughts in text can use graphic outlining software as a link to visual processing skills (Abubakar, *et al*, 2019)

With the integration of assistive technology into the regular classroom, students can have the provision of multiple means to complete their work, with greater independence in performing tasks that they were formerly unable to accomplisher could accomplish with great difficulty; through suitable enhancements or changed methods of interaction with them technology, needed to accomplish such tasks. It helps individual children communicate more effectively, see and hear better, and participate more fully in learning activities. It provides the means of access to and participation in Educational, social and recreational opportunities; empowers greater physical and mental function and improved self-esteem; and reduces costs for Educational services and individual supports.

Moreover, assistive technology supports children to access and enjoy their rights; do things they value; bridges disparities between children with and without special needs; impact on self-image, self-esteem and sense of self-worth; lead fulfilling lives and contribute to the social; cultural and economic vitality of their communities. Assistive technology according to Dafwat (2018) may reduce the need for formal support services by reducing the time and physical burden for caregivers, prevent injuries, further impairments and premature death. An educated child with physical challenge supported by assistive technology devices will have better opportunities for employment which may results in less dependence on welfare, alms and social security measures; have greater contribution to the country's economy and a return on investment that goes beyond an individual family to the larger nation.

Technology is of great importance to learners with special needs due to their special learning needs and conditions. Nkwoagba (2011) revealed that technology plays very important roles in the development of students with special needs in many spheres of life in the following ways: It encourages Individualized Instruction and independent study programme; with the use of technology, learners with special needs can be involved in exploration, experimentation and self-discovery; through this, learners can study on their own with little assistance given to them when needed. It also encourages learning disabled children and slow learners to bring out their potentialities and with little assistance they are motivated to achieved learning; technology encourages Independent living**;** with the help of technology learners with special needs will be able to do most of the daily activities by themselves without too much assistance from other people; Technology aids in the Assessment of Special Needs Programme: Technology have four applications in special needs education such as assessment, which include, computer assisted information search, data analysis, data storage and assessment. In

developing countries, information about instruments, location and address are very difficult to obtain but with use of technology, all these pieces of information are very easy to obtain. Technology serves remedial and compensatory purposes: technological aids such as prostheses, CD rooms, CDs, lenses, computer games, enchanted learning, books and tapes, ultrasonic canes, scanners, voice synthesizer, Jaws etc. are used in remediating and compensating for deficiencies resulting from disabilities in special needs learners.

Isah (2014) states that some of the importance of technology which include among others the following; encouragement of social behavior; they encourage turn taking, foster talking and negotiating and the ability to develop problem solving skills e.g. char–room, computer internet, programme. Technology helps to sustain retention and increase attention span, memory span and concentration of special needs learners especially the learning disabled, the mentally retarded etc. Through technology especially internet and extranet, special needs learners can seek explanation, computer experiences, investigate problems, reflect, reason and learn many concepts in the school. Technology helps them to learn how to learn and think about what they learn and develop the spirit of self-reliance and confidence. Technology provides a rich context for language exploration and allows special needs learners to experiment at their own interest, pace, latent and potential abilities.

Extra Sensitivity to Special Needs Diagnosis and Prognosis: Technology can be utilized to diagnose and evolve baseline for special needs intervention programming in a way that every minute detail required for effective and efficient intervention is provided. For example, computerize audio logical assessment makes it possible to organize cluster – sitting in acoustic amplified classroom (Danlami & Isa 2017). According to Nkwoagba

(2011), one of the importance of technology to persons with special needs is the application of Computer Intervention System Computer Assisted Programmes: Technology is usable as intervention for remediating and enhancing the learning capacity of special needs children. The World Wide Web (www) e learning and e-mail are internet resources that can greatly enhance information use in special needs education or intervention. Internet led cyberspace provides online classes for all categories of learners. Intervention strategies like the use of simulation games, programme instruction, the kip Mcgrarach curriculum by exclusive software are designed to assist students to achieve accelerated progress are such ready examples in the advanced countries. This curriculum-based adaptation is highly used for children experiencing specific learning disabilities e.g. dyslexia, as well as the gifted and talented. (Dafwat (2018).

Assistive technology enables students with special needs to move, play, communicate, write, speak, and participate in many activities that would be inaccessible without the computer. It can help this category of students to overcome barriers in print, in communication, and in learning. Students with special needs can use assistive technology devices such as CDs or taped books, devices that read printed books aloud and "talking computer programmes" e.g. JAWS and Windows eye (Dafwat, (2018).

Dafwat (2018) added that the importance of assistive technology to students with special needs are many but a few among them are to help the students with disabilities to increase their potentials and capabilities, to help them succeed in independent living without relying on somebody else to take up their responsibilities, to help them engage in productive employment. Assistive technology helps them enjoy their health through less vigorous and rigorous physical engagement or activities which in turns improve

their quality of life. Assistive technology devices enhance inclusion of the disabled into the society when considered with accessible environment. The technology assists in the choice of proper materials and proper styles to ensure that a device is suitable and appropriate for its users.

Danlami, (2021) posited that some of the importance of technology to students with special needs include; prompting independence and communication skills, facilitating the development of motor skills, eye tracking and hand-eye coordination, facilitating social interaction and gives them an opportunity to experience turn taking. Technology allows students with special needs to work at their own pace. Danlami, (2021) also reported that assistive technology in special education and the universal design for learning play an important and significant role in helping students with special needs overcome the academic difficulties that they face and helps them develop their academic skills

2.1.1.4 *Use of assistive technology in helping students with special needs*

Proper and effective use of assistive technology devices by people with special needs can provide support in areas of self-care, Education, employment, recreation/leisure and community living. Abani (2015) states that access to assistive technology can provide meaningful learning experiences to develop problem solving and higher order thinking skills so as to function in the world beyond the classroom.

Abani (2015) in discussing the role of assistive technology in helping children with special needs states that assistive technology helps students to: Maximize independence in academics and employment, participate in classroom discussion, and gain access to peers, mentors and role models, self-advocate. Gaining access to the full range of Educational opportunities, participate in experiences not otherwise possible, succeed in

work based learning experience, secure high level of independent learning, prepare for transition to College and careers, work side by side with peers. It also help to master academic tasks that they cannot accomplish otherwise, enter high technology career fields, participate in community and recreational activities.

Assistive technology can make a difference for students with special needs; to corroborate this; Areej, (2018) state that Assistive technology tools can allow access to information and activities that otherwise would have been inaccessible. Assistive technology tools can make information and resources more available even to those who do not have a special need or have not yet been identified as having a special need.

Abani (2015) in discussing the role of assistive technology in helping people with special needs states that assistive technology can help someone to Participate in everyday activities such as; feeding and dressing oneself, playing and enjoying recreational activities, becoming mobile, communicating, hearing better, seeing better, learning better, using computer, increasing independence. Many students with special needs will benefit from an array of assistive devices; but this requires collaboration among people from different fields and agencies. Abani, (2015) states that with the collaboration of these agencies and professionals from different fields, assistive technology will be beneficial to students with special needs in the following ways:

It helps them succeed in independent living without relying on somebody else to take up their responsibilities.

It makes it easier for persons with physical special needs to engage in productive employment.

It helps them to enjoy their health through less vigorous and rigorous physical engagement or activities, which in turn improve their quality of life.

Assistive devices enhance inclusion of the handicapped into the society when considered with accessible environment.

Assistive technology helps to strategize method for indigenous material for mass production.

Assistive technology assists in the choice of proper materials and proper styles to ensure that a device is suitable and appropriate for its user.

As can be seen from the discussion above, assistive technology does not only help the student in learning, it also helps in the performance of day-to-day tasks. Therefore, there is a serious need for persons that will teach these people to be really trained in the use of assistive technology. We need to know whether or not our teacher training institutions are preparing teachers with the needed competency to help meet the assistive technology needs of our children with special needs.

2.1.1.5 *Problems of using AT for students with special education needs*

Despite the benefits of Assistive Technology in the Education and rehabilitation of persons living with special needs, there are some problems that hinder teachers from effectively using it to teach students with special needs. Some of these problems are discussed below:

Epileptic power supply

The nature of electricity supply in Nigeria is terribly bad such that most institutions are using generating sets to power their electronics. Abani (2015) states that power supply

by the nation's Power Holding Company of Nigeria (PHCN) is scarcely available in most of the urban cities not even for 12 hours at a stretch daily. Abani (2015) further states that stable power supply is the hub of an ICT classroom since computers, television, radio, projectors, and video recorders are solely dependent on a stable and uninterrupted power supply. Most of the assistive technology devices are electronically driven; they rely totally on electricity to function. There can therefore not be proper integration of these technologies into special Education teacher training without steady electricity supply.

High cost of assistive technology devices

The assistive technology devices are mostly produced overseas. The cost of production and importation is very high thereby making it difficult or impossible for many institutions to purchase. (Danlami, 2021) state that, one of the factors militating against teachers' use of assistive technology is the high cost of the technological tools. Abani, (2015) also noted high cost of equipment as one of the problems of assistive technology. This has made most teaching on the use of some of these devices to be theoretical instead of practical. Most teachers only know the names of the devices without having even seen them.

Poor funding of education

Funding of Education is still very poor in Nigeria compared to other countries. Sometimes the funds are not even released or they are diverted to other sectors or private pockets. Austria, for example, estimated that $4.3 billion dollars was spent on ICT between 1999 and 2000 (Danlami, 2021). The Education sub sector which is the engine room for the production of tomorrow's leaders is grossly neglected by the Nigerian government and also private participation in funding Education is still very low. This

has made it very difficult for teacher training institutions to purchase assistive devices that will be used for training of teachers. The result is that teachers that have no competence in assistive technology devices are produced yearly.

Poor Teachers' Remuneration

In Nigeria, teachers' salaries, whether in the primary, secondary or tertiary sector is very poor. This is amplified by frequent strikes in the Educational sector. Many qualified lecturers have left their places of work and many that went on study leave overseas have refused to return home; this has led to brain drain. Due to this poor remuneration, some teachers that are still working have little or no interest in the job. They lack the needed impetus to bring about innovative instruction (Abani, (2015).

Lack of Infrastructure

One of the biggest problems in special Education and the use of assistive technology is the dearth of infrastructures in the training institutions. Most of the institutions lack basic classrooms and resource rooms to accommodate the number of students they have. In some institutions a class that is supposed to accommodate only twenty students is being used by 80-100 student's telecommunication gadgets are not available where they are available, they are not functional.

2.1.1.6 *Barriers to assistive technology adoption*

As indicated earlier, physical challenges may engender social challenge as a result of negative interaction between a child with impairment and environment with barriers that hinder participation on an equal basis with others. Assistive technology can reduce or eliminate such barriers if made available. However, obtaining such technology is not always possible due to product and service-related barriers as enumerated below:

Lack of awareness: Most families having students with physical challenges have limited awareness of assistive products and services. This makes it difficult for children and their families to know what assistive technologies are available or suitable and how they can be obtaining.

Lack of functional government policies and programmed on students with physical challenges: There is general lack of or poor government policies regarding the welfare of student with physical challenges. This has resulted in over dependence on the limited family income and to a certain extent street begging for food, clothing, shelter and alms.

Lack of functional assistive technology services: Assistive technology services are often in short supply and even if it exists, it's located far away from where students with special needs live. Non-governmental organizations rarely have the financial means or capacity to develop country-wide sustainable service delivery systems. Current service delivery is not equitable. Inequities have been found not only between people living in different countries or regions of a country, or under different economic conditions: they have also been found among people with different impairments, genders, ages, languages and cultures. In addition to reduced financial means, it is culturally impossible for girls in certain areas to access assistive technology when services are staffed only by male personnel (Abu-Alghayth, 2021).

Unavailability of assistive technology products: Production of assistive products often occurs on a small scale. It is small not only in terms of quantity, but also in terms of the range of types, models and sizes of the products. This maybe as a result of limited access to the materials and equipment needed to produce assistive technology products; market related factors; limited demand; purchasing power and other factors reduces the production capacity of assistive technology. Moreover, currency exchange rates, duty

and import taxes associated with assistive technology can discourage local businesses to import materials, equipment or assistive products. Although a wide range of types of assistive products are available globally, they are not available everywhere, and all designs are not appropriate in all settings. Therefore, product research and development is still required. Unless the design of an assistive product meets students and family's needs and preferences, and is suitable in their physical, social and cultural environment, there will continue to be a low demand for products which may cause artificial scarcity of the products.

Inaccessible environments: Physically or cognitively inaccessible environments act as barriers to assistive technology. For example, inaccessible service centers due to poor road network prevent students from having easy access to the services and products they need. Physical barriers may occur in buildings with stairs having scps (instead of steep flat stairs for wheel chair rolling) or poor lighting; while cognitive barriers may include texts that are not clear or symbols that are difficult to understand. Further, regardless of the cost or availability of a wheelchair, a student will not be able to use it in an inaccessible house, road or school. Environmental barriers are often exacerbated during natural disasters and conflicts (Cardullo, *et al*, 2021).

Inadequate human resources: Paucity of properly trained human resource act as a challenging barrier to assistive technology product development and service delivery. This challenge occurs from the personnel responsible for the design and development of prototype products especially at manufacturing industry level to service delivery at rehabilitation centers.

Financial barriers: The costs of purchasing, maintaining and replacing assistive technology products, and associated services and travelling costs constitute a major

barrier. Costs of products can be exorbitant in the case of children, as they need their assistive products replaced or adjusted as they grow.

2.1.1.7 *Strategies for resolving barriers to assistive technology adoption*

The strategies for resolving barriers to assistive technology adoption according to Danlami, A. and Isah, J. (2018) are based on the principles of availability, accessibility, affordability, adaptability, acceptability and quality.

Availability: Assistive technology services and products should beam available in sufficient quantity close to student's home, schools and communities. This principle will wade away the unavailability of the products and service personnel and provide hope for the community members.

Accessibility: Services and products should be made accessible to every family who needs them. Part of the accessibility is that their delivery should be impartial to avoid discrepancies between genders, impairment groups, socioeconomic groups and geographic locations. Accessibility should include physical and cognitive access to services and products. Physical accessibility means that, for example, buildings are accessible, lighting is appropriate, signs are available in Braille, and noise levels are low. Cognitive accessibility means that verbal and written information and instructions are clear and simple, language and symbols are concrete rather than abstract, and products are intuitive and easy to use-all from the perspective of physically challenged students (Cardullo, *et al*, 2021).

Affordability: Services and products should be affordable to the family of every student who needs them. Part of the principle of affordability is to consider subsidizing the price of the products. This can be made by government; donor organizations NGOs and

concern community members so as facilitate adoption of assistive technology products and services. It has been observed that in many developing countries, parents having physically challenged students are struggling with how to stabilize the three-squire meal; as such they cannot afford assistive technology products and related services.

Adaptability: Services and products should be made adaptable and modifiable to ensure they are appropriate to the needs and requirements of individual students. For instance, in designing and developing wheel chairs and crutches, wheels and legs should be provided with adjustable knobs to accommodate individuals' height, body structure, body function, capacity, gender, age, and preference as well as environmental factors; physical environment, psychosocial environment, climate and culture.

Acceptability: Services and products to be provided should be presented in a way that will be acceptable to the families. This is facilitated by involving them in the provision process and by considering their needs, preferences and expectations. Factors such as efficiency, reliability, simplicity, safety, comfort and aesthetics should be taken into account to ensure that devices and related services are acceptable to student's families. Although needs, preferences and expectations are individual driven, particularly regarding comfort and aesthetics, available designs should satisfy those of both girls and boys. Environmental accessibility is essential for using certain types of assistive technology and therefore influences the acceptability of a product.

Quality: Services and products should be of good quality; Product quality can be measured through appropriate technical standards or guidelines in terms of strength, durability, capacity, safety and comfort. Though, products quality would preferably comply with relevant International Standard Organization (ISO). However, specific service qualities can be measured in terms of compliance with staff training

requirements and service guidelines, while overall quality of services can be measured in terms of outcomes, user satisfaction and quality of life (Pasha, Aftab, & Naqvi, (2021).

2.1.1.8 *Educational intervention for students with special needs*

Educational intervention is needed most by students with all set of impairment than their counterpart normal students due to their special learning needs**.** Danlami, (2021) states that teaching students with special needs requires patience and enough time, because their learning is sometimes very slow. The teacher will need to employ other senses apart from sight such as touch, smell and hearing. Their instruction should be done in segments. Students with impairment should be exposed to the curriculum designed for the normal students but with some modifications and adaptations to suit their needs and capabilities. Danlami, (2021) added that students with special needs should also be exposed to learning with the use of the Braille to enable them read and write and should be trained to move around (that is mobility) and be giving orientation on their environment.

Danlami, (2021) revealed that students with blindness need instruction in Braille, use of tape recorders and other aids in order to benefit from the regular school curriculum. They need training in orientation and mobility (ways of graceful movement). This category of students needs services of special teachers, materials, equipment and aids. Since they cannot see (well), their teachers should talk out what is being written on the chalkboard. Their teachers should employ concrete objects in the teaching process. Some of the students with special needs need reader service and service of resource teachers, aides, student support team when placed in regular classes.

David, (2016) also opined that teachers of students with impairment must be able to instruct these students directly within the classroom and on individual basis. The teachers should prepare and use specialized materials (e.g. Braille sense). Teachers should be able to put reading assignment into Braille, large print or in tape-recorded form. They should be able to interpret information on the child's visual problems and visual functioning to parent and other teachers or members of the teaching team, further reported that teaching of students with special needs requires the use of the following instructional materials. They include Abacus, talking calculator, tape recorder, cassette book machine, Braille machine, writing frame, large print, embossed and raised line drawing boards, paper and relief map, Braille paper, pillow speakers, slate and stylus, cubarithm, canes, guide dog, human guide, computer Braille. Other essential materials for teaching students with special needs comprise the reading machine, Braille verifier, object detector, Dictaphone, step down detectors, tactile globe, tactile ruler and other assistive technology devices.

2.1.1.9 *Challenges in using AT devices for students with special needs*

In Nigerian context, there are numerous challenges that stacked the visually impaired from using assistive technology devices. According to the study conducted by Adebimpe *et al.* (2014), the challenges include; perceived social cultural bias that the visually impaired persons engage in academic work at all levels, perceived socioeconomic bias that the person with special needs cannot engage in productive work; and perceived sociopolitical bias that persons with special needs cannot hold administrative positions in governmental jobs or private sectors.

Danlami, (2021) revealed that another factor that militates against the proper use of assistive technology by students with special needs is the expensiveness of the

technological devices for instance a screen reader and window eyes which converts text into speech cost between three hundred to five hundred thousand Naira. This is beyond the reach of many of the children with special needs and their family or sponsors and educational institutions in Nigeria. Attitudes of government and public on the education of the disabled individuals in general hinder the disbursement of funds to purchase the needed technological devices for this category of individuals. Low level of education among the children with special needs is another factor that posed problem to students with special needs in the use of assistive technology devices. Research has shown that about 75% of children with special needs have not embraced formal education in Nigeria. This means that only 25% are involved in education.

Danlami, (2021) assert that children with special needs might not only lack the basic computing and technological skills needed but also the basic literacy required. In addition, there is lack of computing skill among the persons with visual impairment. This is mainly due to lack of awareness and negative attitude on the use of computer and its accessories in the pursuit of their educational goals. Acquisition of this skill gives room for the students with special needs to use assistive technology devices judiciously and efficiently. Adesina, Ajayi and Olayinka (2015) have identified some challenges that students with special needs are facing while using assistive technology devices as including, lack of awareness, lack of interest, difficulty of access to the devices, high cost of the devices, lack of ongoing support, lack of training, limited complementary services and limited accessibility features of mainstreaming assistive technology training facilities.

Hussin, (2013) identifies some barriers to the effective use of assistive technology for students with special needs which include, limited financial resources, high cost of

equipment, lack of knowledge and support from teachers and eligibility issues for possessing devices. Hussin, (2013) added that, in the United States, a national survey on abandonment of technology by adults with various disabilities showed that almost one-third of the assistive technology devices were unused due to multiple factors: (A) lack of consideration and willingness to use the devices from the individuals with disability needs, (b) technology tools selected by family members, not the users; (C) complicated design, (d) unreliable equipment; (e) insufficient funding for the assistive technology devices; and (f) lack of technical support. In addition, lack of knowledge and awareness, reluctance to use the devices, poor device performance, changes in needs or priorities, and feelings of stigmatization are other barriers to the effective use of assistive technology by students with disabilities and students with special needs in particular.

Hussin (2013) also identified six barriers to effective use of assistive technology devices among students with visual impairment. These include: (a) lack of appropriate staff training and support, (b) negative staff attitudes (c) inadequate assessment and planning process, (d) insufficient funding (e) difficulties procuring and managing equipment, and (f) time constraints. Hussin, (2013) further said that students with special needs faced problems when using assistive technology in seeking information, which included lack of context, that screen readers or magnifiers show small portions of content at any one time; overload of information that slows down content exploration; and excessive sequencing, such as long table making reading distracting. As a result, these barriers caused abandonment or rejection to the innovation.

Abani, (2015) enumerated other limitations in using assistive technology devices by students with special needs that include: students with special needs and their families

are not always involved in the selection of assistive technology devices, using assistive technology devices requires training and practice, needs of students with special needs may keep changing and so do the assistive technology devices which requires constant upgrading, and High-tech assistive technology devices are expensive.

2.1.1.10 *Assistive technology software for students with special needs*

There are various and different assistive technology software that assists students with special needs have access to and utilized information and knowledge provided by the modern technology. Siyam, (2019) posited that Assistive technology software is used for helping people with special needs for studying and gaining knowledge. The researcher went further to state that the following are few assistive technology software used by people with visual impairment. Dragon Naturally Speaking (Voice Recognition Software); Dragon naturally speaking software is a voice recognition programme that allows a user to navigate through and transcribe speech into text on computer programmes such as Microsoft word, excel and internet explorer. Varied children with disabilities can use this software.

Danlami and Isah, (2018) identified Duxbury Brailing Software; this software is a Braille translator. The primary function of Duxbury Braille Translation software (DBT) is a translation between prints and Braille. DBT can translate into grade I (unconstructed Braille) or grade II (contracted Braille) literary Braille for many languages, and also translate from Braille into the equivalent print for several languages and Braille codes. Duxbury Braille Translation Software can also provide formatting of Braille documents, along with translation of the text. This generally implies reworking the format to a certain extent as Braille format is not always similar to print format.

Danlami, (2021) reported that Window Eyes Software (Screen Reader); is software that reads the computer screen aloud. This allows visually impaired, partially sighted or low vision computer user to hear what is happening on their computer or read it through special refreshable Braille displays. This allows them to use standard windows software, like micro soft office, internet explorer, email programmes, and even specialized industry cooperated software. Danlami, (2021) also identified Refreshable Braille display software that provides tactile output of information presented on the computer screen. Unlike conventional Braille, which is permanently embossed onto paper, refreshable display is mechanical in nature and lifts small, rounded plastic pins as needed to form Braille characters. The display contains 20, 40, or 80 Braille cells, after the line is read the user can "refresh" the display to the next line.

Nguyo, (2015) identified Text Help System software; this is software that provides literacy software solution. The software is developed to help struggling readers and writers, those with literacy difficulties, learning disabilities such as dyslexia, mild special needs and also those for whom English is a second language. It helps to improve users reading, writing and research skills at school, in the work place, and at home.

Swatzell, (2019) also identified Grid Software; a grid is a page of buttons, called cells and each cell can be used to perform a number of actions. The actions include talking, writing sentences, jumping to other grids, or carrying out special tasks. This software enables people with physical and sensory disabilities to communicate and access a computer without a keyboard and mouse. The computer can be used for voice output communication and other computer-based tasks such as email and internet browsing. Grid has a number of workspaces, which are like small programmes, or applications. The most commonly used workspaces are for composing sentences for voice output

communication. There are also claro read software, workspaces for email, web browsing, Skype, playing music or DVDs, accessing other software on your computer and more.

Danlami, (2021) affirmed that JAWS is the most powerful and popular screen reader worldwide. A jaw is very powerful software that provides accessibility solution for the visually impaired. It reads information on computer screen using synthesized speech. It provides many useful commands that make it easier to use programmes, edit documents and read web pages with a refreshing Braille display; Jaws can also provide Braille output in addition to, or instead of speech. Jaws can be customized as per individual needs and preferences. Other screen readers are Voice over on Mac, Built-in screen readers, free software, Serotek screen reader and more. Eye – Tracking Software; It is an on-screen cursor controlled by simple body movement. A standard USB web can capture user movement and software translates it into mouse movement. Similarly, Danlami, (202) revealed that Screen enlargement is software that allows everything on the computer screen to appear in a larger-than-standard font. This assistive technology software is used by students with low vision for enlargement of print materials.

Dada, (2013) identified other assistive technology software to include: Quail – World; is software for accessing computer without conventional keyboard and mouse, Math Daisy; is an application developed for making Mathematics accessible to student with disabilities. It enables us to save documents in the DAISY digital talking book format with accessible Mathematics. The students can use math player TM – enable DAISY player software to read classroom materials in the manner that suits the disabled learner; Head – Mouse Extreme; is an innovative solution for wireless head pointing on personal computer, Macintosh system and alternative and augmentative communication (AAC)

devices. The head mouse extreme replaces the standard computer mouse for people who cannot use or have limited use of their hands when controlling a computer or augmentative communication devices. The head mouse translates natural movements of a user's head into directly proportional movement of the computer mouse pointer. The head mouse has a wireless optional sensor, which tracks a tiny disposable target that is conveniently placed on the user's forehead, glasses, hat, etc. It works just like a computer mouse with the mouse pointer being moved by the motion of the user's head. It is very useful for disabled suffering with arthritis, spinal and injury as well.

Yakubu, (2019) also identified a number of assistive technology software for students with visual impairment. He posited that Scanning and character Recognition Software are assistive technology software; The software allows a visually impaired user access to text in combination with an integral screen reader: Some of the software also have in-built low vision accommodation, user can change the appearance of the text to suit his/her vision needs. In the field of sciences, the software can help them recognize mathematical signs, equations and symbols. Screen magnification software; this is software designed to manipulate the appearance of text and images on the computer. The software gives the user vast control over the size of text, icons and images and it often has a speech component. Thus, mathematical and scientific equations and symbols can be boldly displayed for their manipulation for better understanding and application with the assistance of speech component. Yakubu, (2019), added that scanning software allows students with special needs to input text from any source (such as a magazine article or class syllabus), then use screen enlargement software to enlarge it.

Danlami, (2021) reported that AUDIS is assistive technology software that is developed to aid the persons with special needs in their reading print materials. It provides comfortable access for students with special needs to their textbooks. It maximally pays attention to the special needs of others and allows for flexible customization. Danlami and Isah, (2018) also revealed that Golden point computer Braille system is software that includes such functions as Braille input and output, which enable students with special needs to read information board appearing on the computer screen. It is capable of converting what appears on the computer screen to Braille touch board that students with special needs use to read information. It also allows them to send e-mail or conduct information search and retrieval.

2.1.1.11 *Utilization of AT devices by students with special needs*

Utilization is the act of making use of something or things for a purpose. In the other words, utilization is the act of making use of assistive technology devices for a purpose. Nkwaoagba, (2011) revealed that using assistive technology devices by students with special needs help them a lot in achieving their educational and societal goals due to the following reasons:

Through using assistive technology devices students with special needs can study independently and have individualized instruction. With the help of assistive technology devices, this category of students can study on their own with little assistance given to them when needed.

Using assistive technology devices can encourage students with special needs to live independently. This implies that students with special needs can do most of the daily activities by themselves.

Using assistive technology devices can aid in the assessment of students with visual impairment. Assistive technology has four applications in students with special needs assessment which include, computer assisted information search, data analysis, data storage and assessment.

Using assistive technology devices by this category of students can serve remedial and compensatory purposes to them. This is because, assistive technology such as Protheses, CD rooms, CDs lenses, computer games, tape, ultrasonic canes, voice synthesizer, JAWS etc all are used by students with special needs to remediate and compensate for deficiencies resulting from visual impairment.

Using assistive technology devices by students with special needs can encourage Social behavior of this category of students. They encourage turn talking, foster talking and negotiating and the ability to develop problem solving skills e.g. computer internet. Using assistive technology by students with special needs helps them sustain retention and increase attention span, memory span and concentration. Nkwoagba, (2011) added that through assistive technology, especially internet and extranet, students with special needs can seek explanation, share computer experiences, investigate problems, reflect, reason and learn many concepts in the school.

Computer assistive programme is usable as intervention for remediating and enhancing the learning capacity of students with visual impairment. The World Wide Web (www), e-learning and e-mail are internet resources that can greatly enhance information use by this category of students.

According to Tebo, (2017) using assistive technology devices by students with special needs can help their level of visual functioning, their literacy development, as well as the environmental and task demands. For instance, handheld magnifiers allow them

access to not only text but other objects in their environment as well. Using assistive technology devices like Braille labeler in labeling items throughout the student's environment will not only reinforce vocabulary, spelling and reading but will also promote independence and assist with orientation. Tebo, (2017) added that students with special needs can use writing devices like Adaptive paper, word processor, word processor with specialized software, word processor with refreshable Braille display and Braille note taker etc to achieve their writing needs. They can also use abacus, adaptive calculators, and adaptive measuring tools, talking money identifier, tactile Graphics and specialized math software to perform mathematical and scientific calculations. For self, efficient and independent travel throughout the school environment, the students with special needs can use low-tech adaptations in the environment, talking compass, electronic travel aids and GPS devices.

2.1.2 Lecturers perceptions on the use of assistive technology

Technology has become an integral part of human life in the 21st-century. The advent of globalization is largely due to the advent of technology. It is probably in recognition of this that technological or digital literacy is an important skill of the twenty -first century. The sure way to equip the learner especially those with special needs is by integrating technology for teaching and learning. According to Danlami, (2021), technology integration in Education is a process by which teachers plan and use technology purposefully and meaningfully to enhance teaching and learning rather than using it randomly, arbitrarily sporadically. To Abani, (2015), meaningful integration can only occur when teachers are grounded in technology and can perceive the interplay between it and content knowledge. Siyam, (2019) posited that successful integration aims at utilizing accessible and readily available resources to help students to be more actively

involved in the learning process and be engaged in various projects. Dalton and Roush (2010) stated that for the students with special needs and other learning difficulties or mobility issues, assistive technology might expose a completely new path for them in terms of displaying exactly what they can learn and do. Nevertheless, the lecturers' perception is a pertinent issue in technology integration for teaching and learning.

Despite the advantages of Assistive Technology, many lecturers experience a lack of training opportunities to help them to fully understand how to use and implement the AT with their students (Flanagan, Bouck, & Richardson, 2013). Moreover, teachers of students with visual impairments need effective practice in using AT to demonstrate adequate competencies in AT use when teaching lessons for their students (Ajuwon, Meeks, Griffin-Shirley, & Okungu, 2016).

Furthermore, special Education teachers are aware of the significant benefit of how AT can support and help them in teaching literacy curricula. However, they faced some barriers to using AT such as cost and lack of training or preparation to use AT during literacy class. Many teachers reported that they need additional practice and experience on how to select, adjust and implement the assistive technology tool to be able to provide the appropriate support for students in learning literacy (Flanagan, Bouck & Richardson, 2013). Students are provided with multiple means to complete their work and focus on achieving academic standards. Different assistive technology devices are used in schools to provide accommodation, modifications or adaptations made in the environment, curriculum, instruction, or assessment practices. As inclusive schools become the norm, creative curriculum design may depend on assistive technology.

Lecturers also benefit from the effective use of assistive technology as assistive technology can provide them with more options to use in addressing different learning needs. It also provides styles for students using visual, auditory and tactile approaches by making a student more independent. Assistive technology also allows teachers to spend more time on group activities and to give students more one - on - one attention but all these depend to a large extent on how much a teacher knows about assistive technology devices and how competent the lecturers is in the use of the devices. Jordan (2009) states that, large bodies of researches exist on the issue of preparing lecturers to teach, use and integrate technology into the classroom. Several of these researches for example, Abani, (2015), reported that Lecturers preparation programs fail to prepare teachers for using and integrating technology into classroom teaching.

Another research by Trinidad, J. E., & Ngo, G. R., (2019) also discovered that novice Lecturers reported high anxiety in the use of assistive technology in the classroom although they frequently use assistive technology outside of the classroom in personal context. If they so use technology for their personal context then, why are they not using it in the classroom? These reviews out that those teachers may or may not be reluctant or ill equipped to use technology for mentoring purposes. Lecturers need to consider the many assistive technology devices available to them and how they could be integrated into every day teaching of the curriculum (Abani, 2015). Educational researchers and practitioners assert that the potential of new technologies for learning is likely to be found not in the technologies themselves but in the way these technologies are used as tools for learning. An analysis was completed of the categories of assistive technology concerning uses or application as identified by the Rehabilitation Engineering and Assistive Technology Society of North America (Abani, 2015). The resulting compiled list contained fourteen different major application areas for assistive technology. While

all the fourteen areas could apply in some way to the Educational setting, only six apply to common Educational activities, and as such Lecturers will need knowledge of assistive technology options as they relate to their own teaching of students with special needs. These areas include reading, writing, mathematics, and computer access. Technology is an area of the curriculum, as well as a tool for learning in which teachers must demonstrate their own awareness and capacity for learning. In other words, for meaningful and effective learning in the present information age, the demonstration of Lecturers awareness and competencies for instruction and use of assistive technology cannot be underscored.

However, research has found that assistive technology is being significantly underutilized by students who are visually impaired, for example, Abani, (2015) found that in Illinois, 37% of primary and secondary students with special needs in non-itinerant placement and 73% of those in itinerant placement did not use assistive technology. Similarly, Abani, (2015) found that nationwide, 59% to 71% of the primary and secondary students with visual impairments who were most inclined to benefit from assistive technology did not have the opportunity to use it from 2000 to 2004. In contrast to the popular public opinion that the use of assistive technology is quite common in United States schools, the Teachers Training (2012) cited in Abani (2015), states that only about half the nations' teachers use technology in their daily teaching. They went further to report that evidence gathered from technology proponents indicates that much of the use is ineffective. While this figure may be alarming, it might be true that on average, half of Americas' teachers use technology to facilitate learning in the classroom, but the disparity among schools is wide. In some schools' technology is used almost 100% while in others, the use of technology is close to zero percent. The reason for the disparity may not be too far from the lack of assistive technology devices in some

schools and teachers' lack of training and experience on how best to utilize technology in the classroom.

Many literatures on teachers' use of assistive technology suggest that most teachers do not use assistive technology because they do not have the knowledge or technology, skills and experiences that are necessary for teaching with technology as a result of not having grown with technology and not being taught with technology. A second reason for teachers' poor use of technology is that teachers often hold negative attitudes and are skeptical about the use of technology for teaching (Abani, 2015). On the whole, teachers' proclivity towards technology has not been positive. In the early days of technology, teachers were compared to luddites in the industrial revolution who destroyed machines (Abani, 2015); but in the first decade of technology integration in schools, teachers had a feeling of anxiety, latter they acted as gate keepers because they decided what technologies may enter the classroom and whether and how they could be used.

The situation is expected to be different nowadays since many students come to school with at least a basic knowledge of technology. Many schools have computers and some are connected to the internet. Lei, (2016) studied the technology preparation that is needed for digital natives. The research was conducted with a group of 2007 fresh intakes into the teacher Education programme. The research was designed to examine their beliefs, attitudes and technology experience and expertise, to identify the strength and weaknesses in their knowledge of technology and skills and to explore what technology preparation was needed to prepare them to integrate technology into their classrooms. The result revealed, among others that they lacked experiences and expertise in classroom technologies especially assistive technology. In general, teachers

are characterized as reluctant and unwilling to use new technologies Abani, (2015). But even if teachers know what assistive technology is, it does not ensure that teachers will be able to identify or use assistive technology effectively to support students with special needs in their classrooms.

2.1.2.1 *Lecturers knowledge of AT*

With the advances in assistive technology, and the implications with students with special needs, it is important to recognize teachers' overall knowledge, or perceived knowledge of assistive technology. Alkahtani, (2013) looked specifically at teachers' knowledge and use of assistive technology with students with special Educational needs. Data were collected from one hundred and twenty-seven participants via a self-reporting questionnaire. Interviews were also used with three of the participants to gather more in-depth information related to the data gathered from the on-line survey. The results from the study indicate that the vast majority of the teachers surveyed do not use or request assistive technology evaluations for their students and had not considered assistive technology when planning their students' IEPs. The vast majority of teachers in the study also reported that assistive technology was not available in their schools.

Regarding Lecturers level of knowledge and skills using assistive technology, the majority of participants reported that they were unprepared and most of them reported that they had little or no knowledge of assistive technology. When addressing teachers' attitude toward using assistive technology with their students, more than half the teachers had a neutral attitude toward using assistive technology to enable students to access the curriculum. The researcher raises the concern of teachers' neutral attitude and recognizes that not having a positive attitude towards assistive technology use can be a barrier to student success. Consideration of professional development in the area of

assistive technology had interesting results; all of the participants who responded in the study revealed that they would be interested in receiving training and development in the area of assistive technology. Overall, teachers were not confident in their knowledge of assistive technology due to lack of training, but were willing to, and believed that, receiving training on using assistive technology would be very useful.

2.1.2.2 *Lecturers awareness of AT*

The awareness of Lecturers about the existence of assistive technology and where they can acquire them is of great importance. Lecturers need to be aware of the services that are available to acquire assistive technology and the people that are providing the different services that they need. Special Education and regular Education teachers must focus not only on course content and pedagogy, but also on technology in accordance with the national policy on Education. Lecturers must also be trained to use technology with students who have special learning needs. They must be knowledgeable of assistive technology availability and its usefulness for students with needs. Yet both special and general Education teachers lack awareness of both the availability and effective use of assistive technology (Abu-Alghayth, 2021).

Although, the use of assistive technology for young children is increasing, the lack of awareness and training continue to act as major barriers to providers using assistive technology. As a result, parents' express frustration that professionals lack the necessary knowledge to make assistive technology determinations because teachers and IEP teams are often unprepared to make assistive technology decisions because of their limited awareness of assistive technology, (Abani, 2015). Thus, professionals are responsible for helping children and families select and acquire assistive technology devices and equipment as well as instructing them in their use. Because of these mandates, agencies

that serve young children are struggling to meet the challenge in a manner that provides appropriate technology, train professionals and families in the use of assistive technology, and demonstrate unique ways for families to access assistive technology in a timely and reasonable manner (Cardullo, *et al*, 2021). However, this kind of service is not available for children with special needs in north western Nigeria. It is reasonable to assume that if teachers and other professionals in the field of Education have inadequate skills and knowledge about technologies, they will be failing to consider and use assistive technology well with young children. The review of literature in this sub theme indicates fair level of awareness of the benefits and value of assistive technology in the field of special needs. They also indicate keenness to acquire those technologies, both by parents and by professionals in the field.

Challenges are related to lack of access to information about the latest developments, lack of sufficient funding to pursue the leaders in this field for consultancy and acquisition of technology, and the shortage of professional staff who can provide valuable consultancy and support to families at an intensive level. There are indications of rapid growth of awareness and self-development among families and professionals and all that is to the benefit of the children. There is a need for learner-oriented training programs to training the trainers and families on the use of technology to achieve the goal of increasing the child's independent functioning. Technology should aim to achieve that as it has to meet the unique needs of each child.

2.1.2.3 *Regular lecturers and AT in inclusive education*

One of the more extensive changes in the Education of students with special needs in recent years has been the inclusion of persons with special needs into the general Education program. This is to ensure that students with special needs receive instruction

designed to meet their educational needs while being taught in the regular school environment to the maximum extent appropriate (Williams-Buffonge, 2021). Inclusive Education refers to the provision of services to students with special needs in the neighborhood school in age-appropriate general Education classes; with the necessary support services and supplementary aids (for the child and the teacher). The essence is to ensure the child's success academically, behaviorally, and socially and to prepare the child to participate as a full and contributing member of the society.

In North western Nigeria and in other regions of the country, the number of special needs students served in an inclusive setting along with non-disabled students is rising. As Education professional teachers are charged by the National Policy on Education to make accommodations to the process of Education to allow all the students access to the Educational situations. Because of the size and growing number of students classified as special needs students, assistive technology in schools is growing in importance. Special needs students are now having a greater impact on the general Education teacher as during the past 10 years the number of students with special needs served in schools and classes with their nondisabled peers has gradually increased.

Mcnicholl *et al.* (2019) states that in the 1997/1998 school year in the United States of America, between 94.7 and 97.8 percent of students (depending on age) with special needs were served in schools with their non-disabled peers as compared to just four years before when only 43.4 percent were included. As the percentage of students with special needs served in an inclusive setting along with nondisabled students rises, the number of regular Education teachers prepared to provide inclusive environment must also increase. One of the factors that lead to successful inclusion of children with special needs is the attitude of regular teachers. In Nigeria however, much research has not been

conducted in this area. The ones that have been conducted show that regular teachers' attitude towards inclusive Education is negative. Many teachers have negative attitude towards students with special needs because they do not know how to teach them. Similarly, large class size, the lack of equipment and lack of support services create problems as well (Abani, 2015). Researchers conducted outside the country agree that the most important condition for successful inclusion of students with special needs into the regular classroom is a change from negative to positive attitude of regular teachers towards students with special needs and their inclusion into the regular classroom. Another condition for successful implementation of inclusive Education is continuous support and assistance to regular teachers by other professionals such as the school counselor, principal, special education teachers, and school's psychologist and so on. Most schools in Nigeria do not have these professionals working in their schools therefore the regular teacher finds himself in a dilemma sometimes because he has students he has not been taught how to handle in his class.

All the states in North Western Nigeria have embraced inclusive Education, but despite the philosophy and support for inclusive Education, there is evidence that suggests that regular teachers do not believe that they are fully prepared for the inclusion of students with special needs (Pasha *et al.*, 2021).Inclusive programmes typically assume that the ability of the educator to use developmentally appropriate practices and the availability of support services accompanying students with special needs into the regular Education classes are available (Abani, 2015). Such support services should include aides who are trained to handle the special needs of students. These include school personnel, peer grouping, special equipment, various instructional adaptations, and any other services that would allow for effective teaching of students with special needs in a regular school.

This special equipment's are assistive technology devices that are necessary in the Education of children with special needs. Many regular Education teachers have identified barriers to inclusion of students with special needs in general Education. Some of these barriers include inadequate preparation of regular teachers at teacher training level, the lack of information about children with special needs and the lack of teaching methods and knowledge about the use of assistive technology in the Education of persons with special needs in a study discovered that 41.9 percent of general educators believed that inclusion is not workable regardless of the level of support provided. Only 4.6 percent of educators responded positively about the academic result of inclusion. In the same vein, Williams-Buffonge, (2021) interviewed six elementary physical Education specialists to obtain their views on inclusive Education practices and perceived outcomes. The teachers reported that they were inadequately prepared to teach effectively in inclusive classes and they had strong feelings of guilt and inadequacy as they continued to try to be effective for all children.

At present, in North Western Nigeria and other parts of the country, inclusive Education has been adopted as the best Education practice for the Education of persons with special needs. Due to the fact that regular teachers continue to play an important role in the inclusive Education practice, their attitude towards the inclusion of children with special needs and how effective they are in the use of assistive technology needs to be determined.

2.1.2.4 *Lecturers and student's attitude towards AT*

The attitude of students towards assistive technology is one of the problems of using assistive technology for teaching children with special needs. Many of the children with special needs do not to use the devices; this is particularly with those whose problems

are not severe. Many of them will prefer to pretend that they can learn or work without the devices; this always causes a problem between the teachers and such students in the class. Some of the students may be doing that because of their ignorance of the benefit of assistive technology devices; as such they learn with difficulty for refusing to use the devices. Unavailability of Skilled Personnel; for every programmed to be successful, the lecturers must be available and competent to teach or train their students in the use of assistive devices.

Abani, (2015), appraising the relationship between ICT usage and integration and the standard of teacher Education programmed in a developing economy discovered that most of the teachers in our training institutions do not have the needed competence in the use of computers. Similarly, Pasha, Aftab and Naqvi, (2021) states that teachers are inadequately trained; they stated further that the following constitute a barrier to teachers' successful implementation of ICT: (a) experience to use ICT (b) skills to employ ICT (c) resources to learn the use of ICT and (d) the best ways to teach ICT. Teachers comfort in the use of ICT is closely related to training issues.

Other barriers to assistive technology are: (a) professional understanding remains uneven (b) assessment and support are reported to be inadequate (c) there is also the problem of lack of systematic approach (d) most ICTs are relatively new to Education and (e) schools are lagging behind in keeping pace with new technological developments (Williams-Buffonge, 2021). However, Mcnicholl, *et al*. (2019) states that researchers who have studied the use of technology with individuals with special Education needs have concluded that access to this technology is an equity tool and has the potential to meet the learning needs of these individuals. The review above has

shown that teachers in many parts of the world faced different problems as they try to use assistive technology devices in schools.

2.1.2.5 *Gender and lecturers' attitudes toward using AT*

The issue of male versus female teachers' Attitudes in teaching has been an issue of debate and it will continue to be an issue of debate for a long time to come. Male and female teachers are found in the teaching profession all over the world in all levels of Education. They are found both in special and the inclusive schools. The debate is however on which of these teachers have more interest than the other in teaching persons with special needs? In most schools today, we find more female teachers than male lecturers/teachers particularly in schools in the urban areas. Largely, proprietors prefer employing female teachers to male teachers for different reasons that have not been empirically studied, but the absence of male teachers in the teaching profession is not only a problem to male students but also a problem to the female students as well (Sagnak, & Baran, 2021).

Discussions on this subject matter have been thrown to the public for people to give their opinions, for example, Abani, (2015) published the views of many people on the subject matter. They reported the views of David, (2016) who said that women are preferred in the teaching profession because women seem to be more mature, responsible, less prone to come to work drunk and less prone to do stupid things in general and also exhibit a bit of the nurturing. David was quick to give an instance that happened in his own school where a female teacher was sacked from his school for being drunk at work, late coming, partying all night and calling in sick. Because of such complains, she lasted only two months in that school. She was replaced by another female teacher who though doesn't drink, was derelict in her teaching duties. That one

was also fired after two months. Does that mean that female teachers are bad? David, (2016), contributing to the debate stated that female teachers tend to be weaker and less prone to violence. They also do what they are told easier than men, therefore women are more likely to behave better.

David (2016) states that, though the teaching profession is women dominated and it can be argued that female are more natural nurturers, it cannot be generalized that they are better ―teachers‖. He states that he knows some women who are fantastic teachers and some who are very poor. He said that he also knows some men who are fantastic teachers so it is difficult to give a definite answer to the question. All these are based on public opinions and there are many diverse opinions on the subject matter.

David (2016) in a research to find out whether gender differences exist between student teachers' subject content knowledge and pedagogical content knowledge in mathematics discovered that females did slightly better than males in pedagogical content knowledge. This difference in pedagogical content knowledge may exert an effect on student teachers' teaching performance and eventually lead to gender difference in teaching competence. They concluded that generally speaking, females did better than males in presenting mathematics content in their teaching practice.

Most of the literature on this subject matter centered on the lack of male teachers in schools and why school proprietors prefer female teachers to male teachers. Much work has not been done to determine the differences between their competencies in assistive technology and or teaching persons with special learning needs, therefore a gap exist that this research intends to fill.

2.1.3 Nigerian colleges of education system

The Nigerian Colleges of Education were established to train teachers and they were under the Nigerian commission for Colleges of Education, the commission was established in 1989 for the purpose of supervision of the Nigerian College of Education. The established of the commission was a resultant effect of the utmost importance accorded to quality teacher Education by the federal government of Nigeria. Since its inception, the commission has continuously pursed goals of quality assurance in teacher Education. The pride of the commission is based on the seminal philosophy in the national policy on Education (NPE) which stated that "no Education can rise above the quality of its teachers.

In Nigeria, these are 83 officially registered College of Education by NCCE, consisting of 22 federal, 14 private and 46 states approved Colleges of Education. While in North western Nigeria, comprise the seven states (Jigawa, Kaduna, Katsina, Kano, Kebbe, Sokoto and Zamfara) were having 13 federal, state and private College of Education. They are as listed in Table 2.1 below:

Table 2.1: List of colleges of education in North western Nigeria

STATE	NO	NAMES OF THE COLLEGES OF EDUCATION	LOCATION
Jigawa	1	Jigawa state College of Education	Gumal
Kaduna	**1**	Federal College of Education	Zaria
	2	Kaduna state College of Education	Kafachan
	3	Jama'atu College of Education	Kaduna
Kano	1	Federal College of Education	Kano
	2	Federal College of Education technical	Bichi
	3	Sa'adutu Rimi Colleges of Education	Kumbotso
Katsina	1	Federal College of Education	Katsina
	2	Isa Kaita College of Education	Dutsinma
Kebbi	1	Adama Augie College of Education	Argungun
Sokoto	1	Shehu Shagari College of Education	Sokoto
Zamfara	1	Federal College of Education(Technical)	Gusau
	2	Zamfara state College of Education	Maru

Source: NCCE (2017)

2.2 Theoretical Framework

The theories used in this study are; Technology Acceptance Model (TAM) and Bandura Theory of Self-Efficacy. This theoretical framework establishes the groundwork for conducting this study to investigate a specific problem. Theoretical Framework of this work highlights the factors influencing lecturer's intentions to use of Assistive Technology. Also, the framework was built upon the premise that there are many factors that may predict lectures consideration and use of assistive technology in the classroom. These factors form the variables of this study, the researcher intended to use Technology Acceptance Model (TAM) and Bandura Theory of Self-Efficacy to support the variables.

2.2.1 Technology acceptance model (TAM)

Technology Acceptance Model (TAM) highlighted that an individual perceive use of a technological device could influence his intention to adopt the technology for teaching and learning. In support of this, Oniyehu *et al.* (2017) observed that the extent of assistive technology used for teaching and learning is determined by the attitude, perception and experience of teachers. The Technology Acceptance Model shows that a person's attitude towards using a technology is primarily affected by how useful the person perceives the technology to be, and how easy the person perceives the technology to be. Below is a figure 2.2 a Graphic illustration of Technology Acceptance Models:

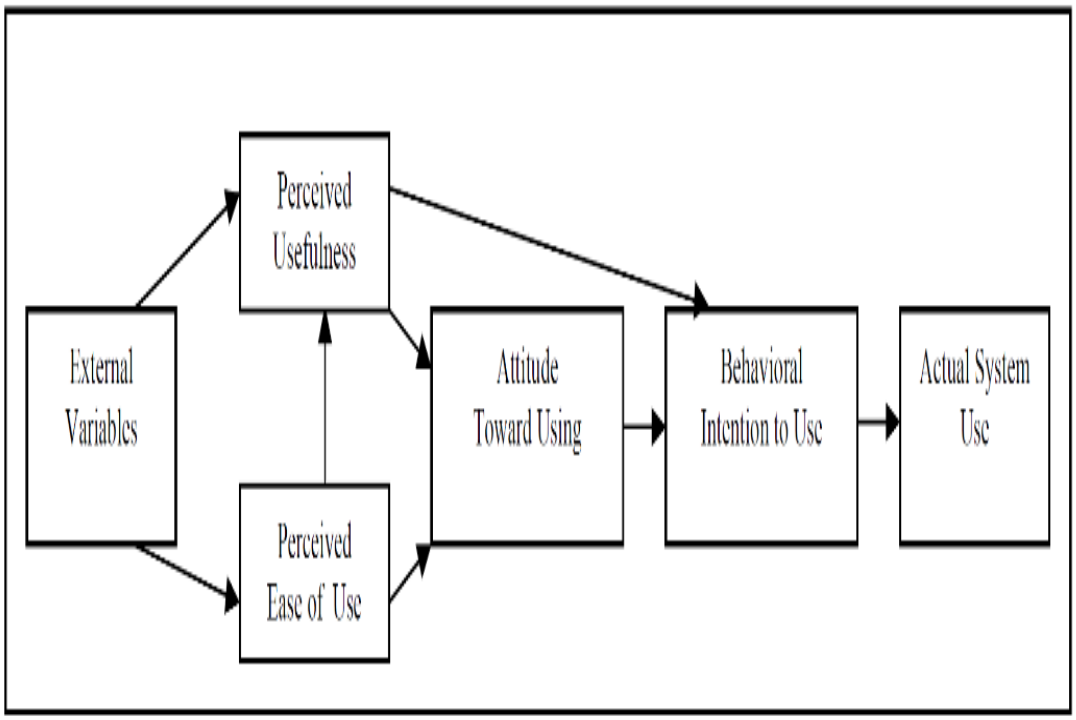


Figure 2.2: A Graphic illustration of Technology Acceptance Models (Oniyehu, *et al* 2017)

Theoretical Framework of this work highlight the factors influencing lecturer's self-efficacy and use of Assistive Technology - Adopted from the Davis' Technology Acceptance Model (Attitudes, usefulness and ease of use) and includes Cassidy and Eachus' Technology Self-Efficacy (attitudes and confidence), as they influence the Lecturers' consideration and use of assistive technology.

The result of these two factors, according to Davis, determines a person's attitude towards technology and will increase or decrease a person's likelihood to use technology. According to Cassidy and Eachus' (2012), as measured on their Computer Use Self-Efficacy Scale (CUSE), attitudes, along with confidence, determine a specific technology self-efficacy score. A person's technology self-efficacy, as it relates to

technology use, determines whether or not lectures will use and considered assistive technology in the classroom. Other factors may determine the consideration and use of assistive technology which may include gender, and experience. The framework was built upon the premise that there are many factors that may predict teachers' consideration and use of assistive technology in the classroom. These factors surround and support the dimensions that affect the decision to use technology. Actual use of assistive technology may be an outcome of some or many of these factors. This study will conceptualize the work of Davis, Bandura, and Dweck to represent the dimensions needed to affect the outcome of actual use and consideration of assistive technology for students with special needs.

The theoretical framework establishes the groundwork for conducting a study to investigate a specific problem (Areej, 2019). In summary, as a result of advances in Education and technology, lecturers are required to use technology in new and changing ways. Not only does the 21st century learner benefit from technology in ways that are current and effective, some students require technology in order to be successful. Technology has helped some students with special needs assist them in reaching their Educational potential. Lecturers' are legally required to provide this type of instruction to their students. It is important to investigate the level of acceptance of assistive technology by teachers working with students who have assistive technology and the impact on the required use of this technology with their students with special needs. There are many factors that can influence whether or not lecturers reflectively use assistive technology with their students. Some of these factors may include teachers' acceptance of technology in general, perceived ease of use of assistive technology, perceived usefulness of the assistive technology and overall technological confidence

or self-efficacy. Other factors that need to be explored are gender, and years of experience.

2.2.2 Bandura theory of self-efficacy

The term self-efficacy was first coined by a psychologist Albert Bandura (Bandura, 1977). This study is supported by this theory which highlighted that to assess individuals' abilities to perform a task or actions they believe could lead to desired outcomes. Bandura, therefore, defined self-efficacy as an individual belief in their capabilities to exercise control over their capabilities to control events that influence their lives. It is seen as a persons' set of beliefs in their ability to succeed in a particular situation (Bandura, 1977). Consequently, in this study, the particular situation is intention to adopt assistive technology studies on teacher self-efficacy proves that teachers who are efficient and effective take responsibility to prepare and teach their students (Gunning & Mensah, 2011). Teacher Self-efficacy influences their decision making as regarding classroom the use of technologies for classroom instruction (Gunning & Mensah, 2011).

Self-efficacy is a crucial factor, which influences teacher's behavior and decision-making pattern. In other words, teachers who are highly self-efficient invest time to setting out new strategies, building or inventing new technologies that will improve science teaching in our world today. For the purposes of this study, the term "technology self-efficacy" refers to (a) the beliefs that shapes teacher's abilities to make decisions as regarding the integration of new technologies, such as mobile technologies, into classroom science teaching and teachers believe that using new technology as regarding classroom teaching will enhance students learning and heighten their interest in learning (adapted from Bandura, 1977). In general, studies have found that teachers' perception

and self-efficacy on the use of technology influences their motivation to use technological devices such as computers in their teaching. Positive affirmation shows strong connections between teachers' technology self-efficacy and their willingness to integrate technology into their teaching practices. Sagna and Baran, (2021) investigated K12 teachers' comfort level with and perceptions of the use of technologies such as iPads of AT and found that teachers' perceptions of the importance of mobile technology were more positive after one year of implementation of technologies in their classrooms. Many other theories can be used to support this study. The following theories were reviewed to serve as reference to this study.

2.2.3 Theory of connectivism of Siemen (2005) and Downes (2010)

The theory explains how internet technologies have created new opportunities for people to learn and share information across the World Wide Web and among them. These technologies include Web browser, email, wikis, online forums, social networks, YouTube, and any other tool that enables the user to learn and share information with other people. The theory of connectivism relates to the first independent variable, that is, assistive technology devices, in creating opportunities for students with special needs to learn and share information to themselves and others. A key feature of connectivism theory is that much learning can happen across peer networks that take place online. In connectivist learning, a teacher will guide students to information and answer key questions as needed, in order to support students learning and sharing on their own. Students are also encouraged to seek out information on their own, it is made available. Students are also encouraged to seek out information on their own online and express what they find. In relation to the study, assistive technology devices will encourage students with special needs to seek out information on their own, if it is made available and accessible to them.

According to the theory, the massive open online course (MOOC) phenomenon comes from connectivist theory. In a connectivist MOOC (cMOOC), is open to anyone who wants to enroll, it uses open software and system across the Web to facilitate learning and sharing, it takes place primarily online, and it happens according to a specified curriculum for a designated period. While facilitators' guides the cMOOC, its participants are largely responsible for what they learn and what and how they share it, this connected behaviour largely helps create the course content. The understanding that decisions are based on rapidly altering foundations (technological changes) drives connectivist. New information is continually being acquired through access to new technologies. The ability to draw distinctions between important and unimportant information is vital. The ability to recognize when new information alters the landscape based on decision made yesterday is also critical.

The theory of connectivism explains how internet technologies have created new opportunities for people to learn and share information across the World Wide Web and among them. This theory relates to the first independent variable, that is assistive technology devices in creating opportunities for students with special needs in colleges of education in Northwest zone, Nigeria to learn and share information to themselves and others. When assistive technology devices are made available, accessible and usable by students with visual impairment, the opportunity of learning and sharing information among themselves and others becomes a reality. Students with special needs will use assistive technology devices to achieve their educational goals like their sighted counterparts.

2.2.4 Theory of planned behavior of Ajzen (1985)

The theory is about the link between attitudes and behavior. The theory identified the importance of assessing the amount of control an individual has over behaviours and attitudes (perceived behavioral control). Control factors identified by the theory include both internal factors (such as skills, abilities, information and emotion) and external factors (such as situation or environmental factors). The theory of planned behavior relates to the first independent variable, which is assistive technology use. Assistive technology device used by students with special needs was predicated upon their perception of the suitability or otherwise of assistive technology device service provision and accessibility.

This is a behavioural construct that has a link with attitude formation in relation to interactions with the technology over a period of time. Perception is largely, a learned process, and one in which each individual learns in his own experiences. Technology use or non-use by the students with special needs is, therefore a product of perception which models their individual behavior towards the assistive technology (in its use or not-use) as a planned or voluntary action, therefore justifying the principle of 'perceived behavior control' contained in the theory. In relation to the present study, when there is usability of assistive technology devices in Colleges of Education in Northwest Zone, Nigeria, the attitude and behavior of students with special needs become positive.

Theory of planned behavior relates to the first independent variable that is assistive technology devices use. Assistive technology used by students with special needs was predicted upon their perception of the suitability or otherwise of assistive technology devices, service provision and accessibility. This is a behavioural construct that has a link with attitude formation in relation to interaction with assistive technology devices

over a period of time. Furthermore, assistive technology use or non-use by students with special needs is therefore a product of perception which models their individual behavior towards the assistive technology devices in it used or not-use forms as a planned or voluntary action.

2.2.5 Consumer satisfaction theory

Cadotte, Woodruff and Jenkis (1987) were the proponents of this theory. The theory states that before shopping, consumers have some pre-purchase standard(s) in their mind that guide their purchasing activities. After purchasing a product (service), customers evaluate the performance of the product (service) against pre-purchase standard(s). When performance is lower than expectations (pre-purchase standard), dissatisfaction occurs. Thus the extent to which a customer experiences satisfaction or dissatisfaction is related to the size and direction of product performance. In this study, assistive technology devices are invested on as consumable products and students with special needs are consumers who are having a purchasing experience. Thus, when assistive technology obtained from the colleges of education in Northwest Zone of Nigeria is lower than assistive technology need (expectation), the user will be dissatisfied and vice visa. The assistive technology devices are better utilized when relevant assistive devices such as reading assistive technology devices like Braille sense on Hand, writing assistive technology devices like Smart Perkins Brailler, Mathematics assistive technology devices like tactile graphics and specialized math software and other available devices that enhance the ability of assistive technology to render necessary services to students with special needs are available and usable by students with visual impairment.

According to the theory of Consumer satisfaction, when assistive technology devices obtained (available) in Colleges of Education in Northwest Zone, Nigeria is lower than assistive technology devices need (expectation) students with special needs will be dissatisfied and vice visa. This implies that when the assistive technology devices needed by students with special needs are not available or are not in the quantity needed by them, the information and knowledge needs of this category of students will not be achieved. Therefore, the integration of the variables that is assistive technology devices, their availability, accessibility and utilization will be bringing about users all satisfactions that is information and knowledge acquisition by students with visual impairment. Therefore, this theory is related to first dependent variable that is availability.

2.3 Related Empirical Studies

2.3.1 Empirical studies on lecturers perceive usefulness of AT

Flanagan, Bouck, and Richardson, (2013) examined middle school special Education teachers' perceptions and use of assistive technology in literacy instruction. They found that among teachers of students who have visual impairments, younger teachers were more confident using AT and had more positive perceptions of AT. It was, therefore, expected that teachers who had been teaching for the fewest number of years would have the greatest computer literacy and AT skills, but this was not the case. In fact, computer literacy was not significantly related to years of teaching. Perhaps this finding was impacted by the fact that participant years or teaching, and not age, was collected in the present study.

Nam, Bahn, and Lee (2013) used structural equation modelling analysis to evaluate the biggest factor impacting AT usage in the classroom compared to general technology

usage. The authors found that the factors influencing AT abandonment were quite different from the for general technology. They suggested that there are many unique characteristics of AT compared to general technology, such as unfamiliar usage and necessity for daily life. They also found that result demonstrability (the AT does what you want it to do and you know how to make the AT do it) affected perceived usefulness of AT. Therefore, it seems that the function of AT was a major factor in its continued use. Nam, Bahn and Lee, (2013). also found that previous result demonstrability affected the likelihood that teachers would use the AT again in the future; if the AT was too hard to use, they did not use it again. Given that teachers' attitudes and perceptions are the key factor for AT implementation, it is important to ensure that the system governing AT use in the classroom is set up in a way to ensure that teachers have the best possible chance of understanding the AT when they are first exposed to it.

Alharbi and Drew (2014) found out in their study that the perceived usefulness of technology has a significant positive-moderate correlation with the attitude of teachers towards using the learning management systems. Similar finding in this study, revealed the existence of a very strong positive correlation between the faculties perceived usefulness of technology and their attitude towards technology.

Alharbi and Drew (2014) made a study about using the technology acceptance model in understanding academics' behavioral intention to use learning management systems. They found out that there is a significant positive-moderate correlation between perceived ease of use of technology and attitude or intention towards using learning management systems among lecturers. The same observation was revealed by Fathema, Shannon, and Ross (2015) in the quantitative study they conducted on expanding the technology acceptance model to examine the faculty use of learning management

systems in higher Education institutions in the United States of America. Using structural equation modeling, their study proves that there is a strong positive correlation between the faculty's perceived ease of use of technology and their attitude towards technology.

Ajuwon and Chitiyo (2015) examined the use of assistive technology in schools in Enugu. The study adopted a survey design. The data was analyzed using descriptive statistics. They concluded that the use of assistive technology in special Education will provide support to students with special needs and also improves teachers' classroom instructional practices. This implies that teachers have positive perception of assistive technology for special Education students.

Similarly, Elkaseh, Wong, and Fung (2016) carry out a quantitative study on the perceived ease of use and perceived usefulness of social media for e-learning in Libyan Higher Education, found out that the use of social media networking plays an important role in the adoption of e-learning. Their findings reveal that the attitude towards behavior or use of technology was predicted by perceived ease of use.

Emeka and Dominic (2020) investigated the perception and factors limiting the use of High-Tech Assistive Technology by teachers in Special Education Schools. The study adopted a descriptive survey design; the data was analyzed using mean and standard deviation. The findings indicated that teachers have positive perception of assistive technology which could positively influence the use of these devices for teaching and learning in special schools

Pasha *et al.* (2021) carry out a study on the Training Need Assessment for Teachers Working in an Inclusive Setting for Children with Special needs. The study addresses the importance of teachers training on usefulness and attitudes towards inclusive

education of children with special needs. A total of 280 respondents, male 79 and female 201 from 15 schools and centres of special education, District Multan were selected as a population in the study. A sample of 125 participants selected through stratified random sampling techniques. In this research, a questionnaire was used for data collection and was administered to 5 members for pilot testing. The questionnaire contained 30 items covering all the components of training need assessment for teachers working in an inclusive setting for children with special needs. The descriptive and qualitative research method was applied to analyze the collected data. Training enhances teachers 'self- efficiency' and information regarding adapting their teaching methodologies in an inclusive environment for the individual needs of exceptional children. An inclusive set up is advantageous for learners with special needs and teachers' training programs enhance sharing of information about awareness of special needs and enhance teaching skills and knowledge for an efficacious inclusive system for children with special needs.

Sagna and Baran, (2021) conducted a qualitative case study on faculty members' perceived behaviour regarding the use of technology in their classrooms. The behavior was examined within the framework of the decomposed theory of planned behavior. The theory states that technology integration behaviour is directly related to intention and perceived behaviour control and indirectly related to attitude, subjective norms and perceived behaviour control. Data sources included semi-structured interviews conducted with 17 faculty members who participated in a faculty technology mentoring programme implemented at a large public university in Turkey over a semester of 4 months' duration. The data analysis revealed that the factors affecting faculty members' planned technology integration behaviour were related to their intentions, attitude, subjective norms and perceived behaviour control, as explained in the theory. Faculty

members identified a number of student-related, faculty-related and context-related challenges in technology integration.

Abu-Alghayth, (2021) carry out a study on Qualitative Exploration of Preserves Teachers' Preparation to Use Assistive Technology in Saudi Arabia. A qualitative approach was employed to explore preserves teacher preparation to use AT with a qualitative survey questionnaire. The data were collected from 32 participants from two Saudi universities. Three major themes from the data were obtained for this study: (a) teacher preparation, (b) learning experiences, and (c) perceived needs. The findings revealed a significant paucity of learning experiences regarding AT usage, AT courses, and AT practices, with the participants indicating a pressing need for prior practicum training

2.3.2 Empirical studies on lecturers perceive ease of use of AT

Zhou *et al.* (2011) surveyed 165 teachers of students with visual impairments in Texas to investigate their perceptions and attitudes of their skills and knowledge of assistive technology use. The results indicated notable differences between lecturers' current perceptions and what they expected in the level of expertise of AT use (Zhou *et al.*, 2011). Lecturers reported that "their current levels of knowledge and skills were significantly lower than they thought teachers of students with visual impairments in general should have (Zhou *et al.,* 2011). Moreover, 74% of teachers lacked knowledge of assistive technology competencies and 57% had a low level of confidence in their skills about teaching assistive technology to students with visual impairments.

A study by Smarkola (2011) also examined technology adoption as it relates to perceived usefulness and perceived ease of use and compared student teachers with more experienced teachers. Using a planned behavioral framework that substantiated

and extended Davis' Technology Acceptance Model, Smarkola found that there were more similarities than differences in computer usage beliefs between new teachers and experienced teachers. Both new and more experienced teachers believed that preparing students to use technology served an important societal role and saw the need to obtain computer classroom integration training. Both novice and experienced teachers supported the TAM as they both were more likely to use computers if they perceived them as useful and recognized the value and usefulness of using computers in the classroom. One significant difference between the age groups was that student teachers were naive in their assessment of their own Educational technology skills as they focused on their skills using the Internet, rather than Educational technology.

Nam *et al.* (2013) investigated the Acceptance of Assistive Technology by Special Education Teachers: A Structural Equation Model Approach. To investigate the acceptance of assistive technology (AT) by special Education teachers, the present study developed and tested hypothesized relationships among key determinants of AT acceptance such as the facilitating condition, perceived ease of use, computer self-efficacy, result demonstrability, perceived usefulness and behavioral intention. Results from analysis of data collected from a number of special Education teachers in schools for the visually and/or auditory impaired confirmed the effects hypothesized in our conceptual model of AT acceptance. In particular, perceived usefulness was a dominant factor affecting AT usage. Facilitating condition was strongly related to perceived ease of use while perceived ease of use had a significant effect on computer self-efficacy. This study also found the importance of result demonstrability factor which had significant effects on both computer self-efficacy and perceived usefulness. This study expanded and enriched a traditional technology acceptance model by further investigating determinants associated with the acceptance of AT by special Education

teachers for the blind and/or the deaf. In addition, the results of the present study should provide some insights into the understanding of AT acceptance and the decisions of AT utilization, as well as its distribution and training.

Shun and Priscilia, (2018) carried out a study on the Acceptance of Assistive Technology by Special Education Teachers: A Structural Equation Model Approach. To investigate the acceptance of assistive technology (AT) by special Education teachers, the present study developed and tested hypothesized relationships among key determinants of AT acceptance such as the facilitating condition, perceived ease of use, computer self-efficacy, result demonstrability, perceived usefulness, and behavioral intention. Results from analysis of data collected from a number of special Education teachers in schools for the visually and/or auditory impaired confirmed the effects hypothesized in our conceptual model of AT acceptance. In particular, perceived usefulness was a dominant factor affecting AT usage. Facilitating condition was strongly related to perceived ease of use, whereas perceived ease of use had a significant effect on computer self-efficacy.

Chukwuemeka and Samaila, (2019) 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 special needs.

Mcnicholl *et al.* (2019) study the impact of assistive technology use for students with special needs in higher education. The systematic review examines the impact of assistive technology (AT) on educational and psychosocial outcomes for students with special needs (SWDs) in higher education. Qualitative, quantitative and mixed method studies were identified through systematic searches of five databases: Psyc INFO, Pub Med, CINAHL, ERIC and Web of Science (Social Science Citation Index). The search was conducted in January 2018. Thematic synthesis was carried out to collate findings across papers and the methodological quality of included papers was assessed using a Mixed Methods Appraisal Tool (MMAT). The findings showed that Twenty-six papers were included for analysis. Four analytic themes were identified; "AT as an enabler of academic engagement"; "barriers to effective AT use can hinder academic engagement"; "the transformative possibilities of AT from a psychological perspective"; and "AT as an enabler of participation". Similarly, the systematic review identifies that AT can promote educational, psychological and social benefits for SWD.

Additionally, AT users and AT officers must be aware of certain factors, such as inadequate AT training, inadequacies of devices, availability of external support and the challenge of negotiating multiple information sources, can hinder effective AT use and thus restrict engagement in the higher education environment.

2.3.3 Empirical studies on lecturer's self-efficacy on assistive technology

ZIefIe, Rocker, and Holzinger (2016) investigated Perceived Usefulness of Assistive Technologies and Electronic Services for Ambient Assisted Living. The paper reports

on a study analyzing the attitudes of users towards different types of Ambient Assisted Living (AAL) services. The study explores the acceptance and terms of use of large interactive screens for the most common applications types: health, social and convenience services. In order to understand the impact of user diversity, we explored age, gender, health status, social contact, interest in technology, and the reported ease of use as well as their relation to acceptance. Using the questionnaire method, 30 women and 30 men between 17-95 years were examined. The results show that users are not yet very familiar with the vision of smart technology at home and report a considerable diffidence and aloofness towards using such technologies.

Zhou, *et al,* (2012) found that among teachers of students who have visual impairments, younger teachers were more confident using AT and had more positive perceptions of AT. It was, therefore, expected that teachers who had been teaching for the fewest number of years would have the greatest computer literacy and AT skills, but this was not the case. In fact, computer literacy was not significantly related to years of teaching. Perhaps this finding was impacted by the fact that participant years or teaching, and not age, was collected in the present study. The results of the present study demonstrate that AT knowledge alone predicted perceived usefulness of AT despite the fact that computer literacy is significantly correlated with perceived usefulness of AT. Given that AT knowledge is positively correlated with years of teaching it appears that the more years of teaching experience a teacher has, the more exposure to or the more opportunities they have to learn about AT. This finding appears to be in contrast with the findings of Zhou *et al.* (2012) who suggested that younger teachers may be more confident using AT because their teacher preparation program included training in AT whereas older teachers' training did not. Perhaps the teacher training programs attended by the participants in this study are not providing teachers with the necessary AT skills

and instead teachers are receiving this training on the job. Given that fewer than 30% of teachers in this sample reported any exposure to AT during their teacher training program, this result is unsurprising. It is also possible that teachers with more years of teaching experience have had more exposure to working with students with LDs and appreciate the impact or potential of using AT with their students. Teachers with more years of experience may be more proficient with classroom management strategies or other aspects of managing as a classroom teacher and are more comfortable with learning how to use AT and manage it for those students who require it.

Zapf *et al.* (2016) found that students who used AT more often were more likely to have teachers who were comfortable with and interested in using AT and this teacher comfort with AT seemed to have the greatest impact on whether students who were assigned AT would actually use it (Zapf, *et al,* 2016). Therefore, it appears that teachers who have more knowledge of AT may actually impact their students' use of AT in the classroom.

Bronwyn *et al.* (2018) similarly, found that the largest barrier to AT use was lack of teacher training on AT. In their study, only 24.7%of teachers reported that their teacher Education programs had provided them with adequate training on AT. Additionally, Lee and Vega found that those teachers who had received more training in AT were more likely to report that AT played an important part in the daily routine of their students.

Cardullo *et al.* (2021) conducted a study on K-12 teachers' remote teaching self-efficacy during the pandemic. The study was to examine the relationship between factors in the extended technology acceptance model (TAM) model and teachers' self-efficacy in remote teaching during the COVID-19pandemic. In addition, the authors sought to listen to classroom teachers as they expressed their unbiased views of the advantages, disadvantages and challenges of teaching remotely during the COVID-19 pandemic. A

survey research design was employed to examine the relationship between factors in the extended TAM model and teachers' self-efficacy in remote teaching during the COVID-19 pandemic using the 49-item questionnaire. A multiple regression analysis using a stepwise procedure was used to examine the relationship between factors in the extended TAM model and teachers' self-efficacy. Three open-ended questions closely examined remote teaching during the pandemic, related to challenges, advantages and disadvantages. The findings included Internet connection, lack of interaction and communication and challenges with motivation and student engagement. Disadvantages included teachers' level of self-efficacy in using technology to teach, lack of support and resources to teach online and the struggle to motivate and engage students. Perceived benefits included flexibility for the teacher and differentiation, rich resources and a way to support learners when in-person instruction is not possible.

Al- Mekky *et al.* (2021) examined the validity and reliability of perceived self-efficacies questionnaire (PSE) which is designed for university students at faculty of education. A total of 472 students participated, selected by using cluster random sampling. In order to examine the construct validity of the PSE, Quantitative data were analyzed using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) using SPSS 23 and AMOS 23. EFA revealed similar structures from prior research and the present study. The CFA approach verified the questionnaire of perceived self-efficacies was satisfactory for university students' context.

Williams-Buffonge, (2021) carry out a study on Caribbean Lecturers' Self-Efficacy and their Perceived Barriers to Technology Adoption. The study examined how lecturers' self-efficacy at one college in Antigua and Barbuda influenced their technology adoption in terms of their instructional practices, including perceived barriers and

supports for technology use. The conceptual frameworks for this study were Bandura's self-efficacy theory and Rogers' diffusion of innovation. The study included nine lecturers from a Caribbean college in Antigua and Barbuda as participants. Data were collected through interviews and analyzed using open coding and thematic analysis. Findings from the study were that college lecturers' beliefs regarding technology were positive and technology held value in terms of the learning process. However, the results established that not all lecturers were comfortable adopting technology within their instructional practice and faced barriers when attempting to adopt technology. Lecturers indicated the need for professional training, institutional support, and observational learning of others which would assist with lecturers' pedagogy, content knowledge, and technology adoption.

2.3.4 Empirical studies on the general use of assistive technology

Abiose *et al.* (2009) conducted a study on determining causes of blindness and special needs among adults aged 40 years and above. A multistage, stratified, cluster random sampling with probability proportion to size procedure was used to identify a nationally representative sample of 15,027 persons aged 40 years and above. Distance vision was measured with a reduced log MAR tubing E-chart. Clinical examination included basic eye examination of all subjects and a more detailed examination of those who had presenting vision less than 6/12 in either eye. Cause for vision loss was assigned to all subjects with presenting vision less than 6/12 in any eye. The study revealed that the prevalence of blindness among adults aged 40 and above were 75.9% severe visual impairment, 73.5% blindness. Whereas, mild special needs had 56.6% and moderate special needs was 15.8%. The results indicated that the prevalence of blindness among adults aged 40 years and above was higher than other special needs in Northeast, Nigeria.

Danlami, (2021) carried out a study on Prevalence of blindness and special needs in Nigeria. A multistage, stratified, cluster random sampling with probability proportional to size procedure was used to identify a cross-sectional nationally representative sample of 15,027 persons aged 40 years and above from all 36 states in Nigeria and the Federal Capital Territory. Distance visual acuity (VA) was measured with a reduced long MAR Tumbling-E chart at 4 and 1m. Presenting and best corrected visual acuities were recorded. Auto refraction was performed in all examined adults. Clinical evaluations included examination under dilation for those with presenting vision 6/12 in either eye. The study revealed that 15,122 persons aged 40 years and above were enumerated and 13,599 (89.9%) examined. The prevalence of blindness 20/400 in the better eye and severe special needs20/200-20/400 presenting vision was 4.2% (95% confidence interval (CI): 3.8%-4.6% and 1.5% (95% CI: 1.3%-1.7%), respectively. Therefore, it is estimated that 4.25 million adults aged 40 years and above have moderate to severe special needs or blindness less than 20/63 in the better eye. There is a high prevalence of blindness and severe special needs among adults aged 40 years and above in Nigeria.

Mudasiru *et al.* (2012) carried out another study on the availability of assistive technology for special education in Nigerian educational institutions. The study was conducted at University of Calabar, University of Ibadan, University of Jos, Kaduna polytechnic and Federal College of Education (Special), Oyo. The population of the study is 1,115 teachers from the area of study. Descriptive survey was adopted. Purposive sampling technique was used to select all tertiary institutions that offer special education programme. Questionnaire and Observation check list titled "Inventory of assistive technology devices in special educational institutions were used as instruments for data collection.

The findings of the study revealed that majority of the institutions 98.72% do not have required assistive technology for students with visual impairment. Fifty eight (58) Special educational institutions had talking computers representing (74.36%), 25.64% institutions do not have these devices. It also revealed that 75.64% of the institutions have computers available and functional; Nineteen (19) institutions representing 24.36% have no computers at all. The implications of the study are; students with special needs do not have access to the required assistive technology in their institutions and teachers have positive attitude towards assistive technology and this positive attitude of teachers to assistive technology in schools implies that the teachers will be ready to integrate the required assistive technology if provided.

The study recommended that assistive technology hardware and software should be provided for all special educational institutions and the provision of assistive technologies, their maintenance and upgrading could be incorporated within institutional strategies and associated operational plans. This study is related to the current study because it investigated three variables that are involved in the current study (that is assistive technology devices, their availability and the students with visual impairment). It is also related to the current study because both of them adopted a descriptive survey design.

Adebimpe *et al.* (2014) conducted a study on the availability and accessibility of information materials for sustainable academic achievement of students with visual impairment. The study was conducted at Federal College of Education (Special) Oyo. Descriptive survey was adopted. The population of the study comprised of 81 students with special needs and 27 information professionals (Braillists) hence total population for the study was 108. Questionnaire and observation were used as the Instruments for

data collection. The study revealed that students with special needs need information for academic purpose 73 respondents (84%). It was also revealed that materials such as computers with JAWS 5 (4%), optical character recognition 11 (10%), Braille note taker (Braille sense and Braille edge 40) 13 (12%) others were not available as expected of an institution serving students with visual impairment. It was also revealed that students with special needs lack proficiency in the use of computers as indicated by 70 (88%).

The study further revealed the responses of professionals (Braillists) on challenges being faced while making information accessible to students with visual impairment. Majority responded positively to the options given on inadequate fund 25 (93%) inadequate personnel 22 (81%), incessant power outage 27 (100%), hardware/software problem 24 (89%), poor maintenance culture 25 (93%), poor knowledge of computer knowledge 23 (85%), inability to read and write Braille 24 (89%), attitude of the visually impaired persons towards seeking for information 24 (89%), inadequate government and NGOs supports.

Adetoro (2012) conducted a study on availability and use of information materials by students with special needs in Southwest zone of Nigeria. A sample size of 150 students with special needs was used. The sample size was drawn from the population of 563 students with visual impairment. Descriptive survey was used as design of the study. A questionnaire titled: 'availability and use of information materials in alternative format by students with visual impairment' was used to collect data. The data was analyzed using frequency counts and percentages, mean and standard deviation, and Pearson product moment correlation. The result revealed that Braille materials (69.9%) and talking books or audio recordings (43.5%) were not readily available in the area of

study. Large prints are not available (79.3%). Braille materials had high level of utilization (mean=4.44, SD= 1.21). Information materials availability in the area of study cannot ensure and sustain adequate utilization. Many students with special needs complained that they hardly come across large print materials for use. The study also revealed that the most frequently used alternative format among students with special needs in the area of study was Braille, followed by talking books or tape recordings. The study revealed that information materials available in the area of study are inadequate to meet the information needs of students with visual impairment.

Isah (2014) carried out a study on the use of assistive technology by students with special needs in the United States. The population comprised 114 students with visual impairment. A secondary analysis of a nationally representative database was used. The findings showed that majority of students with special needs were not using assistive technology devices. It also found that students with special needs did not take full advantage of availability of computer-based assistive devices and, ultimately, used computers to a lesser extent compared with sighted students.

Abani, (2015) conducted a study on a survey of Teachers' awareness and use of Assistive technology in teaching children with Special needs in North Central, Nigeria. The population of the study was 291 and the sample size was 150 respondents. Teachers' Awareness of Assistive Technology Competency Questionnaire and Observation Schedule were used as the instruments for data collection. The findings reported that many of the schools that educated students with special needs in North West Nigeria did not have most of the assistive technology devices that were used for the education of persons with visual impairment. Some of the schools that had them did not have them in sufficient quality and quantity; furthermore, some of the devices that

were available were personal to the students with special needs and not owned by the schools.

The study further discovered that teachers were not using assistive technology while teaching students with special needs as they lacked the competence in the use of assistive technology. It also revealed that teachers in the area of study were faced with many problems as they try to teach students with special needs using assistive technology devices. The most serious problem being lack of training in the use of assistive technology devices, lack of competency in assistive technology devices and lack of the devices themselves in the institutions. The study recommended that there is need for an enlightenment campaign on the importance of assistive technology devices in schools and government should come up with a policy on assistive technology devices to make it mandatory for institutions to purchase them before they can admit students with special needs into their institution.,

Silman *et al.* (2017) carried out a study on the use of assistive technology for teaching, learning and administration process of people with visual impairment. The study was conducted in Cyprus Turkish Blind Association in North Cyprus. The population of the study is fourteen 14 students with visual impairment. Purposive sampling was used as a sampling technique for data collection. The data was collected through semi-structured interviews. The findings of the study revealed that students with special needs were able to use various assistive technology devices like audio maps, i-pad, cubes and trays in the process of searching knowledge and information. It also reported that there was lack of an automatic high-tech speed book scanner. It recommended that assistive technology devices for students with low vision like large print, enlarged images should be provided to help this category of students see printed materials better.

Theeratorn (2016) conducted a study on access to information for learning on the types of assistive technology used by undergraduate students with disabilities in Northern Thailand. A questionnaire (a rating scale checklist) was used as instrument for data collection. The population of the study consists of 140 students with visual impairment. Stratified random sampling technique was used. The findings of the study showed that students with special needs gained almost all assistive technology devices and educational services (98.75%) by accessing information for learning from their institutions. This access to information was provided mostly to students with special needs (26.25%). It was found that assistive technology devices were provided the most to students with special needs (40.00%), and those with hearing impairment and physical disabilities were provided equally (20.00%), while those with learning disabilities, including intellectual disabilities and autism, received the least (5%).

It was also found that students with special needs used assistive technology devices mostly involving an IC recorder (70.37%) and a personal computer with Braille keyboard (66.67%). However, when considering frequency of use, it was found that all of the students with disabilities used assistive technology devices at both low and high levels. In addition, results regarding the problems and barriers in using assistive technology devices for students with special needs in higher educational institutions were found to be 93.57% for effective use, 87.86% for external features of the technology, 87.86% for maintenance, and 83.57% for safe usage. On the other hand, skill training was found to be less of a problem or barrier in the use of AT devices (75.00%).

Johnstone *et al.* (2009) conducted a study on students with special needs and assistive technology. The study was conducted in five states of Minnesota. The population of the

study involved 18 students with visual impairment. Interview was adopted as an instrument for data collection. The result revealed that 61% of the respondents (n=11) were able to read regular print and large print. Many of the students also used audio books to access print regardless of their primary method of print reading (72%, n=13). Ten (10) students had used JAWS in the past year for audio needs. It also found that Braille products were used often by the participants. The Braille note device was used by 5 students. Two others used the Braille sense or Braille sense plus, and one student used Braille and speak. For magnification, students used a variety of technologies, from simple handheld magnifiers to computer-based products. Used frequently were both Zoomtex (most often also with speech) or a closed-circuit television (CCTV). It also revealed that students with some vision used multiple means of accessing texts, including large print, audio, and Braille. Students who were legally blind were more likely to be Braille readers and also used audio.

2.4 Summary of Literature Reviewed

The review of relevant literature has revealed that there are many technologies or technological devices that are used for the Education and rehabilitation of persons with special needs. These devices are assistive technology and are categorized differently according to their functions. However, researches to determine the availability of these devices in Colleges of Education in North West Nigeria are available or very scanty and the attitude of lectures and students towards them, hence the need for this research. The relevant literature reviewed reveal that many lectures (depending on the country) are aware of some of the assistive technology devices but they do not know how to use them to promote teaching and learning. For example, many researchers conducted in developed countries show that lectures are aware of assistive technology devices while

researches conducted in developing countries show that teachers are not aware of the devices.

The review on teachers' assistive technology skills and professional development showed that many lectures have not been prepared to acquire skills that will assist them in the use of assistive technology devices. The review also shows that many teacher training institutions in some developed countries integrate assistive technology into their teacher training programmed to help would–be lectures graduate with awareness, knowledge and skills in assistive technology for effective Education of student with special Education needs. However, this is not so in Nigeria, particularly, in North West Nigeria, therefore a need for this research on the factors of lectures intention to use assistive technology. Thus a gap exists that this research intends to fill.

The review on lecture's use of assistive technology devices may that some lectures were not using the devices regularly. Many lectures are reluctant and unwilling to use assistive technology in teaching; some of them that try to use them were not using the devices competently. Researches to determine lectures attitude towards assistive technology is very scanty, hence the need for this research to increase knowledge of lectures, intention to use assistive technology.

Literature reviewed also indicated that assistive technology devices are not adequately provided for students with special needs. There also exists differences in the provision of assistive technology devices between Colleges of Educations, but researches to determine whether there exists that kind of difference in Nigeria particularly in North West Nigeria is scanty thus the need for this research.

Furthermore, literature reviewed revealed that there are many assistive technology competencies that lectures of students with special needs are supposed to possess to

enable them teach children with special needs effectively. However, there is no standard universal assistive technology competency set for special Education teachers therefore every institution or state sets their own standards. With this kind of teacher training in Nigeria, it is not known whether lectures are having the intention to use assistive technology since there is no standard organization to examine and certify them. Therefore, is there a gap exists? That is what the researcher intends to fill.

Relevant literature reviewed on the issue of male versus female teachers' intention in teaching shows that many empirical studies have not been done on the subject particularly as it relates to teaching persons with special needs, hence the need for this research to fill this gap. Literature reviewed further showed that most regular lectures do not have a good knowledge of special Education and assistive technology as most of them are opposed to the idea of inclusion because they don't know much about how to use assistive technology to teach children with special needs. Empirical studies to determine whether or not they can teach children with special Education needs is therefore very scanty, hence the need for this research.

The review has also shown that there are some factors that hinder lectures from effectively using assistive technology devices for teaching students with special Education needs, but researcher is determining which of these factors affects lectures more in North West Nigeria that has not been taken into consideration, therefore may be a gap that exists, that is what the researcher intends to fill.

The review also revealed that many lectures are aware of some of the technological assistive technology equipment or devices, but the research is determining whether the special needs teachers/lectures have the knowledge and capacity to utilize the available/little and promote teaching and learning in their classes, hence the need for

this research to fill that gap. Generally, the review showed that research on teachers' awareness and use of assistive technology in teaching special needs students in Nigeria particularly in the North Western Geopolitical Zone is very scanty, and research to determine the constraints to teacher's effective use of Assistive technology has not been taken seriously. It is on the basis of this that this research is being conducted to fill these gaps.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Design

This study adopted a quantitative correlation study to investigate the factors that influence lecturer's behavioral intention to adopt assistive technology for teaching students with special needs among Colleges of Education in North-west Nigeria. Quantitative research design of this nature helps to explain relationship between the predictor or independent variables and the criterion or dependent variable and it seek to clarify phenomena through careful data collection and analysis (Creswell, 2015). This quantitative co relational design will allow the researcher to explain how the predictor variable influenced or define the criterion variable. In the case of this study, the dependent variable; AT, perceive usefulness, ease of use, self-efficacy and demographic data influence lecturers' behavioral intention to adopt AT. The survey items cover both the dependent and independent. Creswell (2015) opined that dependent variables are those that rely on the independent variable and are considered as the outcomes of the independent

3.2 Population of the Study

The population of the study was all lecturers in States and Federal Colleges of Education in North-west Nigeria. The target populations were 493 lecturers teaching students with special needs in Colleges of Education in north-west Nigeria. The table shows number of lecturers teaching special people with special needs in Colleges of Education in north-west Nigeria:

Table 3.1: Number of Lecturers Teaching Special People with Special Need from both special education department and other department handling the students

S/N	STATE	NAMES OF THE COLLEGES OF EDUCATION	LECTURERS
1	Jigawa	Jigawa state College of Education Gumal	36
2	Kaduna	Federal College of Education Zaria	35
3		Kaduna state College of Education Kafacan	38
4		Jama'atu College of Education Kaduna	29
5	Kano	Federal College of Education Kano	51
6		Federal College of Education technical Bichi	43
7		Sa'adutu Rimi Colleges of Education Kumbotso	39
8	Katsina	Federal College of Education Katsina	41
9		Isa Kaita College of Education Dutsinma	39
10	Kebbi	Adama Augie College of Education Argungun	42
11	Sokoto	Shehu Shagari College of Education Sokoto	32
12	Zamfara	Federal College of Education (Technical) Gusau	39
13		Zamfara state College of Education Maru	29

Source: NCCE (2017)

3.3 Sample and Sampling Technique

The sample of the study was 210 lecturers in Colleges of Education in North-west Nigeria. This constitutes 39.5 percent of the total populations of lecturers teaching students with special needs. Cluster random sampling was used in selecting the sample size of the study. The stratum would be the old Kano state (Kano and Jigawa states), Old Kaduna state (Kaduna and Katsina states) and old Sokoto state (Sokoto and Zamfara states).

3.4 Research Instruments

The instrument for this study is a structured close ended questionnaire titled "Assistive Technology Questionnaire for Students with Special needs" (ATQSD). The questionnaire was developed by the researcher in line with Technology Acceptance Model (TAM) and Bandura Theory of Self-Efficacy construct. The questionnaire was scaled using 5-point Likers type. It was divided into four sections (A-E) section A: sought demographic information of the respondents' institution, gender, and years of experience. Section B_1: sought participants' opinions on their perceive usefulness of AT. Sections B_2: will focus on lecturers perceive ease of use of AT, Section B_3: sought lecturers' opinion on technological Self-efficacy, Section B_4: sought opinions on behavioral intention to use AT.

3.5 Validation of the Instrument

The instrument was subjected to validation process to ascertain its face and content validity as well as to determine the construct validity of the instrument. The questionnaire was given to one expert in the Department of Educational Technology, Federal University of Technology Minna, and one expert in the Department of science and Technology Education (Educational Technology section), Bayero University Kano, one expert in the Department special education, Bayero University Kano, another expert in the Department of Psychology and Guidance and Counseling in Ahmadu Bello University Zaria. The experts checked the general format of the instrument for face validation; the appropriateness of the contents of AT and its alignment with the need of teaching students with special needs was ascertain for content validation. Additionally, the construct of TAM and Bandura was checked as applied to AT to ascertain the

construct validity of the instrument. Their comments and suggestion was integrated to improve the questionnaire.

3.6 Reliability of the Instrument

The instrument for data collection was pilot tested to determine the reliability of the instrument which was 5-point Likers scale, the researcher administered the questionnaire to a sample of 40 lecturers of pre-service teachers with special needs in COE who are part of the population but are not part of the sample size. The sub-section of the instrument includes, perceive usefulness of AT, perceive ease of use of AT, behavioral intention to use AT, and lecturers' technological Self-efficacy. Cronbach alpha statistics was used to establish the reliability of the different construct of the instrument as presented in Table 3.2

Table 3.2: A Reliability of the Instrument in the Pilot Study

S/NO	Construct	No of Items	Reliability coefficient
1	Perceive usefulness	9	0.71
2	Perceive Ease of Use	9	0.83
3	Behavioral Intention	9	0.84
4	Technological Self-efficacy	10	0.78

Table 3.2 shows the reliability coefficient of the instrument, the finding shows the reliability of 0.70, 0.83, 0.84, and 0.78 for perceive usefulness of AT, perceive ease of use of AT, behavioral intention to use AT, and lecturers' technological Self-efficacy respectively. Sekaran and Bougie, (2010) reported that the reliability coefficient of 0.6 is considered as poor, 0.7 is considered acceptable and 0.8 is considered as good.

Similarly, reported in another research that a reliability coefficient of 0.50 - 0.80 is considered moderate while above 0.80 it is high. Therefore, the reliability coefficient obtained for this instrument is considered acceptable for this research.

3.7 Method of Data Collection

The researcher obtained a letter of introduction from the Department of Educational Technology, Federal University of Technology Minna to the sample school for the study. The researcher applied for permission to conduct the study in the sampled schools. Research assistants trained in each school to administer the questionnaire. Lecturers were intimitate on the purpose of this research. Thereafter, the instruments were administered to the respondents through face-to-face administration and were retrieved via the same research assistants. A total of four weeks was used for data collection and the completed questionnaire was processed and analyzed.

3.8 Method of Data Analysis

The data collected was analyzed using descriptive and inferential statistics. Research questions one to three were analyzed using Mean and Standard Deviation. The arithmetic mean for the values was computed as 5+4+3+2+1= 15/5 = 3.00 which was used as decision mean. Therefore, any item with weighted mean of 3.00 and above was considered agreed and any item with weighted mean less than 3.00 will be considered disagreed as a decision rule. Research question four (4) to nine (9) was analyzed using Mean, Standard Deviation and Scatter Plot. While the formulated hypotheses from 1 to 3 was analyzed using Linear Regression at 0.05 significant level. Furthermore, Hypothesis 4 and 5 was analyzed using Point Biserial. Finally, hypothesis 6 was analyzed using Multiple Regression Analysis at 0.05 significant level using SPSS version 23.0.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Presentation of Results

The findings from the data for the study were presented under the following.

i. Demographic data

ii. Research questions

iii. Testing hypotheses

4.1.1 Demographic data

In this section the demographic data are presented showing the distribution of the respondents based on gender and year(s) of experience.

4.1.1.2 *Sample distribution based on gender*

The distribution of demographic data of the respondents of this population in terms of gender and the analysis is presented in Table 4.1

Table 4.1: Gender Distribution of the Respondents

Gender	Frequency	Percent
Male	128	61.0
Female	82	39.0
Total	**210**	**100.0**

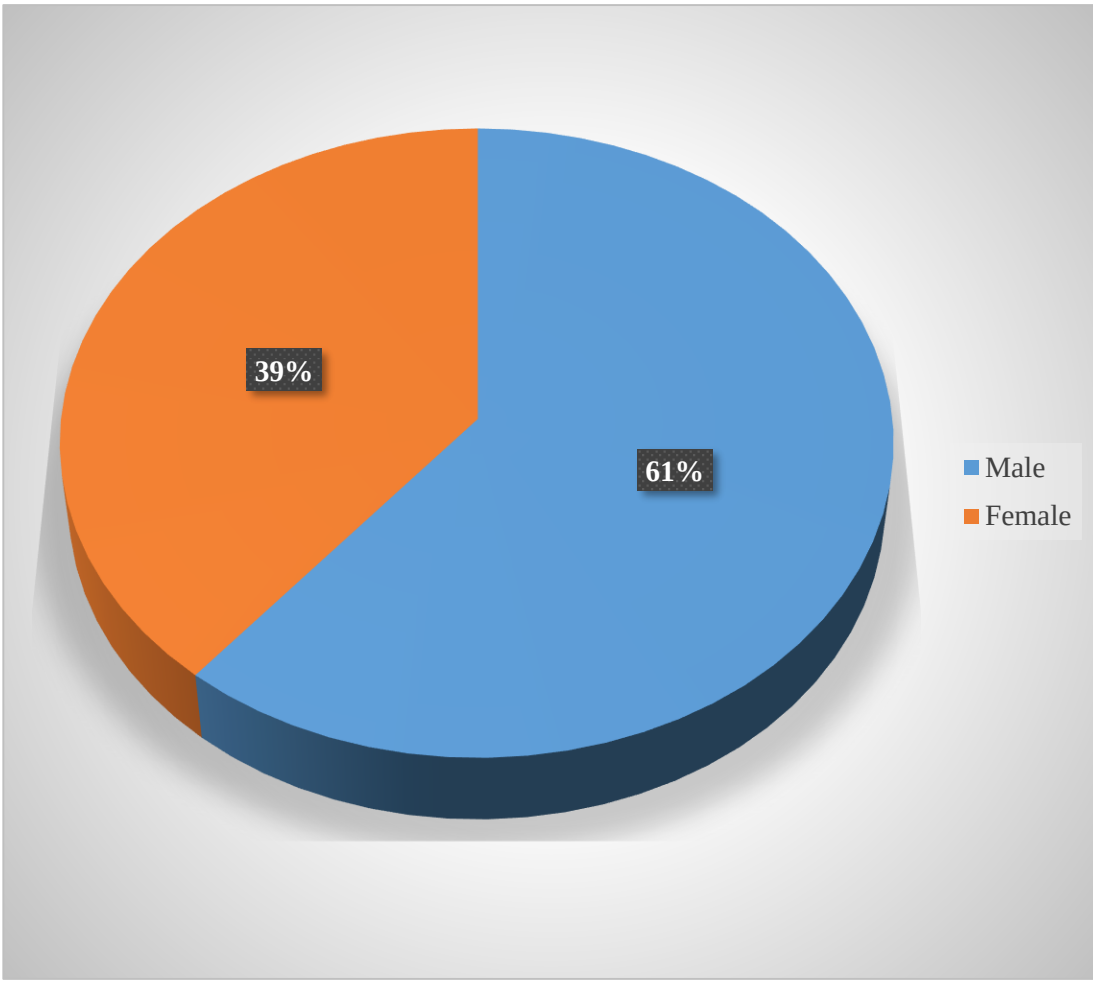


Figure 4.1 Gender Distribution of the Respondents

Table 4.2: Distribution of Respondents based on Years of Experience

Years of Experience	Frequency	Percent
0-10 years	57	27.10
11-20 years	80	38.10
21-30 years	59	28.10
31-40 years	14	6.70
Total	**210**	**100.0**

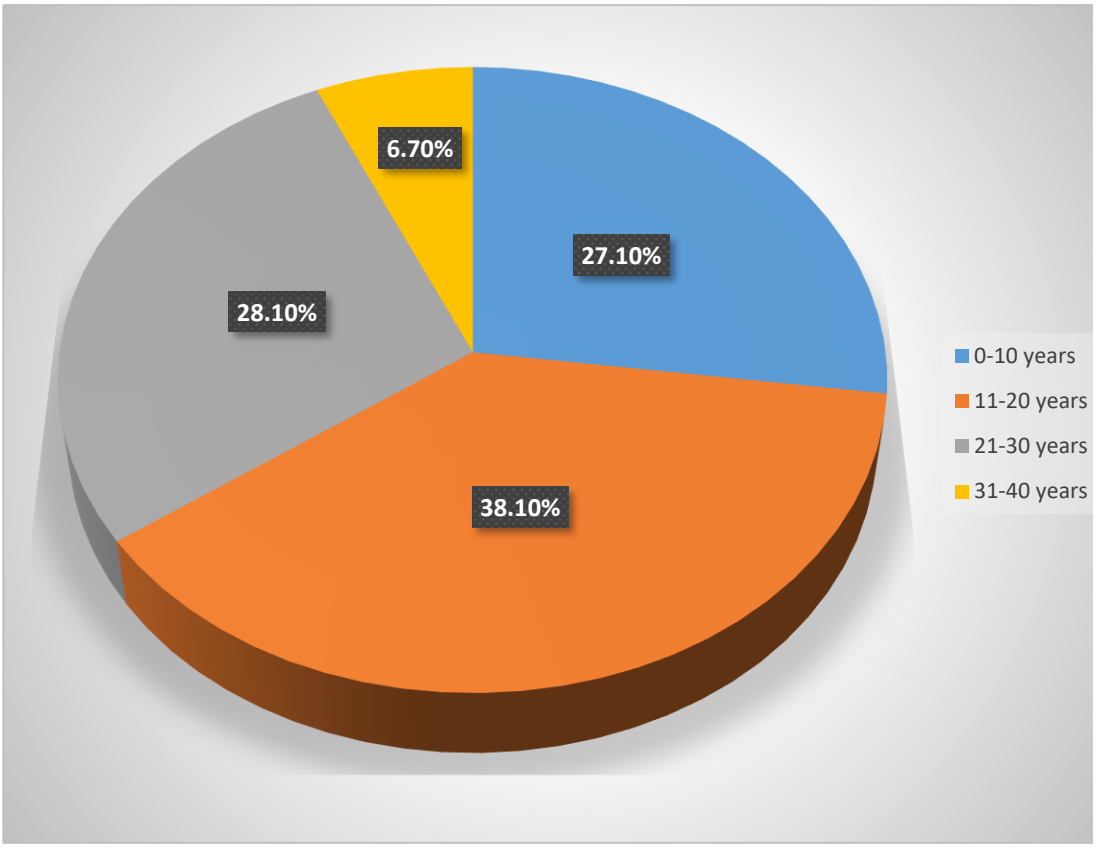


Figure 4.2 Distribution of Respondents based on Years of Experience

4.1.2 Answering Research Questions

Research Question One: What are lecturers perceived usefulness of Assistive technology for teaching college of education students with special needs? To answer this research question, mean and standard deviation was used and the analysis presented in Table 4.3

Table 4.3: Lecturers Mean and SD Responses on PU of AT

S/No		N	Mean	S D	Remarks
1	Using electronic aids like talking calculators, spell checkers, portable word processors for teaching students with special needs (SWDs) would enable me to accomplish tasks more quickly.	210	3.50	1.33	Useful
2	Using assistive writing software for students witl dysgrapia will improve my teaching performance	210	3.47	1.36	Useful
3	Using amplification devices for teaching hearing impaired students will improve my productivity.	210	3.50	1.42	Useful
4	Using ATDs in teaching will allow me to evaluat suitable devices for a particular student with spec	210	3.47	1.35	Useful
5	Using ATDs in teaching will allow me to evaluat devices for a particular students with special needs.	210	3.43	1.38	Useful
6	Using alternative keyboards and speech synthesi: teaching will enable me to integrate technology in my teaching career.	210	3.40	1.40	Useful
7	Using screen reading software would enhance m effectiveness in teaching students with visual impairment.	210	3.49	1.30	Useful
8	I would find electronic aids like magnifiers, talki calculators, Braille writers and adapted tape play in my teaching carrier.	210	3.56	1.32	Useful
9	I see ATDs as a way of making teaching more interesting.	210	3.44	1.36	Useful
10	Digital technology provide feedback	210	3.53	1.31	Useful
11	ATD helps me to facilitates and monitor learning of students with special needs	210	3.49	1.30	Useful
12	ATDs helps the learner to learn at their own pace	210	3.50	1.41	Useful
13	ATDs provide the opportunity for collaborative among the students	210	3.46	1.36	Useful
14	ATDs enhances the development of creative skills	210	3.55	1.29	Useful
15	ATDs enhances meaningful learning	210	3.52	1.39	Useful
	Grand Mean	**210**	**3.49**	**1.35**	**Useful**

Table 4.4 reveals the Mean and SD of lecturers PU of AT for teaching COE students with special abilities. The average mean of 3.00 and above was used as the benchmark for **'Useful'** and the mean of less than 3.00 is considered **'Not Useful**.' Consequently,

fifteen (15) items were listed, all of the items had mean scores which were between 3.40 and 3.55 and were above the benchmark of 3.0. This indicates that all lecturers in this population perceive AT to be useful in teaching students with special abilities. It is important to highlight that more respondents in this population perceive electronic aids like magnifiers, talking calculators, braille writers and adapted tape players to be useful in their teaching (item 8), and ATDs enhances the development of creative skills (item 14) with the highest mean of 3.56 and 3.55, respectively. The findings also show the grand mean of 3.49 which indicates lecturers perceive AT to be very useful for teaching students with special abilities in this population.

The standard deviation of the respondents perceive usefulness of Assistive Technology were between 1.29 and 1.42, while the standard deviation grand mean is 1.35, indicating that there is no meaningful deviation of respondents' perception from each other, and the standard deviation mean of the group.

Research Question Two: What are lecturers' perceived ease of use of Assistive technology for teaching college of education students with special needs? To answer this research question, mean and standard deviation was used and the analysis presented in Table 4.5

Table 4.4: Lecturers Mean Responses on PEU of AT

SN	Statement	N	X	SD	Decision
1	Learning to operate assistive devices would be easy for me.	210	3.49	1.27	Easy to use
2	It would be easy for me to diagnose and recommend suitable ATDs for students With special needs in my school.	210	3.46	1.37	Easy to use
3	I feel that selecting suitable ATDs for my students would be easy for me.	210	3.50	1.36	Easy to use
4	I feel that it would be easy for me to become skillful at using electronic and non-electronic ATDs.	210	3.57	1.33	Easy to use
5	I feel that it would be easy for me to transfer my computer skills to guide Students with special need in using electronic ATDs.	210	3.54	1.35	Easy to use
6	I would find using assistive technology software to be flexible and easy to use	210	3.58	1.37	Easy to use
7	I feel it would be easy for me to assemble the ATDs for possible use.	210	3.50	1.37	Easy to use
8	Training students with special need to use ATDs, adaptive and rehabilitative devices would be easy for me.	210	3.52	1.39	Easy to use
9	I feel that I would have the knowledge necessary to implement and use ATDs in my teaching.	210	3.55	1.39	Easy to use
10	I have enough experience to use ATDs without any problem	210	3.47	1.41	Easy to use
11	ATDs are user friendly	210	3.49	1.40	Easy to use
12	Creating an enabling environment for the use of AT is easy	210	3.53	1.39	Easy to use
13	AT could be easier for my students with special needs to improve their learning capability	210	3.51	1.36	Easy to use
14	ATDs are very easy to explore learning content	210	3.47	1.37	Easy to use
15	I feel using AT devices would create a conducive environment for students with special needs	210	3.50	1.37	Easy to use
	Grand Mean	**210**	**3.51**	**1.37**	**Easy to use**

Table 4.4 reveals the Mean and SD of lecturers' PEU of Assistive technology for teaching COE students with special needs. The average mean of 3.00 and above was used as the benchmark for **'Easy to Use'** and the Mean of less than 3.00 is considered '**Not Easy to Use**' Consequently, all fifteen (15) items listed had Mean scores which were between 3.46 and 3.58 which were above the benchmark of 3.00. This indicates

that all lecturers in this population perceive AT to be easy to use for teaching students with special abilities. It is important to highlight that more respondents in this population perceive that they find AT software to be flexible and easy to use (item 6) and feel that it would be easy for them to become skillful at using electronic and non-electronic ATDs (item 4) with the highest Mean of 3.58 and 3.57, respectively. The findings also show the grand Mean of 3.51 which indicates lecturers perceive assistive technology to be easy to use for teaching students with special abilities in this population.

The standard deviation of the respondents perceive ease of use of AT was between 1.27 and 1.41, while the SD grand Mean is 1.37. Indicating that there is no meaningful deviation of respondents' perception from each other, and the SD mean of the group.

Research Question Three: What is lecturer's technological self-efficacy in assistive technology for teaching COE students with special needs? To answer this question, Mean and standard deviation was used and the result presented in Table 4.5

Table 4.5 Lecturers Mean and Standard Deviation Responses on Technological Self-Efficacy (TSE) on Assistive Technology

S/N	Statement	N	Mean	SD	Decisions
1	I can diagnose with special needs student independently and identify a need for ATDs use.	210	3.55	1.28	High TSE
2	I can select and recommend suitable ATDs based on the students diagnosed level of needs.	210	3.57	1.31	High TSE
3	I can assemble ATDs and make them ready for use students with special needs independently.	210	3.59	1.32	High TSE
4	I can support students to use ATDs for their learning.	210	3.55	1.37	High TSE
5	I can operate any suitable ATDs for my students.	210	3.46	1.36	High TSE
6	I can locally construct a simple ATDs for my students with special needs	210	3.49	1.37	High TSE
7	AT provides opportunities for individualized instruction to students with special needs.	210	3.55	1.26	High TSE
8	I am confident in offering interventions with ATDs associated with Existing rehabilitation plans of my schoc	210	3.60	1.38	High TSE
9	I have the capability to provide professional and technic assistance to students with special needs.	210	3.63	1.34	High TSE
10	I can offer evaluative assessment by specifying appropri that will meet the needs of my students.	210	3.43	1.42	High TSE
11	I can confidently modify AT devices to adapt students' conditions.	210	3.52	1.32	High TSE
12	I have confident to repair and replace a worn out component of ATDs	210	3.56	1.32	High TSE
13	I have enough experience to cope with the use of ATDs to students with special needs.	210	3.43	1.29	High TSE
14	I can serve as facilitator for students learning using ATI to students with special needs.	210	3.47	1.40	High TSE
15	With enabling environment, I can engage in a technolog Enhanced instruction to students with special needs.	210	3.55	1.47	High TSE
	Grand Mean	**210**	**3.53**	**1.35**	**High TSE**

Table 4.5 reveals the Mean and SD of TSE of assistive technology for teaching COE students with special needs. The average mean of 3.00 and above was used as the benchmark for **'High** and the Mean of less than 3.00 is considered **'Low Self-Efficacy**.' Consequently, fifteen (15) items were listed, all of the items had Mean scores which were between 3.43 and 3.63 which were above the benchmark of 3.0. This indicates that all lecturers in this population have High technological self-efficacy towards using AT for teaching students with special needs. It is important to highlight that more respondents in this population agreed that they have the capability to provide professional and technical assistance to students with special needs (item 9), and confident in offering interventions with ATDs associated with Existing rehabilitation plans of their schools. (item 8) with the highest Mean of 3.63 and 3.60 respectively. The findings also show the grand mean of 3.53 which indicates lecturer's TSEAT to be High for teaching students with special needs in this population.

Research Question Four: Is there any influence of lecturers perceived usefulness on Behavioural intention to use Assistive technology for teaching college of education students with special needs? To answer this research question, Mean and standard deviation (SD) was used and the analysis presented in Table 4.6

Table 4.6 Mean and SD of Perceived Usefulness and Behavioural Intention

Variable	N	Mean	SD	Mean difference
PUATot	210	69.75	22.783	
				1.02
BITot	210	70.77	23.774	

Table 4.7 shows the Mean and SD of lecturers' PU on BI to AT for teaching COE students with special needs. The findings show computed Mean score of 69.75and SD of 22.78 for PU and the Mean score of 70.77 with SD on of 23.774 for BI. This gives mean difference of 1.02 between PU and BI. The relationship between PU and BI is illustrated using scatterplot in figure 4.4

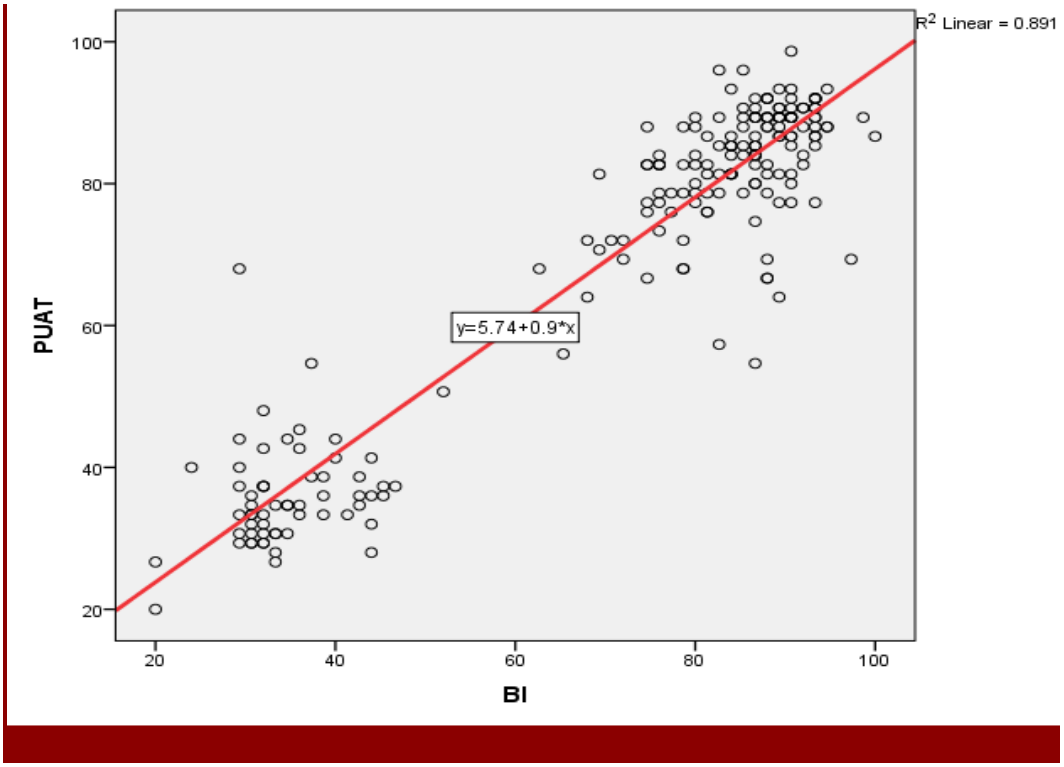


Figure 4.3: Scattered plot relationships between PU and BI

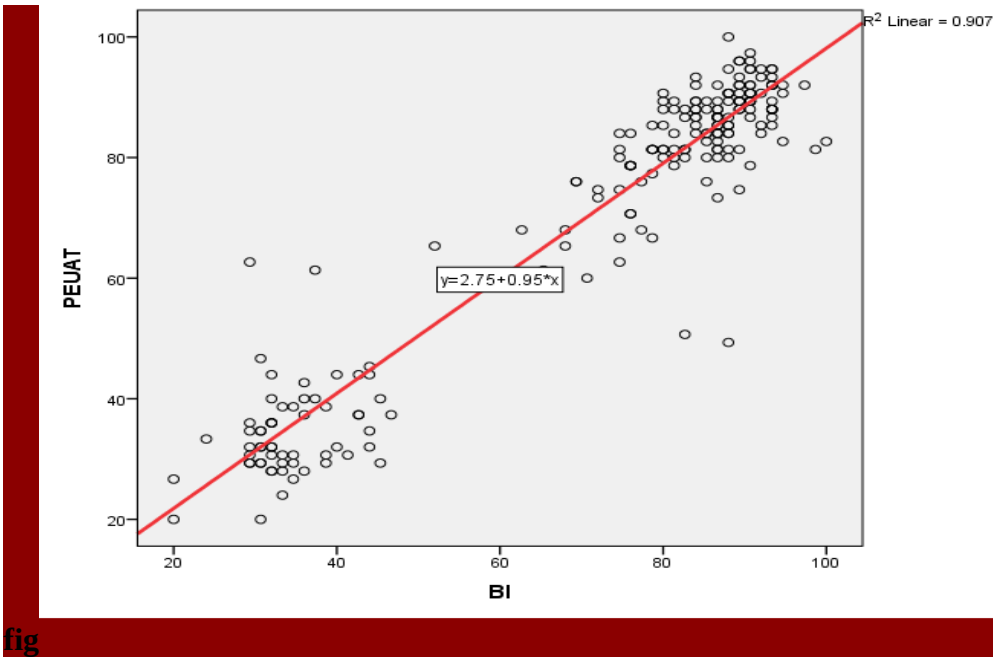
Figure 4.3 is a Scatterplot of the relationships between PU and BI. The scattered plot indicates that there seems to be a Positive Relationship between the two constructs as indicated by the regression line. Therefore, linear regression was used to determine the strength of the relationship.

Research Question Five: How does lecturers perceived ease of use influence their Behavioural intention to use Assistive technology for teaching college of education students with special needs? To answer this research question, Mean and standard deviation was used and the analysis presented in Table 4.7

Table 4.7: Mean and SD of PEU and BI

Variable	N	Mean	SD	Mean difference
BITOT	210	70.77	23.774	
				0.52
PEUATOT	210	70.25	23.803	

Table 4.7 shows the Mean and SD of lecturers' PEU on BI to use Assistive technology for teaching COE students with special needs. The findings show computed Mean score of 70.77and SD of 23.774 for Behavioural intention and the Mean score of 70.25 with Standard Deviation of 23.803 for perceived ease of use. This gives Mean difference of 0.52 between PEU and BI. The relationship PEU and BI is illustrated using scatterplot in figure 4.5



fig

Figure 4.4: Scattered plot relationships between PEU and BI

Figure 4.4 is a Scatterplot of the relationships between perceived ease of use and Behavioural intention. The scattered plot indicates that there seems to be a positive

relationship between the two constructs as indicated by the regression line. Therefore, linear regression was used to determine the strength of the relationship.

Research Question Six: Is there any influence of lecturers' technological self-efficacy on Behavioural intention to use Assistive technology for teaching college of education students with special needs? To answer this research question, Mean and standard deviation was used and the analysis presented in Table 4.8

Table 4.8: Mean and SD of TSE on BI AT

Variable	N	Mean	SD	Mean Difference
TSETot	210	70.58	23.640	
				0.19
BITot	210	70.77	23.774	

Table 4.8 shows the Mean and SD of lecturers' TSE on BI to use AT for teaching COE students with special needs. The findings show computed Mean score of 70.58 and SD of 23.640 for Self-efficacy and the Mean score of 70.77 with SD of 23.774 for BI. This gives Mean difference of 0.19 between TSE and BI. The relationship between TSE and BI is illustrated using scatterplot in figure 4.6.

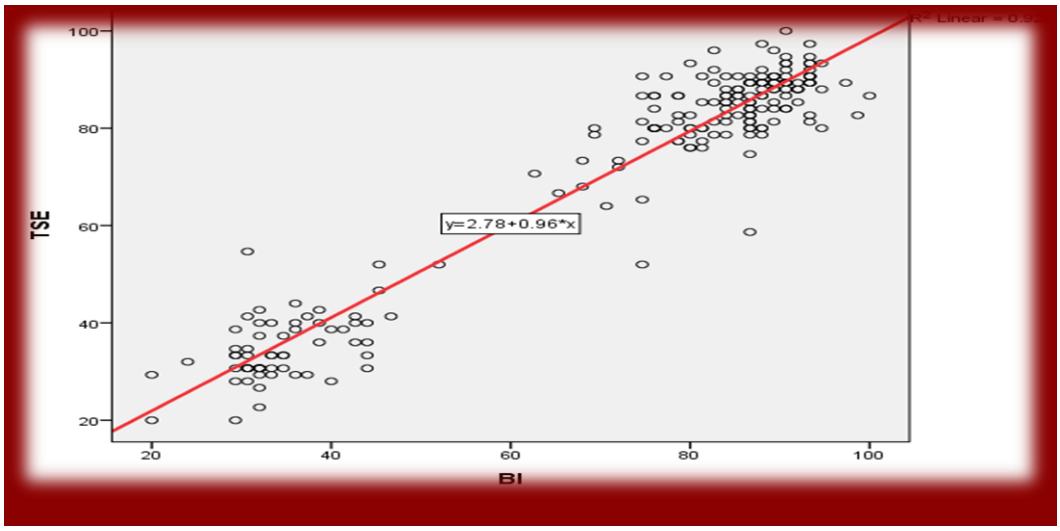


Figure 4.5: Scattered plot relationships between TSE and BI

Figure 4.5 is a Scatterplot of the relationships between self-efficacy and BI. The scattered plot indicates that there seems to be a positive relationship between the two constructs as indicated by the regression line. Therefore, linear regression was be used to determine the strength of the relation.

Research Question Seven: Is there any relationship between years of experience and lecturers' Behavioural intention to use Assistive technology for teaching college of education students with special needs. To answer this research question, mean and standard deviation was used and the analysis presented in Table 4.9

Table 4.9: Mean and SD of YOE and BI

Variable	N	X	SD	Mean difference
YOP	210	2.14	0 .896	
				68.63
BITOT	210	70.77	23.774	

Table 4.9 shows the Mean and SD of influence of years of experience on BI to use AT for teaching college of education students with special needs. The findings show computed mean score of 2.14 and SD of 0.896 for YOE and the Mean score of 70.77 with SD of 23.774 for BI. This gives Mean difference of 68.63 between YOE and BI. The relationship between YOE and BI is illustrated using scatterplot in figure 4.7

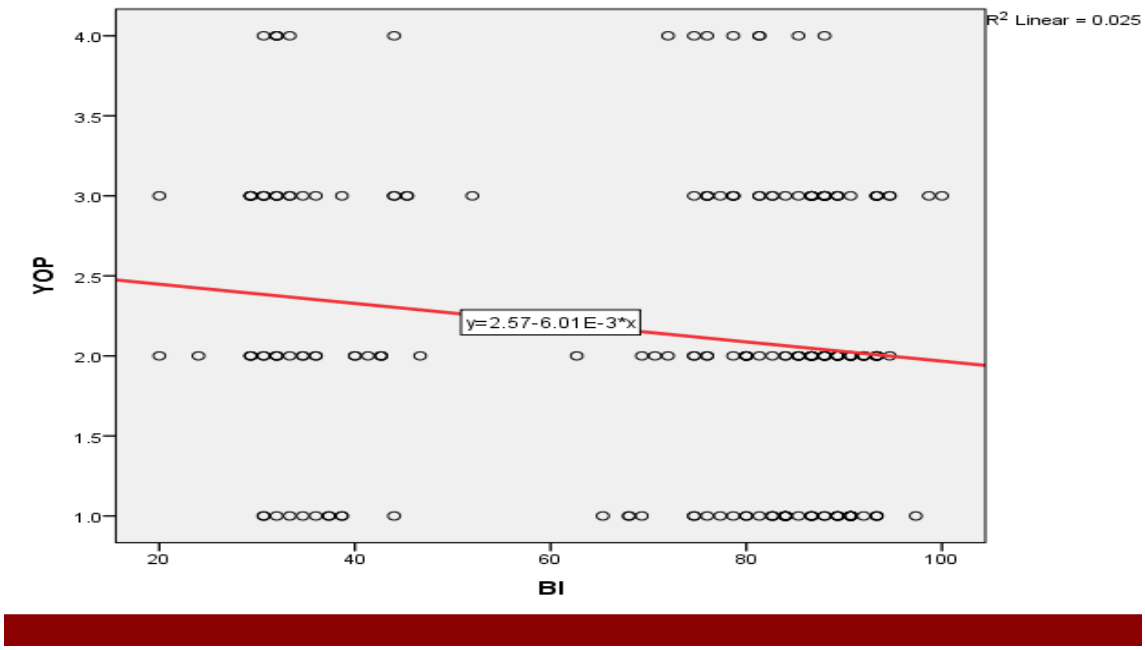


Figure 4.6: Scattered plot relationships between YOE and BI

Figure 4.6 is a Scatterplot of the relationships between YOE and BI. The scattered plot indicates that there seems to be a negative relationship between the two constructs as

indicated by the regression line. Therefore, linear regression was used to determine the strength of the relation.

Research Question Eight: Is there any influence of gender on Behavioural intention to use Assistive technology for teaching college of education students with special needs? To answer this research question, mean and standard deviation was used and the analysis presented in Table 4.10

Table 4.10: Mean and SD of Gender and BI

Variable	N	Mean	SD	Mean difference
Gender	210	1.39	0 .489	
				69.38
BITot	210	70.77	23.774	

Table 4.10 shows the Mean and SD of influence of Gender on BI to use AT for teaching COE students with special needs. The findings show computed Mean score of 1.39 and SD of 0.489 for Gender and the Mean score of 70.77 with SD of 23.774 for BI. This gives Mean difference of 69.38 between Gender and BI. The relationship between Gender and BI is illustrated using scatterplot in Figure 4.8

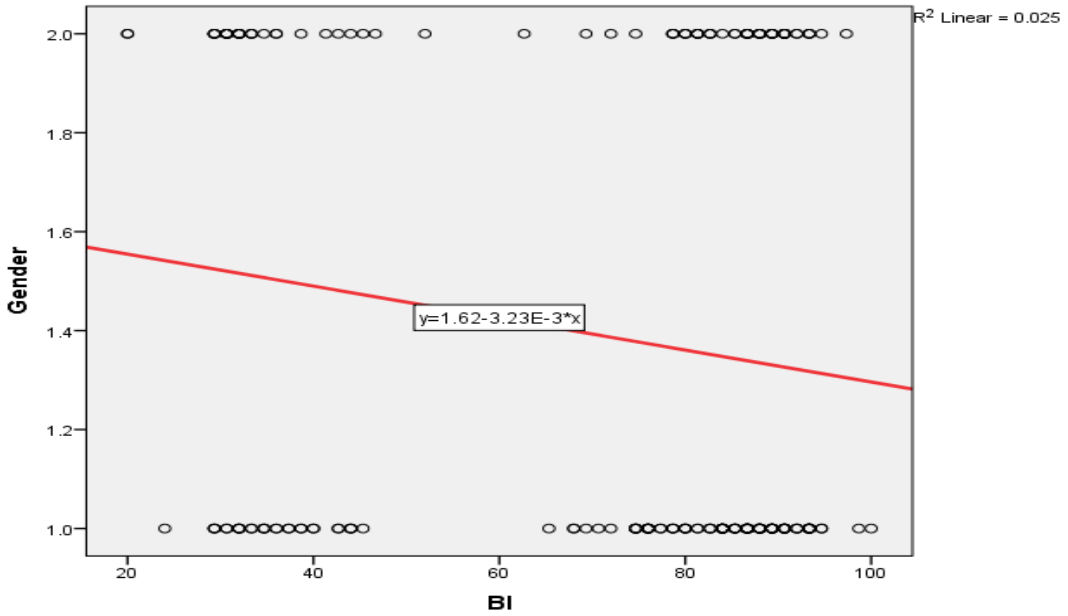


Figure 4.7: Scattered plot relationships between Gender and BI

Figure 4.7 is a Scatterplot of the relationships between Gender and BI. The scattered plot indicates that there seems to be a negative relationship between the two constructs as indicated by the regression line. Therefore, linear regression was used to determine the strength of the relation.

Research Question Nine: How does perceive usefulness, ease of use and self-efficacy predict the Behavioural intention to use Assistive technology for teaching college of education students with special needs. To answer this research question, mean and standard deviation was used and the analysis presented in Table 4.11

Table 4.11: Mean and SD of Lecturers PU, PEU and TSE on BI

Variables	N	Mean	SD
PUATot	210	69.75	22.783
PEUATOt	210	70.25	23.803
TSETot	210	70.58	23.640
BITot	210	70.77	23.774
Valid N (listwise)	**210**		

Table 4.11 shows that mean and standard deviation of Perceive Usefulness of Assistive Technology, PUAT, PEUAT, TSE and BI. The findings show computed mean score and Mean score of 69.75, 70.25 and 70.58 with SD of 22.783, 23.803 and 23.640 for PUAT, PEUAT and TSE. Similarly, the mean score of 70.77 with SD of 23.774 was for BI, the finding is highlighted using a scattered plot in figure 4**.9.**

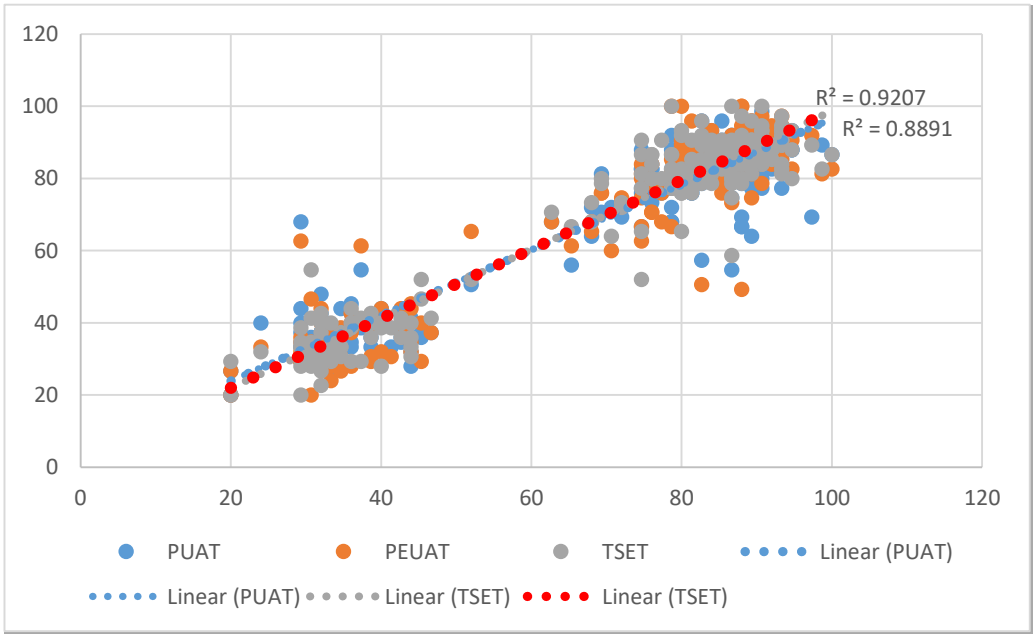


Figure 4.8: shows relationship between lecturers PUAT, PEUAT, TSE and BI

Figure 4.8 is a scatter plot of the relationship between lecturers PUAT, PEUAT, TSE and BI. This indicates that there seem to be a positive relationship between the predictors and the criterion variables. Therefore, multiple regression was used to determine the strength and magnitude of the relationship.

4.1.3 Testing Research Hypotheses

The formulated research hypotheses were tested at 0.05 significant level as presented in the next section

Hypothesis One: There is no significant influence of lecturers' perceived usefulness on Behavioural intention to use Assistive technology for teaching college of education students with special needs? To test this formulated hypothesis, linear regression was used and the result presented in Table 4.12a.

Table 4.12a: Linear Regression Model Summary on the Influence of Lecturers PU on BI to use AT

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.944[a]	0.891	0.890	7.880

a. Predictors: (Constant), PUAT

Table 4.12a The result shows r (2,208) = 0.944, r^2 = 0.891. Indicating that 89.1% of the variance in BIAT can be explained by PUAT among lecturers of students with special needs in North-Central, Nigeria. To determine whether the model was a good predictor, regression ANOVA result presented in Table 4.12b

Table.4.12b: Regression ANOVA on Lecturers PU on BI to use AT for teaching COE students with special needs

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	105207.790	1	105207.790	1694.238	0.000[b]
	Residual	12916.265	208	62.097		
	Total	**118124.055**	**209**			

a. Dependent Variable: BI

b. Predictors: (Constant), PUAT

Table 4.12b display ANOVA results. The findings show that there is a significant difference between the predictors (PU of AT), and the dependent variable (BI), *F* (2,208) = 1694.238, p (0.00) <0.05. This indicates that the model is a good predictor of the relationship between respondents PUAT and BI. This implies that the model fits the data better than using the means as confirmed by the regression coefficient. The regression coefficient is presented in Table 4.12c.

Table 4.12c: Linear Regression Coefficient between Lecturers PU on BI to Use AT for Teaching

		Unstandardized Coefficients		Standardized Coefficients		
Model		**B**	**Std. Error**	**Beta**	**T**	**Sig.**
1	(Constant)	2.085	1.755		1.188	0.236
	PUAT	.985	.024	.944	41.161	0.000

a. Dependent Variable: BI

Table 4.12c shows the regression coefficient of lecturers PU on BI to use AT for teaching COE students with special needs. The result shows PU of AT is a significant predictor of BI to use AT (B = .944, t = 41.16, p (0.00) < 0.05). The findings indicate that the standardized Beta coefficient for PU of AT is positive and statistically significant.

Hypothesis Two: There is no significant influence of lecturer's PEU on their BI to use AT for teaching COE students with special needs. To test this formulated hypothesis, linear regression was used and the result presented in Table 4.13a

Table 4.13a: Linear Regression Model Summary on the Lecturer PEU Influence of BI to use AT

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.953[a]	0.907	0.907	7.249

a. Predictors: (Constant), PEUAT

Table 4.13a shows the regression coefficient for the independent (predictor) variable (PEU) of AT on the dependent or criterion variable; BI. The result shows r (2,208) = .953 r^2 = .907. Indicating that only 90.7% of the total variance on BI to use AT for teaching COE students with special needs in North-Central, Nigeria. To determine whether the model was a good predictor, ANOVA result presented in Table 4.13b

Table 4.13b: Regression ANOVA on lecturers' perceived ease of use on Behavioural intention to use Assistive technology for teaching college of education students with special needs

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	107192.611	1	107192.611	2039.626	.000[b]
	Residual	10931.444	208	52.555		
	Total	**118124.055**	**209**			

a. Dependent Variable: BI
b. Predictors: (Constant), PEUAT

Table 4.13b display ANOVA results. The findings show that there is no significant difference between the predictors (PEUAT), and the dependent variable (BI), *F* (1,208) = 2039.626, p (0.00) <0.05. This indicates that the model is a good predictor of the relationship between respondents PEUAT and BI of lectures of COE students with

special needs. This implies that the model fits the data better than using the means. The regression coefficient is presented in the next Table 4.13c

Table 4.13c: Linear Regression Coefficient between lecturers PEU on BI to use AT for teaching COE students with special needs

		Unstandardized Coefficients		Standardized Coefficients		
Model		**B**	**Std. Error**	**Beta**	**T**	**Sig.**
1	(Constant)	3.932	1.562		2.517	0.013
	PEUAT	0.951	0.021	0.953	45.162	0.000

a. Dependent Variable: BI

Table 4.13c shows the regression coefficient of lecturers PEU on BI to use AT for teaching COE students with special needs. The result shows PEU Assistive technology is a significant predictor of BI (B = .953, t = 45.16, p(0.00) <0.05). The findings indicate that the standardized Beta coefficient of lecturers PEU of AT is positive and statistically significant. Therefore, the hypothesis is rejected. The regression coefficient indicates that for any increase in one unit of PEU of AT was cause an increase in 0.95 units of BI (when all other factors are constant) among COE Lecturers of in North West Nigeria.

Hypothesis Three. Is there any influence of lecturers' TSE on BI to use AT for teaching COE students with special needs? To test this formulated hypothesis, linear regression was used and the result presented in Table 4.14a

Table 4.14a: Linear Regression Model Summary on the Influence of lecturers' TSE on BI to use AT for teaching COE students with special needs

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	0.964[a]	0.928	0.928	6.376

a. Predictors: (Constant), TSE

Table 4.14a shows the regression coefficient for the independent (predictor) variables; TSE, and the dependent or criterion variable; BI. The result shows r (2,208) = 0.928 r^2 = 0.928. Indicating that only 92.8% of the variance in research and academic activities can be explained by TSE of lecturers among special needs lecturers in North-Central, Nigeria. To determine whether the model was a good predictor, ANOVA result presented in Table 4.14b

Table 4.14b: Regression ANOVA on lecturers TSE on BI to use AT for teaching COE students with special needs

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	109669.252	1	109669.252	2698.017	0.000[b]
	Residual	8454.803	208	40.648		
	Total	**118124.055**	**209**			

a. Dependent Variable: BI

b. Predictors: (Constant), TSE

Table 4.14b display ANOVA results. The findings shows that there is no significant difference between the predictors (TSE), and the dependent variable (BI), *F*(2,208) = 2698.017, p(0.00) <0.05. This indicates that the model is not a good predictor of the relationship between respondents' lecturer's TSE and BI. The regression coefficient is presented in the next Table 4.14c

Table 4.14c: Linear Regression Coefficient between Lecturers Perceived TSE on BI to use AT for Teaching COE Students with Special needs

Coefficients[a]					
	Unstandardized Coefficients		Standardized Coefficients		
Model	**B**	**Std. Error**	**Beta**	**T**	**Sig.**
1 (Constant)	2.373	1.388		1.709	0.089
TSE	0.969	0.019	0.964	51.942	0.000

a. Dependent Variable: BI

Table 4.14c shows the regression coefficient of lecturer's TSE on BI to use AT for teaching COE students with special needs. The result shows TSE is not a significant predictor of BI (B = .964, t = 51.94, p(.089) >0.05). The regression coefficient indicates that any increase in one unit of TSE was cause an increase in 0.96 units of BI (when all other factors are constant) among special needs lecturers in North West Nigeria.

Hypothesis Four: There is no significant relationship between years of experience and behavioural intention to use Assistive technology for teaching college of education students with special needs. To test this formulated hypothesis, linear regression was used and the result presented in Table 4.15

Table 4.15: Relationship between YOE and BI to use AT for teaching COE students with special needs

Correlations			
		BI	**YOP**
BI	ɤpb	1	-.159*
	Sig. (2-tailed)		.021
	N	**210**	**210**
YOE	ɤpb	-.159*	1
	Sig. (2-tailed)	.021	
	N	**210**	**210**

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4.15: revealed there is no significant relationship between YOE and BI to use AT for teaching COE students with special needs. The results show ɤpb=-.159, p-value = 0.021, which means p<0.05, the null hypothesis four is accepted. The correlation

coefficient (ɤpb = -.159) further shows that there is a weak negative relationship between YOE and BI to use AT for teaching COE students with special needs.

Hypothesis Five. There is no significant relationship between Gender and BI to use AT for teaching COE students with special needs? To test this formulated hypothesis, linear regression was used and the result presented in Table 4.16

Table 4.16: Relationship between Gender and BI to use AT for teaching COE students with special needs

		Gender	**BI**
Gender	ɤpb	1	-0.157*
	Sig. (2-tailed)		0.023
BI	ɤpb	-0.157*	1
	Sig. (2-tailed)	0.023	
	N	**210**	**210**

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4.16 revealed there is no significant relationship between students' gender and BI to use AT for teaching COE students with disabilities. The results show ɤpb=-.157, p-value = 0.023, which means p<0.05, the null hypothesis four is rejected. The correlation coefficient (ɤpb = -.157) further shows that there is a weak negative relationship between gender and BI.

Hypothesis Six: Lecturers PU, PEU and TSE are not significant determinants of their BI to use AT for teaching COE students with special needs. To test this formulated hypothesis, multiple regression was used and the result presented in Table 4.17

Table 4.17a: Multiple Regression Model Summary on Lecturers PU, PEU and TSE on BI to use AT for teaching COE students with special needs

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	0.976[a]	0.953	0.952	5.197

a. Predictors: (Constant), TSE, PUAT, PEUAT

Table 4.17a. The result shows r (2,238) = 0.976, r^2 = 0.953. Indicating that only 95.3% of the variance in research and academic activities can be explained by Lecturers PU, PEU and TSE among special needs lectures in North-Central, Nigeria. To determine whether the model was a good predictor, ANOVA result presented in Table 4.17b

Table 4.17b: Regression ANOVA on Lecturers PU, PEU and TSE on BI to use AT for teaching COE students with special needs

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	112560.454	3	37520.151	1389.235	0.000[b]
	Residual	5563.601	206	27.008		
	Total	118124.055	209			

a. Dependent Variable: BI

b. Predictors: (Constant), TSE, PUAT, PEUAT

Table 4.17b display ANOVA results. The findings shows that there is significant difference between the predictors (Lecturers PU, PEU and TSE), and the dependent variable (BI), $F(2,238) = 1389.24$, p(0.00) <0.05. This indicates that the model is a good predictor of the relationship between respondents' Lecturers PU, PEU and TSE and BI. The regression coefficient is presented in the next Table 4.17c

Table 4.17c: Linear Regression Coefficient between Lecturers PU, PEU and TSE on BI to use Assistive technology for teaching COE students with special needs

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
Model		**B**	**Std. Error**	**Beta**	**T**	**Sig.**
1	(Constant)	-0.207	1.168		-0.177	0.859
	PUAT	0.250	0.053	0.240	4.707	0.000
	PEUAT	0.229	0.058	0.229	3.975	0.000
	TSE	0.531	0.046	0.528	11.594	0.000

a. Dependent Variable: BI

Table 4.17c shows the regression coefficient of Lecturers PU, PEU and TSE on BI to use AT for teaching COE students with special needs. The result shows Lecturers PU is a significant predictor of BI (B = 0.240, t = 4.71, p(0.00) <0.05). The regression coefficient indicates that for any increase in one unit of PU was cause an increase in 0.250 units of BI (when all other factors are constant) among lecturer in the population. Secondly, The regression coefficient of lecturers PEU of AT show that PEU is a significant predictor of BI, (B = 0.229, t = 3.98, p(0.00) <0.05), indicating that for any increase in one unit of lecturers ease of use of AT was cause an increase in 0.229 units of BI (when all other factors are constant) among lecturers in the population. Thirdly, the regression coefficient of lecturers TSE is a good predictor of BI, (B = 0.528, t = 11.594, p(0.00) <0.05), indicating that for any increase in one unit of lecturers TSE was cause an increase in 0.531 units of BI (when all other factors are constant) among lecturer in the population among special needs lecturers in North West Nigeria.

4.3 Summary of the Findings

From the data analysis and the results obtained from this research, the findings were recorded and summarized as follows:

The respondents perceive Assistive Technology (AT) to be useful, ease of use and have high self-efficacy towards the use of AT for teaching COE students with special needs.

Perceive usefulness and Perceive ease of use of AT is significant predictor of COE lecturer's intention to use AT for teaching COE students with special needs and there is a significant influence of lecturers' technological self-efficacy on behavioral intention to use assistive technology for teaching COE students with special needs.

There is no significant relationship between respondents' years of experience, gender and their behavioral intention to use AT.

There is significant relationship between Lecturers perceive usefulness, ease of use and self-efficacy. In combine methods or multiple linear regression and are not significant determinants of their behavioral intention to use assistive technology for teaching COE students with special needs.

4.4 Discussion of Findings

Research finding of research question one; according to the response of respondents revealed that Lecturers perceive assistive technology to be very useful for teaching students with special needs in this study. It is important to highlight that more respondents in this population perceive electronic aids like magnifiers, talking calculators, Braille writers and adapted tape players to be useful in their teaching and ATDs enhances the development of creative skills with the highest mean, while the standard deviation of the respondents perceive usefulness of Assistive Technology was indicating that there is no meaningful deviation of respondents' perception from each other. The finding was in line with Alharbi and Drew, (2014) that stated a significant positive moderated correlation between the students with special needs. This is also in line with Fathema, *et al*, (2015) with a similar finding in their study, revealing the existence of a very strong positive correlation between the faculties' perceived usefulness of technology and their attitude towards technology. Another research finding of Smarkola, (2011) found that there were more similarities than differences in computer usage beliefs between new teachers and experienced teachers. Both new and more experienced teachers believed that preparing students to use technology served an important societal role and saw the need to obtain computer classroom integration training. Both novice and experienced teachers supported the TAM as they both were more likely to use computers if they perceived them as useful and recognized the value and usefulness of using computers in the classroom. One significant difference between

the age groups was that student teachers were naive in the assessment of their own Educational technology skills as they focused on their skills using the Internet, rather than Educational technology. But the findings of by Nam, *et al,* (2013) whose findings was not fully in support, revealed that the factors influencing AT abandonment were quite different from for general technology. They suggested that there are many unique characteristics of AT compared to general technology, such as unfamiliar usage and need for daily life. They also found that result demonstrability affected perceived usefulness of AT. Therefore, it seems that the function of AT was a major factor in its continued use. Another result by Zhou, *et al,* 2011 further opposed our findings. Their results indicated notable differences between lecturers' current perceptions and what they expected in the level of expertise of AT use. Lecturers reported that "their current levels of knowledge and skills were significantly lower than they thought teachers of students with visual impairments in general should have", the higher Lecturers lacked knowledge of assistive technology competencies and a low level of confidence in their skills about teaching assistive technology to students with visual impairments.

Research finding of research question two; revealed from the respondents that most of Lecturers perceive AT to be easy to use for teaching College of Education students with special needs as the findings revealed a positive perception on the ease of use of AT for teaching students with special needs. It is important to highlight that more respondents in this population perceive that they find assistive technology software to be flexible and easy to use and feel that it would be easy for them to become skillful at using electronic and non-electronic ATDs. While, the standard deviation of the respondents perceive ease of use of Assistive Technology was indicating that there is no meaningful deviation of respondents' perception from each other. These findings corroborate with Nam, Bahn and Lee, (2013) which revealed that Facilitating condition

was strongly related to perceived ease of use while perceived ease of use had a significant effect on computer self-efficacy. This study also found the importance of result demonstrability factor which had significant effects on both computer self-efficacy and perceived usefulness. This study expanded and enriched a traditional technology acceptance model by further investigating determinants associated with the acceptance of AT by special Education teachers for the blind and/or the deaf. In addition, the results of the present study should provide some insights into the understanding of AT acceptance and the decisions of AT utilization, as well as its distribution and training. Another research supported by Elkaseh, *et al,* (2016) as they carried out a quantitative study on the perceived ease of use and perceived usefulness of social media for e-learning in Libyan Higher Education, found out that the use of social media networking plays an important role in the adoption of e-learning. Their findings reveal that the attitude towards behavior or use of technology was predicted by perceived ease of use.

Research finding of research question three reveals the mean and standard deviation of technological self-efficacy have high self-efficacy towards the use of AT for teaching College of Education students with special needs. This indicates that all lecturers in this population have High technological self-efficacy towards using Assistive Technology for teaching students with special needs. It is important to highlight that more respondents in this population agreed that they have the capability to provide professional and technical assistance to students with special needs and confident in offering interventions with ATDs associated with Existing rehabilitation plans of their schools. The findings also show lecturers technological self-efficacy of assistive technology to be high for teaching students with special needs. In agreement with findings of Cardullo, *et al,* (2021), who conducted a study on K-12 teachers' remote

teaching self-efficacy during the pandemic. The study was to examine the relationship between factors in the extended technology acceptance model (TAM) model and teachers' self-efficacy in remote teaching during the COVID-19 pandemic. In addition, the authors sought to listen to classroom teachers as they expressed their unbiased views of the advantages, disadvantages and challenges of teaching remotely during the COVID-19 pandemic. The findings included Internet connection, lack of interaction and communication and challenges with motivation and student engagement. Disadvantages included teachers' level of self-efficacy in using technology to teach, lack of support and resources to teach online and the struggle to motivate and engage students. Perceived benefits included flexibility for the teacher and differentiation, rich resources and a way to support learners when in-person instruction is not possible. Additionally, Zapf, *et al*, (2016). Therefore, it appears that teachers who have more knowledge of AT may actually impact their students' use of AT in the classroom. In the same way, Al-Mekky, Atef, and El-Badramany, (2021), Quantitative data were analyzed using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) using SPSS 23 and AMOS 23. EFA revealed similar structures from prior research and the present study. The CFA approach verified the questionnaire that perceived self-efficacies was satisfactory for university students' context. And in contrary, Bronwyn, Sarah and Lamond, (2018), found that the largest barrier to AT use was lack of teacher training on AT. In their study, only 24.7%of teachers reported that their teacher Education programs had provided them with adequate training on AT. In the same line also, ZIefIe, Rocker, and Holzinger (2011) The results show that users are not yet very familiar with the vision of smart technology at home and report a considerable diffidence and aloofness towards using such technologies.

In research question four and null hypothesis one. It is Perceive that usefulness of AT is significant predictor of College of Education lecturer's intention to use AT for teaching college of Education students with special needs. The findings revealed that, the relationship between perceived usefulness and Behavioral intention indicates a positive relationship as indicated by the regression line. The findings of hypotheses one indicates that 89.1 of the variance in behavioural intention to use assistive technology can be explained by perceived usefulness. The findings indicate that the standardized Beta coefficient for perceived usefulness of assistive technology is positive and statistically significant. Therefore, the hypothesis is rejected. The regression coefficient indicates that any increase in one unit of perceived usefulness Assistive technology was cause an increase in units of Behavioural intention (when all other factors are constant) among special needs lecturers in North West Nigeria. This agrees with the findings of; Alharbi and Drew (2014) who found out in their study that the perceived usefulness of technology has a significant positive-moderate correlation with the attitude of teachers towards using the learning management systems. Fathema, *et al*, (2015) have a similar finding in their study, revealing the existence of a very strong positive correlation between the faculty's perceived usefulness of technology and their attitude towards technology. Alharbi and Drew (2014) made a study about using the technology acceptance model in understanding academics' behavioral intention to use learning management systems. They found out that there is a significant positive-moderate correlation between perceived ease of use of technology and attitude or intention towards using learning management systems among lecturers. The same observation was revealed by Fathema, Shannon, and Ross (2015) in the quantitative study they conducted on expanding the technology acceptance model to examine the faculty use of learning management systems in higher Education institutions in the United States of

America. Using structural equation modeling, their study proves that there is a strong positive correlation between the faculty's perceived ease of use of technology and their attitude towards technology. Ajuwon and Chitiyo (2015) examined the use of assistive technology in schools in Enugu. They concluded that the use of assistive technology in special Education were provide support to students with special needs and also improves teachers' classroom instructional practices. This implies that teachers have positive perception of assistive technology for special needs students. The results of the present study demonstrate that AT knowledge alone predicted perceived usefulness of AT despite the fact that computer literacy is significantly correlated with perceived usefulness of AT in contrary to our findings.

The finding further, research question five and null hypothesis two revealed that**,** perceives ease of use have a positive. The relationship between perceived ease of use and Behavioural intention to use assistive technology is illustrated using scatterplot. The scattered plot indicates that there seems to be a positive relationship between the two constructs as indicated by the regression line. The findings of hypotheses two indicates that 90.72 of the variance in behavioural intention to use assistive technology can be explained by perceived usefulness. Furthermore, the findings indicate that the standardized Beta coefficient of lecturers perceived ease of use of assistive technology is positive and statistically significant. Therefore, the hypothesis is rejected. The regression coefficient indicates that for any increase in one unit of perceived ease of use of Assistive technology was cause an increase of Behavioural intention (when all other factors are constant) among College of Education Lecturers of in North West Nigeria.

However**,** some research was in conformity or contrary with our findings; Nam, *et al,* (2013) findings revealed that perceived usefulness was a dominant factor affecting AT

usage. Facilitating condition was strongly related to perceived ease of use while perceived ease of use had a significant effect on computer self-efficacy. This study also found the importance of result demonstrability factor which had significant effects on both computer self-efficacy and perceived usefulness. In related study, by Smarkola, (2011) also examined technology adoption as it relates to perceived usefulness and perceived ease of use and compared student teachers with more experienced teachers. Using a planned behavioral framework that substantiated and extended Davis' Technology Acceptance Model, Smarkola found that there were more similarities than differences in computer usage beliefs between new teachers and experienced teachers. Both new and more experienced teachers believed that preparing students to use technology served an important societal role and saw the need to obtain computer classroom integration training. Both novice and experienced teachers supported the TAM as they both were more likely to use computers if they perceived them as useful and recognized the value and usefulness of using computers in the classroom. The findings shows that there is no significant difference between the predictors (perceive ease of use of assistive technology), and the dependent variable (behavioural intention). This indicates that the model is a good predictor of the relationship between respondents perceive ease of use assistive technology and behavioural intention of lectures of college of students with special needs. The findings which is not in line with our result is of Chukwuemeka, and Samaila, (2019). reported that teachers do not use high-tech assistive devices regularly to teach students with physical special needs.

In research question six and null hypotheses three revealed that, there is a significant influence of lecturers' technological self-efficacy on behavioral intention to use assistive technology for teaching COE students with special needs, which shows the mean and standard deviation of lecturers' technological self-efficacy on Behavioural

intention to use Assistive technology for teaching college of education students with special needs. The relationship between variables is illustrated using scatterplot. The scattered plot indicates that there seems to be a positive relationship between the two constructs as indicated by the regression line. Therefore, linear regression was used to determine the strength of the relation. The result indicating that the variance in research and academic activities can be explained by technological self-efficacy of lecturers of students with special needs in COE in North western Nigeria. Other research in compliance or converse our findings was outline as follows; Sagna and Baran, (2021) revealed that technology integration behaviour is directly related to intention and perceived behaviour control and indirectly related to attitude, subjective norms and perceived behaviour control, also revealed that the factors affecting faculty members' planned technology integration behaviour were related to their intentions, attitude, subjective norms and perceived behaviour control. Findings of Emeka and Dominic, (2020) indicated that teachers have positive perception of assistive technology which could positively influence the use of these devices for teaching and learning in special schools. While Williams-Buffonge, (2021) goes contrary, the study included nine lecturers from a Caribbean college in Antigua and Barbuda as participants. Data were collected through interviews and analyzed using open coding and thematic analysis. Findings from the study were that college lecturers' beliefs regarding technology were positive and technology held value in terms of the learning process. However, the results established that not all lecturers were comfortable adopting technology within their instructional practice and faced barriers when attempting to adopt technology. Lecturers indicated the need for professional training, institutional support, and observational learning of others which would assist with lecturers' pedagogy, content knowledge, and technology adoption.

In research question seven and null hypothesis four, the findings from research question seven shows a negative relationship between the moderating variable (years of experience) and behavioral intention to use assistive technology. Furthermore the finding of the corresponding hypotheses shows that there is no significant relationship between years of experience and behavioral intention. The hypothesis is rejected as indicated in scatterplot. The scattered plot indicates that there seems to be a negative relationship between the two constructs as indicated by the regression line. The results show the null hypothesis four is rejected.

Zhou, *et al,* (2012) who revealed in support of our findings. The study revealed that among teachers of students who have special needs, younger teachers were more confident using AT and had more positive perceptions of AT. It was, therefore, expected that teachers who had been teaching for the fewest number of years would have the greatest computer literacy and AT skills, but this was not the case. In fact, computer literacy was not significantly related to years of teaching. This finding appears to be in contrast with the findings of Zhou, *et al,* (2012), who reported that younger teachers may be more confident using AT because their teacher preparation program included training in AT whereas older teachers' training did not. Perhaps the teacher training programs attended by the participants in this study are not providing teachers with the necessary AT skills and instead teachers are receiving this training on the job. Given that fewer than 30% of teachers in this sample reported any exposure to AT during their teacher training program, this result is unsurprising. It is also possible that teachers with more years of teaching experience have had more exposure to working with students with LDs and appreciate the impact or potential of using AT with their students. Teachers with more years of experience may be more proficient with classroom management strategies or other aspects of managing as a classroom teacher and are more

comfortable with learning how to use AT and manage it for those students who require it. The findings revealed there is no significant relationship between years of experience and behavioural intention to use Assistive technology for teaching college of education students with special needs. There is a weak negative relationship between years of experience and behavioural intention to use Assistive technology for teaching college of education students with special needs

In research question eight and null hypotheses five The findings give mean difference between Gender and Behavioural intention. The relationship between genders is presented in a Scatterplot. The scattered plot indicates that there seems to be a negative relationship between the two constructs as indicated by the regression line. Therefore, linear regression was used to determine the strength of the relation which revealed that there is no significant relationship between gender and behavioural intention to use AT. The results show the null hypothesis five is rejected. The correlation coefficient further shows that there is a weak negative relationship between gender and behavioural intention to use Assistive technology for teaching college of education students with special needs. From the findings female lecturers has positive behavioural intention than their male counterpart in using AT in teaching their students. It was revealed that there is no significant relationship between students' gender and behavioural intention to use Assistive technology for teaching college of education students with special needs.

In research question nine and null hypotheses six, shows the regression coefficient for the independent (predictor) variables; Lecturers perceive usefulness, ease of use and self-efficacy, while the dependent or criterion variable; Behavioural intention. The result Indicating that 95.3% Behavioural intention to use Assistive technology of

variance can be explained by ihe combine impact of Lecturers perceive usefulness, ease of use and self-efficacy among special needs lectures in North-Central, Nigeria. The regression coefficient of Lecturers perceives usefulness, ease of use and self-efficacy on Behavioural intention to use Assistive technology for teaching college of education students with special needs was significant at 0.05. Therefore, the hypothesis was rejected. The result shows Lecturers perceive usefulness is not a significant predictor of Behavioural intention. This is in conformity with Williams-Buffonge, (2021) carry out a study on Caribbean Lecturers' Self-Efficacy and their Perceived Barriers to Technology Adoption. The study examined how lecturers' self-efficacy at one college in Antigua and Barbuda influenced their technology adoption in terms of their instructional practices, including perceived barriers and supports for technology use. The conceptual frameworks for this study were Bandura's self-efficacy theory and Rogers' diffusion of innovation. Findings from the study were that college lecturers' beliefs regarding technology were positive and technology held value in terms of the learning process. However, the results established that not all lecturers were comfortable adopting technology within their instructional practice and faced barriers when attempting to adopt technology. Lecturers indicated the need for professional training, institutional support, and observational learning of others which would assist with lecturers' pedagogy, content knowledge, and technology adoption. Williams-Buffonge, (2021) findings was supported by ZIefIe, *et al*, (2011) as the results show that users are not yet very familiar with the vision of smart technology at home and report a considerable diffidence and aloofness towards using such technologies. There is significant relationship between Lecturers perceive usefulness, ease of use and self-efficacy are determinants of their behavioral intention to use assistive technology for teaching COE students with special needs.

Shun and Priscilia, (2018) carried out a study on the Acceptance of Assistive Technology by Special Education Teachers: A Structural Equation Model Approach. To investigate the acceptance of assistive technology (AT) by special Education teachers, the present study developed and tested hypothesized relationships among key determinants of AT acceptance such as the facilitating condition, perceived ease of use, computer self-efficacy, result demonstrability, perceived usefulness, and behavioral intention. Results from analysis of data collected from a number of special Education teachers in schools for the visually and/or auditory impaired confirmed the effects hypothesized in our conceptual model of AT acceptance. In particular, perceived usefulness was a dominant factor affecting AT usage. Facilitating condition was strongly related to perceived ease of use, whereas perceived ease of use had a significant effect on computer self-efficacy.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Based on the result findings of this research, the following conclusions are drown;

The majority of lecturers in Colleges of Education (COEs) in northwestern Nigeria highly value the usefulness of assistive technology devices (ATDs) for teaching students with special needs, as observed in this study.

A significant number of respondents in this group acknowledge the value of electronic aids such as magnifiers, talking calculators, Braille writers, and adapted tape players in their teaching, as these aids enhance the development of creative skills. Lecturers specializing in students with special needs perceive the positive impact of these devices on their behavioral intention to use ATDs when teaching COE students with special needs.

The positive perception of ease of use in teaching COE students with special needs suggests that a considerable proportion of respondents find assistive technology software to be flexible and user-friendly. They feel confident in becoming skilled at using both electronic and non-electronic ATDs.

Lecturers specializing in students with special needs find the devices simple and adaptable for teaching COE students with special needs. However, some limitations exist, particularly with electronic devices due to factors like light shortage.

Nearly all lecturers in the study exhibit a high level of technological self-efficacy in using ATDs for teaching COE students with special needs. A significant number of respondents believe they have the capability to provide professional and technical assistance to students with special needs. They are confident in offering interventions with ATDs that align with the existing rehabilitation plans of their schools.

The results indicate that the variance in behavioral intention to use assistive technology among lecturers of students with special needs in North-west Nigeria can be explained by perceived usefulness (PU), perceived ease of use (PEU), and technological self-efficacy (TSE) of ATDs. The standardized Beta coefficient for perceived usefulness, perceived ease of use, and technological self-efficacy of assistive technology is positive and statistically significant.

The findings reveal that there is no significant relationship between three moderating variables (lecturers' years of experience, age, and gender) and the criterion variables (behavioral intention) to use assistive technology for teaching college of education students with special needs. Furthermore, there is a weak negative relationship between years of experience, age, gender, and behavioral intention.

The findings indicate that there is no significant difference between the predictors (lecturers' perceived usefulness, ease of use, and self-efficacy) and the dependent variable (behavioral intentions). This suggests that the model is not a reliable predictor of the relationship between lecturers' perceived usefulness, ease of use, self-efficacy, and behavioral intentions.

The results show that lecturers' perceived usefulness is not a significant predictor of behavioral intention.

There appears to be a positive relationship between lecturers' perceived usefulness, ease of use, and self-efficacy as determinants of their behavioral intention to use assistive technology for teaching students with special needs.

5.2 Recommendations

The following recommendations were made based on the subjects of the study:

National Commission for Colleges of Education and COE administration should prioritize the provision of adequate funding and resources to ensure the availability and

accessibility of assistive technology devices (ATDs) in COEs. This includes allocating budgetary resources specifically dedicated to acquiring and maintaining a wide range of ATDs. By securing funding and resources, the government and COE administration can demonstrate their commitment to inclusivity and create an enabling environment for lecturers to effectively support students with special needs.

COE administration should collaborate with assistive technology developers to ensure a wide range of electronic aids is readily available for lecturers to use in their teaching. This collaboration can involve establishing partnerships with reputable assistive technology companies or organizations to ensure the timely acquisition and continuous updates of electronic aids. By working together, COE administration and assistive technology developers can enhance the availability and effectiveness of electronic aids, enabling lecturers to meet the diverse needs of their students.

COE administration should provide comprehensive training programs and support materials to help lecturers become skilled and confident in using assistive technology software and devices. This includes organizing workshops, seminars, and hands-on training sessions that cover the functionalities and practical applications of various ATDs. Additionally, COE administration should develop support materials such as user manuals, online resources, and peer mentoring programs to assist lecturers in their professional development journey with ATDs.

Assistive technology developers should address the limitations of electronic devices by improving battery life, providing alternative power sources, or developing innovative solutions to overcome lighting issues. By prioritizing research and development efforts in these areas, assistive technology developers can enhance the usability and functionality of electronic devices, making them more reliable and adaptable for teaching purposes. This collaboration between COE administration and assistive

technology developers will lead to improved ATDs that can effectively address the specific challenges faced by lecturers and students.

COE administration should establish a support system that recognizes and promotes lecturers' technological self-efficacy, offering professional development opportunities and creating platforms for sharing expertise and best practices. By fostering a supportive environment, COE administration can boost lecturers' confidence in using ATDs and encourage them to explore innovative teaching methods. This can be achieved through organizing regular conferences, workshops, and communities of practice where lecturers can network, exchange ideas, and showcase their successful implementations of ATDs.

COE administration should focus on strengthening the perceived usefulness, ease of use, and technological self-efficacy of lecturers through targeted training programs and ongoing support. This can involve designing training programs that emphasize the practical applications of ATDs in the classroom, providing hands-on practice sessions, and offering continuous support through coaching or mentorship programs. By addressing these aspects, COE administration can empower lecturers to fully leverage the potential of ATDs in enhancing the learning experience of students with special needs.

COE administration should ensure that years of experience, age, and gender do not become barriers to the implementation and utilization of ATDs by providing equal opportunities, support, and resources to all lecturers. This requires creating an inclusive environment that values diversity and acknowledges the unique perspectives and contributions of lecturers at different stages of their careers. COE administration should implement fair and transparent policies that ensure equitable access to training, resources, and career advancement opportunities for all lecturers.

COE administration should conduct further research to identify additional factors that may influence lecturers' behavioral intentions and tailor support programs accordingly. By actively engaging in research, COE administration can gain insights into lecturers' needs, motivations, and challenges when it comes to using ATDs. This knowledge will enable them to develop evidence-based support programs that effectively address lecturers' concerns and foster a positive attitude towards ATDs.

COE administration should emphasize the practical applications and benefits of ATDs in teaching students with special needs through targeted

5.3 Contribution to Body of Knowledge

This research has contributed to knowledge in many ways:

The researcher has been able to develop and validate some instruments that measured the factors that influence the lecturer’s intention to use assistive technology for teaching colleges of education (COE) students with special needs in North western Nigeria, the research was not known with certainty before now thereby contributing to knowledge.

In the same vein, the researcher was able to find out that some lecturers of COE in North-West Nigeria were not having the intention to use assistive technology devices fully while teaching special needs students which was not known with certainty before now. This is a contribution to knowledge

More so, moderating variables (gender age and years of experience) were not significantly influence the lectures behavioral intention to use assistive technology devices for teaching special needs students in COE in North west Nigeria which was not known with certainty before now. This is also a contribution to knowledge

Looking at the literature reviewed in chapter two, it can be seen that most of the literature are either from America or Britain. This showed that there was inadequate literature and researches in assistive technology in Nigeria. The study harnessed contributed to literature and researches in assistive technology devices for systematic reading and application to other researches thereby contributing to knowledge.

5.4 Limitations of the Study

The researcher encountered some problems which made it so difficult to carry out this study the way it was earlier planned. First, the researcher found it difficult to lay hands on accurate data on the number of schools and lecturers that educate children with needs in all the states in North West Nigeria. The National Commission for Colleges of Education could not give the correct number and names of the Colleges that practice inclusive education. This lack of proper record keeping made it difficult for the researcher to get the accurate number of Colleges and lecturers in these states or zone. This consequently affected the sample that was used for the study.

Another limitation was that some Colleges administrators (deans and head of departments) saw the researcher as one who was on a fact finding mission so some of them did not easily open their doors for the researcher. Many of them gave appointments that they did not keep. This delayed and extended the period of the main study unnecessarily. Closely linked to this is the problem of transportation as the Colleges are located far away from one another. This made it very difficult for the researcher to cover them within a short time. This also prolonged the period of the main study unnecessarily.

Finance was another problem that the researcher encountered. Travelling around the states selected for the study and lodging in hotels involved a lot of money. This is

coupled with the fact that in some places, the researcher had to hire somebody to take him round some of the Colleges since the researcher did not know some of the towns where the schools are or located. All this involved money and the researcher did not have enough to comfortably carry out the research.

Many lecturers were not willing to have time to fill in questionnaires and so many of them kept dodging the researcher. This also elongated the period of the main study. Some of the college that claimed to practice special education were not really practicing it. This was because many of the lecturers were not qualified lecturers of special education only opportune to be there as lecturers. This made it difficult for the researcher to select equal number of participants from the colleges and the states because some of the colleges and the states did not have the required number of lecturers to participate in the study.

5.5 Suggestions for Further Study

The Suggestions for further studies of this research work are based on delimitation and limitation of this study as follows:

Factors that influencing lecturer's intention to use assistive technology devices for teaching students with special needs in Universities in Northwest Zone, Nigeria.

A comparative study on perceive usefulness, perceive ease of use and behavioral intention to use assistive technology devices for teaching students with special needs in Colleges of Education in Northwest Zone, Nigeria.

Effects of self-efficacy on behavioral intention to use assistive technology devices on teaching science subjects to students with special needs in Federal college of Education, Kano.

Effects of Gender, Age year of experience of teachers' intention to utilize assistive technology devices for teaching students with special needs schools in Kano metropolis.

Investigate the lecturers' awareness and use of assistive technology devices on the academic performance of students with special needs in colleges of education in Nigeria.

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Appendix I

Validated Questionnaires

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
Fed. University of Technology
12 MAR 2020
P.M.B. 65 Minna, Niger State

12/03/2020

Head of Department (Signature, Date & Official Stamp)

Student's Surname: ABUBAKAR ~~IBRAHIM~~ Other Names: IBRAHIM BELLO

Registration Number: PhD/SSTE/18/2029 Programme: EDUCATIONAL TECHNOLOGY

Title of the Instrument: FACTORS THAT INFLUENCING LECTURERS INTENTION TO USE ASSISTIVE TECHNOLOGY

ATTESTATION SECTION

Summary of the Remark on the Instrument: The current version validated is okay after effecting previous corrections pointed out.

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

Name of Attester: Dr. O.C. Falode

Designation: Lecturer

Name and Address of Institution: F.U.T. Minna

Phone Number: [illegible] E.- Mail: oluwole.falode@futminna.edu.ng

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.....adequately.....
5. The structuring of the Questionnaire.....well structured.....
6. Others (grammatical errors, spelling errors and others.....None.....
7. General overview of the Instrument.....satisfactory.....

Suggestions for improving the quality of the Instrument

1. .....The final set of minor corrections.....
2. .....observed should be effected.....
3. .....
4. .....
5. .....

Name of Validator.....Dr. O.C. Falade.....

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

Name of Institution.....F.U.T. Minna.....Designation.....Lecturer.....

Signature.....Date.....17/07/2020.....

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
Fed. University of Technology
12 MAR 2020
Minna, Niger State

12/03/2020

Head of Department (Signature, Date & Official Stamp)

Student's Surname ABUBAKAR Other Names IBRAHIM BELLO

Registration Number PhD/SSIE/18/2029 Programme PhD EDUCATIONAL TECH.

Title of the Instrument Factors Influencing Teachers Intention to Use Assistive Technology for Teaching students with Disability in COE in N.West

ATTESTATION SECTION

Summary of the Remark on the Instrument This version of Instrument validation is suitable for the research, you can go ahead and effect the correction for further use

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

Name of Attester Muhammadu Abdullahi

Designation Professor

Name and Address of Institution Bayero University, P.M.B. 3011, Kano.

Phone Number 08037858177 E.- Mail amabdu103@yahoo.com

Please comment on the following

1. Appropriateness of the instrument for the purpose it's design for.....
   The instrument is adequate for its purpose.
2. Clarity and simplicity for the level of the language used.....
   The language used is quite O.K.
3. Suability for the level of the targeted audience .....
   Very suitable
4. The extent in which the items cover the topic it meant to cover.....
   Satisfactorily covered
5. The structuring of the Questionnaire.....
   Very acceptable
6. Others (grammatical errors, spelling errors and others.....
   Right style.
7. General overview of the Instrument.....
   A carefully structured instrument covering its purpose.

Suggestions for improving the quality of the Instrument

1. .....
2. None
3. .....
4. .....
5. .....

Name of Validator..... Prof. Muhammadu Abdullahi

Area of Specialization..... Educational Technology

Name of Institution..... Bayero Univ. Kn ..... Designation..... Professor

Signature..... ..... Date..... 20th March 2020

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
Fed. University of Technology
12 MAR 2020
P.M.B 65 Minna, Niger State
Sign

Head of Department (Signature, Date & Official Stamp)

Student's Surname. ~~IBRAHIM~~ ABUBAKAR ~~BELLO~~ Other Names IBRAHIM BELLO

Registration Number. SSE/2018/8019/8029 Programme EDUCATIONAL TECHNOLOGY

Title of the Instrument. FACTORS THAT INFLUENCE TEACHERS' INTENTION TO USE ASSISTIVE TECHNOLOGIES FOR TEACHING STUDENTS WITH DISABILITIES IN COLLEGES OF EDUCATION IN NORTH-WESTERN NIGERIA.

ATTESTATION SECTION

Summary of the Remark on the Instrument. The current version of Validation is okay for the Survey research and Contains all variables, little Correction were made for you to effect it Please

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

Name of Attester. Professor Ibrahim Muhammed Saron-Dimes

Designation. Professor

Name and Address of Institution. Ahmad Bello University Zaria

Phone Number. 08036492478 E.- Mail. Sarondimes@gmail.com

Please comment on the following

1. Appropriateness of the instrument for the purpose it's design for. The instrument is adequately and appropriate for the purpose
2. Clarity and simplicity for the level of the language used. The language use is simple and very clear
3. Suability for the level of the targeted audience. It is suitable for the target
4. The extent in which the items cover the topic it meant to cover. The items covers all variable highlighted
5. The structuring of the Questionnaire. The items is quite acceptable
6. Others (grammatical errors, spelling errors and others. It is clear there is not much errors is very minimals
7. General overview of the Instrument. It is satisfactory

Suggestions for improving the quality of the Instrument

1. Final the minor correction highlighted
2. the observed and by and attached
3. for further
4.
5.

Name of Validator: Professor Ibrahim Muhammed Gwandu

Area of Specialization: Educational Psychology

Name of Institution: A.B.U. Zaria Designation: Professor

Signature: Date: 12/07/2020

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
Fed. University of Technology
23 MAR 2020
P.M.B. 65 Minna, Niger State
Sign

12/03/2020

Head of Department (Signature, Date & Official Stamp)

Student's Surname ABUBAKAR Other Names IBRAHIM BELLO

Registration Number SSE/2017/105/2020 Programme EDUCATIONAL TECHNOLOGY

Title of the Instrument FACTORS THAT INFLUENCE TEACHERS' INTENTION TO USE ASSISTIVE TECHNOLOGIES FOR TEACHING STUDENTS WITH DISABILITIES IN COLLEGE OF EDUCATION IN NORTH-WESTERN NIGERIA

ATTESTATION SECTION

Summary of the Remark on the Instrument The Instrument is okey for validation and can be use for the study. Good

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

Name of Attester Kyauta Ibralim

Designation Professor

Name and Address of Institution Bayero University Kano Department of Special Education

Phone Number +2348037018035 E.- Mail kyautaibrahim@gmail.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..... Simple & Clear
3. Suability for the level of the targeted audience .....
   highly suitable
4. The extent in which the items cover the topic it meant to cover.....
   it has covers all the valuable
5. The structuring of the Questionnaire.....
   well arranged and sequenced
6. Others (grammatical errors, spelling errors and others..... Very few
7. General overview of the Instrument..... satisfactory items

Suggestions for improving the quality of the Instrument

1. ..... fined the corrections given and effected
2. ..... where necessary and can be further
3. ..... to use as an instrument to the study
4. .....
5. .....

Name of Validator..... Prof. Kyauta Ibrahim

Area of Specialization..... Special Education

Name of Institution..... Bayero University Kano Designation..... Professor

Signature..... Date..... 25/03/2020

Thank You

Appendix II

Sample Questionnaires

Department of Educational Technology

School of Science and Technology Education

Federal University of Technology, Minna Niger State, Nigeria

Questionnaire on Lecturers Intention to Use Assistive Technologies

Dear Participant

My name is Ibrahim Abubakar Bello, I am a PhD student conducting a study on Factors Influencing Lecturers Intention to Use Assistive Technologies for Teaching Students with Disabilities in Colleges of Education in North-West Nigeria.

I am presenting to you a research questionnaire and soliciting for your time to participate in this ongoing survey by filling this five option questionnaire with a tick "√" in the boxes that best describes your opinion. The items of the questionnaire were generated from Technology Acceptance Model (TAM) and were simplified to elicit information on the factors you perceived to be influencing your behavioural intention to use assistive technologies for teaching students with disabilities.

Assistive devices are items, piece of equipment and product systemized to increase, maintain or improve the functional capabilities of students with disabilities, prevent impairment sand activity limitations. While assistive technology services are any service that directly assists an individual with a disability in the selection, acquisition or use of assistive technology (Nsofor & Bello, 2015).

Given the background of assistive technology, kindly read the questions carefully and provide appropriate responses that will help the researcher with usable information. Please note that the information providwill beed will be kept anonymously and for research purposes only.

Thank you in anticipation of your cooperation and understanding. If you have any question regarding the survey, do not hesitate to contact me.

Ibrahim Abubakar Bello

(Researcher)

SECTION 'A'

Bio Data of Respondents

Please tick out the responses with '✓'

College _____ **Male** ☐ **Female** ☐

S/N	Age	Response	Years of Working Experience	Response
1	55-60		31-40 years	
2	45-54		21-30 years	
3	35-44		11-20 years	
4	25-34		0-10 years	

SECTION "B"

Please rate how much you agree/ or disagree with each statement using the scale below:

1=Strongly Disagree **SD**|**2**=Disagree **D**| **3=**Undecided **UD**| **4=**Agree **A**| **5=**Strongly Agree **SA**

Key: ATDs refers to Assistive Technology Devices

Section **B1**

	B1= Perceived Usefulness of Assistive Technology (PUAT)	SD	D	UD	A	SA
1	Using electronic aids like talking calculators, spell checkers, portable word processors in teaching students with disabilities (SWDs) would enable me to accomplish tasks more quickly.					

2	Using assistive writing software for students with dysgraphia will improve my teaching performance.					
3	Using amplification devices for teaching students with hearing impairment will improve my productivity.					
4	Using Assistive Technology Devices (ATDs) in teaching will allow me to make the needed impact in the academic life of my students.					
5	Using ATDs in teaching will allow me to evaluate suitable devices for students' with different special need conditions.					
6	Using alternative keyboards and speech synthesizer in teaching will enable me to integrate technology in my teaching career.					
7	Using screen reading software would enhance my effectiveness in teaching students with visual impairment.					
8	I would find electronic aids like magnifiers, talking calculators, Braille machine and adapted tape players useful in my teaching carrier.					
9	I see ATDs as a way of making teaching more interesting.					
10	Digital technology provide feedback					
11	ATD helps me to facilitates and monitor learning of students with special need					
12	ATDs helps the learner to learn at their own pace					
13	ATDs provide the opportunity for collaborative learning among the students					
14	ATDs enhances the development of creative skills					
15	ATDs enhances meaningful learning					
S/N	**B2= Perceived Ease of Use of Assistive Technology (PEUAT)**					
1	Learning to operate assistive devices would be easy for me.					
2	It would be easy for me to diagnose and recommend suitable ATDs for students with special needs in my school.					
3	I feel that selecting suitable ATDs for my students would be easy for me.					
4	I feel that it would be easy for me to become skillful at using electronic and non-electronic ATDs.					
5	I feel that it would be easy for me to transfer my computer skills to guide students with special need in using electronic ATDs.					
6	I would find using assistive technology software to be flexible.					
7	I feel it would be easy for me to assemble the ATDs for possible use.					
8	Training students with special need to use ATDs, adaptive and rehabilitative devices would be easy for me.					

9	I feel that I would have the knowledge necessary to implement and use ATDs in my teaching.					
10	I have enough experience to use ATDs without any problem					
11	ATDs are user friendly					
12	Creating an enabling environment for the use of AT is easy					
13	AT could be easier for my students with special needs to improve their learning capability					
14	ATDs are very easy to explore learning content					
15	I feel using AT devices would create a conducive environment for students with special needs					
S/N	**B3= Behavioral Intention to Use ATDs (BIUATDs)**					
1	I intend to recommend suitable ATDs for all students diagnosed with special needs.					
2	I intend to use ATDs to support the learning of my students with special needs.					
3	I have a plan to use ATDs if available.					
4	I plan to direct my students with special needs to use recommended ATDs that suit their educational needs					
5	I intend to encourage constant use of ATDs for students adaptation.					
6	I am curious to learn how to support students using ATDs.					
7	I plan to assist parents to identify the AT needed to support their children with special needs.					
8	I intend to provide useful information to parents on where they can find ATDs for their children with special needs.					
9	I plan to direct parents to a technician that can help construct ATDs for their children with special needs.					
10	I intend to have positive experience offering ATDs to services students with special needs.					
11	I intend to use ATDs to compensate my students with special needs					
12	I intend to use assistive and adaptive devices in teaching students with special needs.					
13	I intend to use ATDs for evaluation and monitoring students learning Progress.					

14	I intend to train my students with special needs well enough to use a variety of AT tools.					
15	I plan to use ATDs in the future.					
S/N	**B4= Technological Self-efficacy (TSE)**					
1	I can diagnose with special needs student independently and identify a need for ATDs use.					
2	I can select and recommend suitable ATDs based on the students diagnosed level of needs.					
3	I can assemble ATDs and make them ready for use students with special needs independently.					
4	I can support students to use ATDs for their learning.					
5	I can operate any suitable ATDs for my students.					
6	I can locally construct simple ATDs for my students with special needs.					
7	AT provides opportunities for individualized instruction to students with special needs.					
8	I am confident in offering interventions with ATDs devices, associated with Existing rehabilitation plans of my school.					
9	I have the capability to provide professional and technical assistance to Students with special needs.					
10	I can offer evaluative assessment by specifying appropriate ATDs that will meet the needs of my students.					
11	I can confidently modify AT devices to adapt students' conditions.					
12	I have confident to repair and replace a worn out component of ATDs.					
13	I have enough experience to cope with the use of ATDs students with special needs.					
14	I can serve as facilitator for students learning using ATDs students with special needs.					
15	With enabling environment I can engage in a technology enhanced instruction students with special needs.					

Appendix III

Reliability Test

Reliability

/VARIABLES=PUAT1 PUAT2 PUAT3 PUAT4 PUAT5 PUAT6 PUAT7 PUAT8 PUAT9
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA.

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	60	26.3
	Excluded[a]	168	73.7
	Total	228	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.712	9

RELIABILITY
/VARIABLES=PEUAT1 PEUAT2 PEUAT3 PEUAT4 PEUAT5 PEUAT6 PEUAT7 PEUAT8 PEUAT9
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/MODEL=ALPHA.

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	60	26.3
	Excluded[a]	168	73.7
	Total	228	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.831	9

```
RELIABILITY
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AUAT8 AUAT9
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
```

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	60	26.3
	Excluded[a]	168	73.7
	Total	228	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.843	9

```
RELIABILITY
  /VARIABLES=BI1 BI2 BI3 BI4 BI5 BI BI7 BI8 BI9 BI10
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  /MODEL=ALPHA.
```

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	60	26.3
	Excluded[a]	168	73.7
	Total	228	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
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```
RELIABILITY
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TSE11 TSE12
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  /MODEL=ALPHA.
```

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	60	26.3
	Excluded[a]	168	73.7
	Total	228	100.0

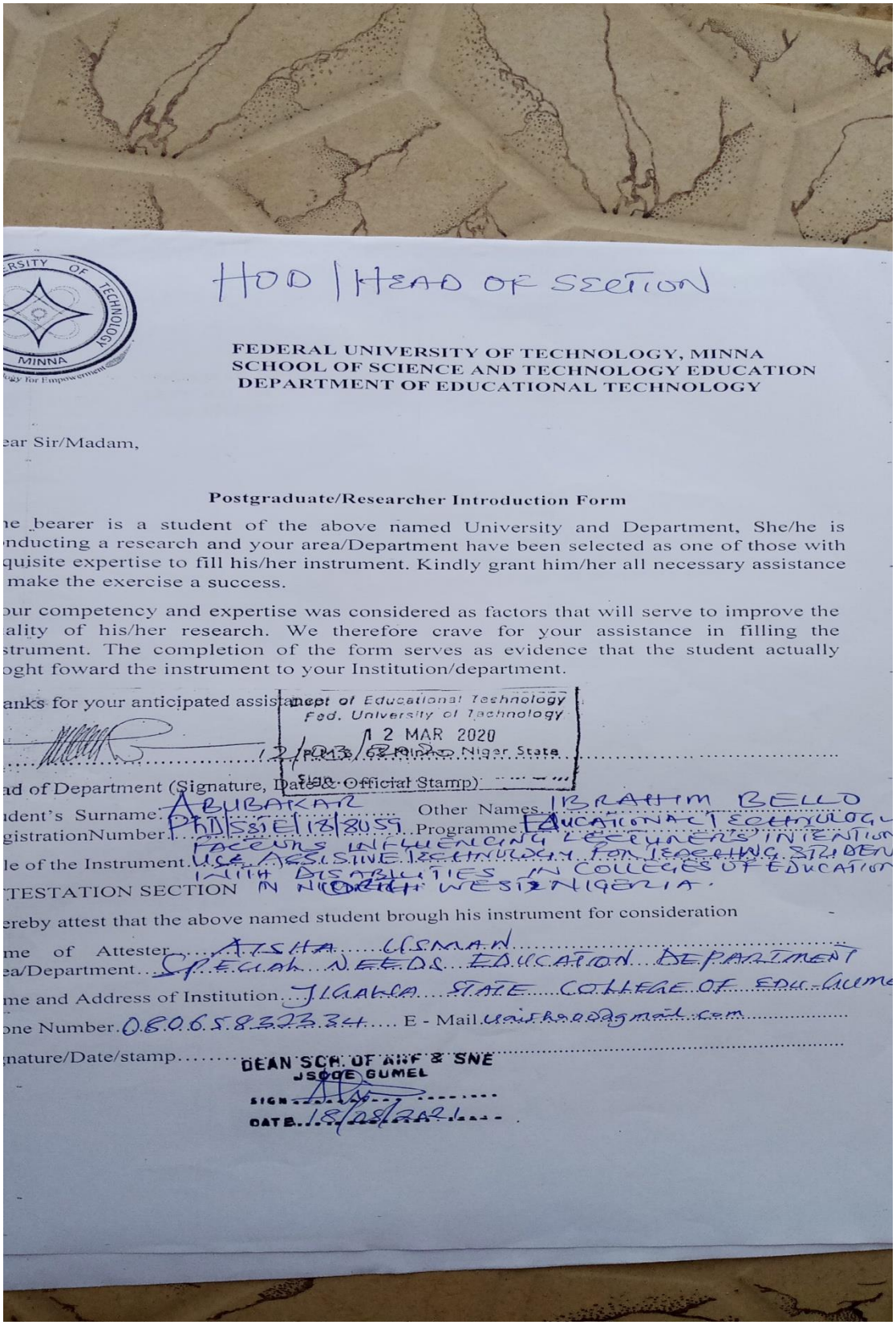
a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.727	12

Appendix iv

Introductory letter to conduct research



HOD / HEAD OF SECTION

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

ear Sir/Madam,

Postgraduate/Researcher Introduction Form

he bearer is a student of the above named University and Department, She/he is nducting a research and your area/Department have been selected as one of those with quisite expertise to fill his/her instrument. Kindly grant him/her all necessary assistance make the exercise a success.

our competency and expertise was considered as factors that will serve to improve the ality of his/her research. We therefore crave for your assistance in filling the strument. The completion of the form serves as evidence that the student actually ought foward the instrument to your Institution/department.

anks for your anticipated assistance.

Dept of Educational Technology
Fed. University of Technology
12 MAR 2020
Minna, Niger State

12/03/2020

ad of Department (Signature, Date & Official Stamp):

dent's Surname: ABUBAKAR Other Names: IBRAHIM BELLO

gistrationNumber: PHD/SSE/18/8059 Programme: EDUCATIONAL TECHNOLOGY

le of the Instrument: FACTORS INFLUENCING LECTURERS' INTENTION USE ASSISTIVE TECHNOLOGY FOR TEACHING STUDENTS WITH DISABILITIES IN COLLEGES OF EDUCATION IN NORTH WEST NIGERIA.

TESTATION SECTION

ereby attest that the above named student brough his instrument for consideration

me of Attester: AISHA USMAN

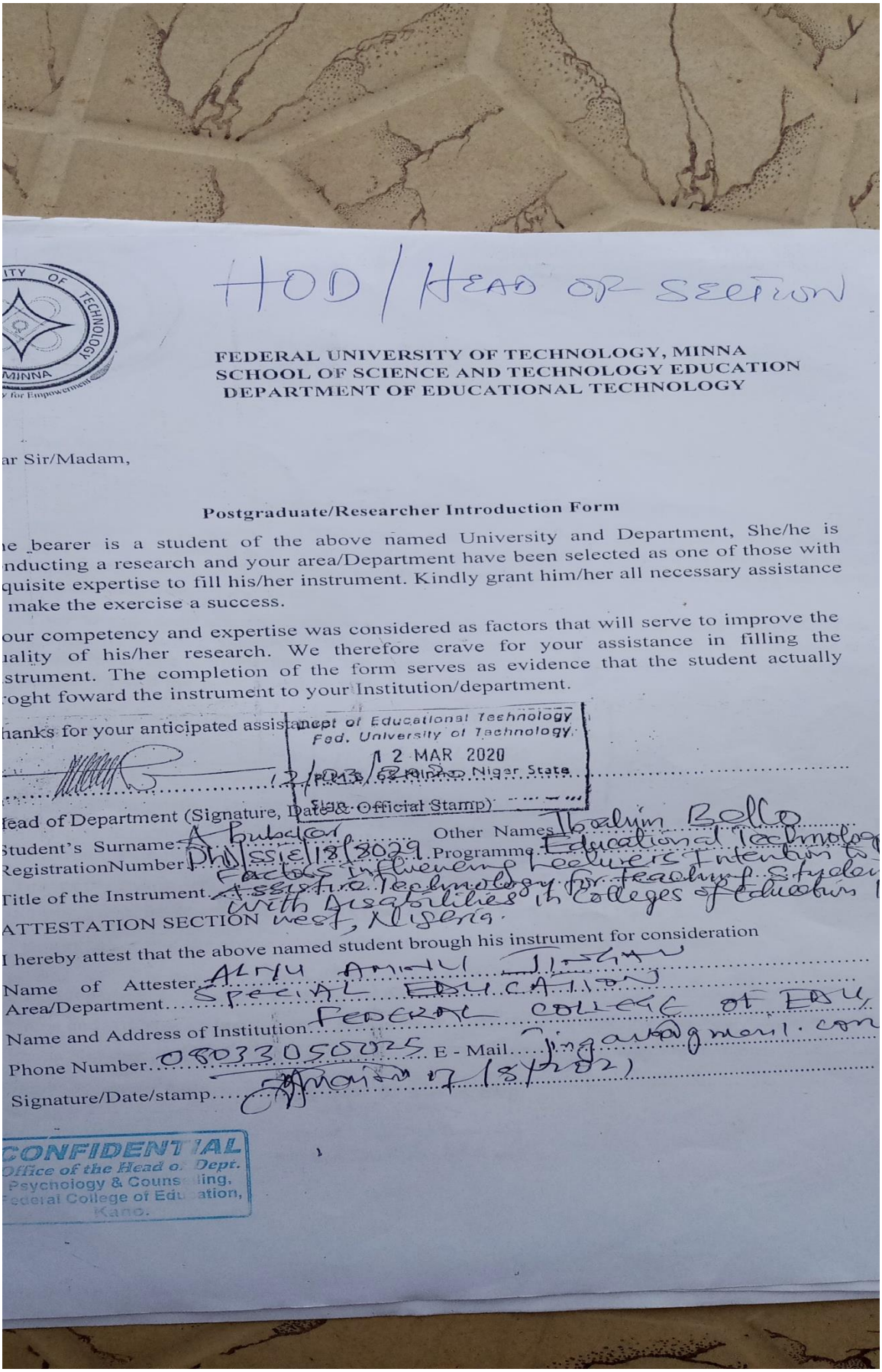
ea/Department: SPECIAL NEEDS EDUCATION DEPARTMENT

me and Address of Institution: JIGAWA STATE COLLEGE OF EDUCATION GUMEL

one Number: 08065832334 E - Mail: usmanaisha@gmail.com

gnature/Date/stamp:

DEAN SCH. OF ARTS & SNE
JSCOE GUMEL
SIGN
DATE: 18/03/2021



HOD / HEAD OF SECTION

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

ar Sir/Madam,

Postgraduate/Researcher Introduction Form

ne bearer is a student of the above named University and Department, She/he is nducting a research and your area/Department have been selected as one of those with quisite expertise to fill his/her instrument. Kindly grant him/her all necessary assistance make the exercise a success.

our competency and expertise was considered as factors that will serve to improve the uality of his/her research. We therefore crave for your assistance in filling the strument. The completion of the form serves as evidence that the student actually roght foward the instrument to your Institution/department.

hanks for your anticipated assistance

Dept of Educational Technology
Fed. University of Technology,
12 MAR 2020
Minna Niger State

12/03/2020
Sign & Official Stamp)

ead of Department (Signature, Date & Official Stamp)

Student's Surname A Bubakar Other Names Ibrahim Bello

RegistrationNumber PhD/SSTE/18/8029 Programme Educational Technology

Title of the Instrument Factors Influencing Teachers' Intention to Use Assistive Technology for Teaching Students with Disabilities in Colleges of Education in North Western Nigeria.

ATTESTATION SECTION

I hereby attest that the above named student brough his instrument for consideration

Name of Attester ALIYU AMINU JINGI

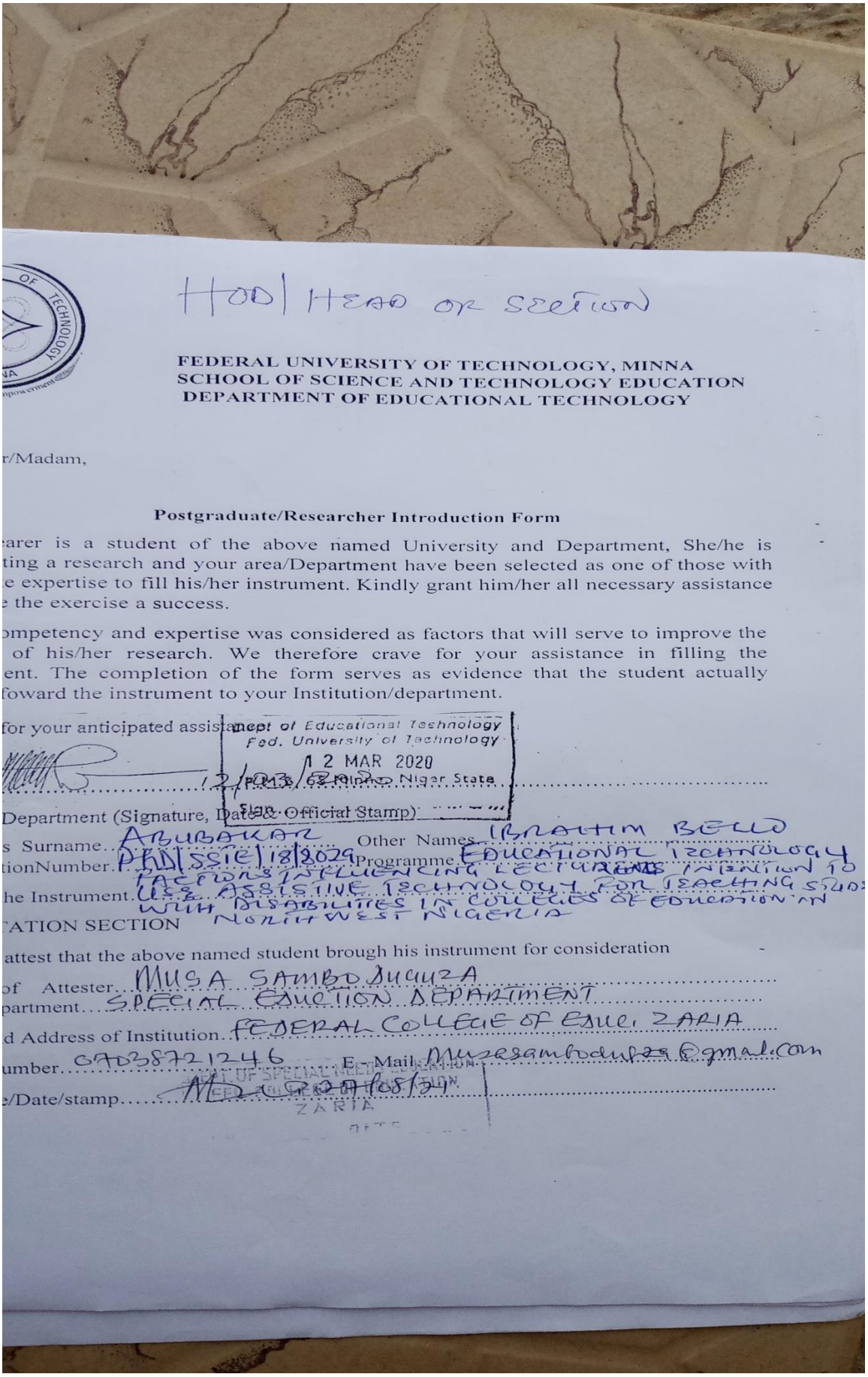
Area/Department SPECIAL EDUCATION

Name and Address of Institution FEDERAL COLLEGE OF EDU, KANO

Phone Number 08033050025 E - Mail jingi2@gmail.com

Signature/Date/stamp 17/3/2020

CONFIDENTIAL
Office of the Head of Dept.
Psychology & Counselling,
Federal College of Education,
Kano.



HOD | HEAD OF SECTION

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

r/Madam,

Postgraduate/Researcher Introduction Form

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ompetency and expertise was considered as factors that will serve to improve the of his/her research. We therefore crave for your assistance in filling the ent. The completion of the form serves as evidence that the student actually foward the instrument to your Institution/department.

for your anticipated assistance.

Dept. of Educational Technology
Fed. University of Technology
12 MAR 2020
Minna, Niger State

12/03/2020

Department (Signature, Date & Official Stamp)

s Surname ABUBAKAR Other Names IBRAHIM BELLO

tionNumber PHD/SSTE/18/8029 Programme EDUCATIONAL TECHNOLOGY

he Instrument FACTORS INFLUENCING LECTURERS INTENTION TO USE ASSISTIVE TECHNOLOGY FOR TEACHING STUDENTS WITH DISABILITIES IN COLLEGES OF EDUCATION IN NORTH WEST NIGERIA

TATION SECTION

attest that the above named student brough his instrument for consideration

of Attester MUSA SAMBO SUGUZA

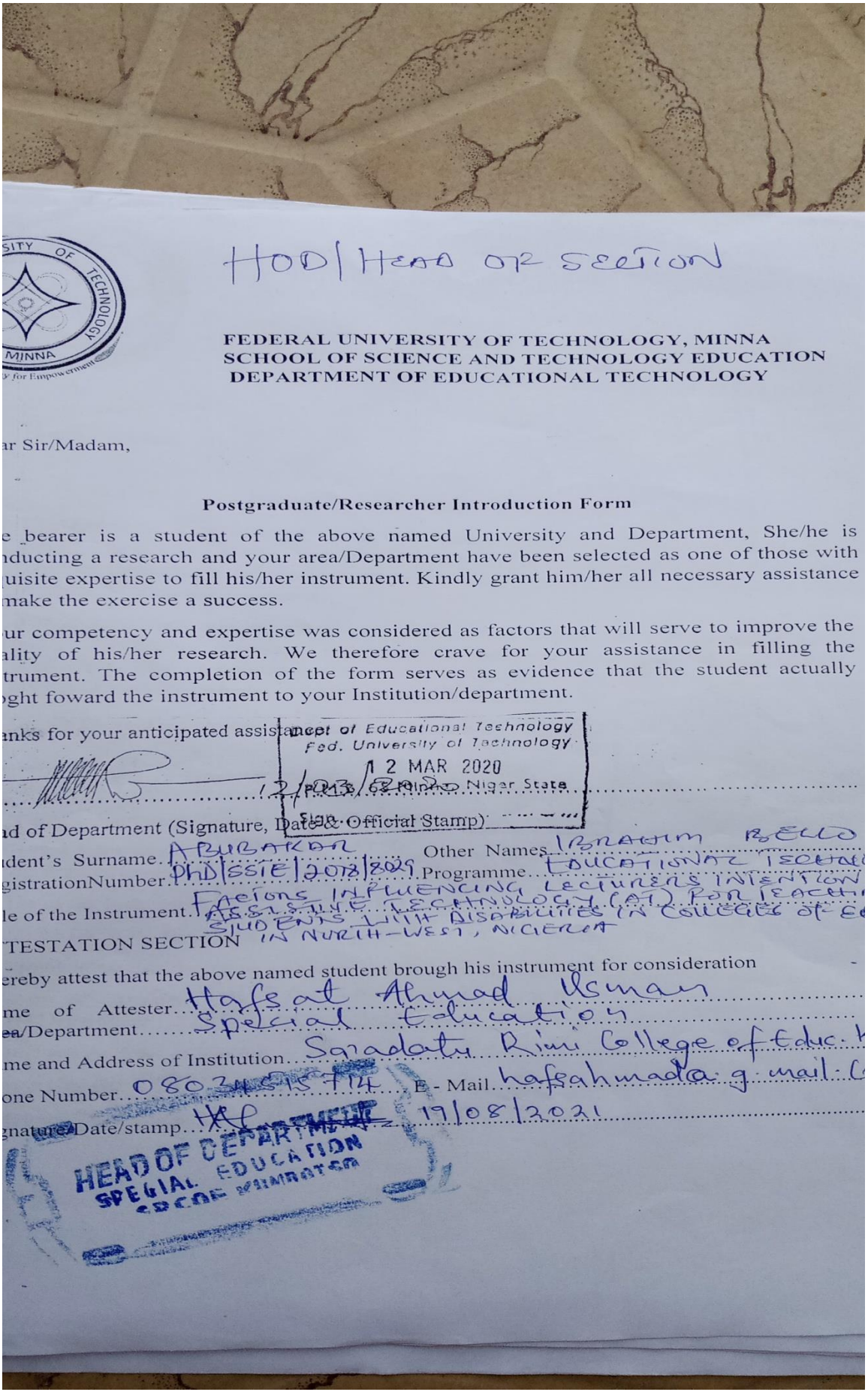
partment SPECIAL EDUCTION DEPARTMENT

d Address of Institution FEDERAL COLLEGE OF EDUC. ZARIA

umber 07038721246 E-Mail musasambodu@29@gmail.com

e/Date/stamp 12/03/2020

FEDERAL COLLEGE OF SPECIAL NEEDS EDUCATION
ZARIA



HOD/HEAD OF SECTION

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

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Postgraduate/Researcher Introduction Form

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nks for your anticipated assistance.

Dept of Educational Technology
Fed. University of Technology
12 MAR 2020
Minna, Niger State

12/03/2020

d of Department (Signature, Date & Official Stamp)

dent's Surname ABUBAKAR Other Names IBRAHIM BELLO
gistrationNumber PhD/SSIE/2018/8029 Programme EDUCATIONAL TECHNOLOGY
le of the Instrument FACTORS INFLUENCING LECTURERS INTENTION TO USE ASSISTIVE TECHNOLOGY (AT) FOR TEACHING STUDENTS WITH DISABILITIES IN COLLEGES OF EDUCATION IN NORTH-WEST, NIGERIA

TESTATION SECTION

ereby attest that the above named student brough his instrument for consideration

me of Attester Hafsat Ahmad Usman
ea/Department Special Education
me and Address of Institution Saadatu Rimi College of Educ.
one Number 08034615714 E - Mail hafsahmada@gmail.com
gnature/Date/stamp HF 19/08/2021

HEAD OF DEPARTMENT
SPECIAL EDUCATION
SSCOE MINNA

HOD | HEAD OF SECTION

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

Dear Sir/Madam,

Postgraduate/Researcher Introduction Form

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Thanks for your anticipated assistance

Dept of Educational Technology
Fed. University of Technology
12 MAR 2020
PMB 65 Minna Niger State

Head of Department (Signature, Date & Official Stamp)

Student's Surname A. Bubakar Other Names Ibrahim Bello

RegistrationNumber PhD/SSE/18/3029 Programme Educational Technology

Title of the Instrument Factors Influencing Lecturers' Intention to ... Assistive Technology for Teaching Students with Disabilities in Colleges of Education in ... West, Nigeria.

ATTESTATION SECTION

I hereby attest that the above named student brough his instrument for consideration

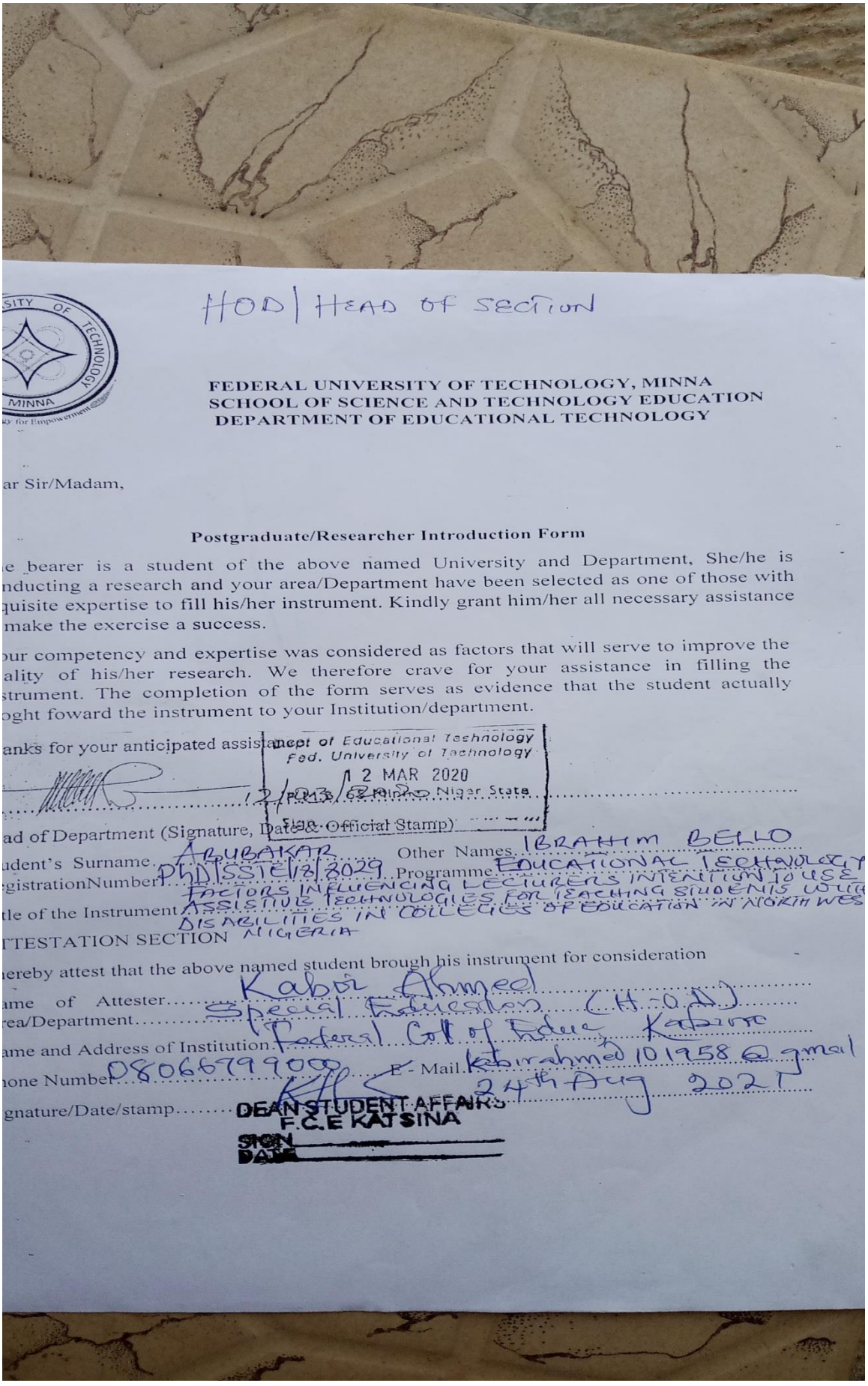
Name of Attester BATURE HALIRU

Area/Department DEPARTMENT OF SPECIAL NEEDS EDUCATION

Name and Address of Institution Isa Kaita College of Education, Dutsin-ma Katsina

Phone Number 07063690997 E - Mail baturehalliru27@gmail.com

Signature/Date/stamp BH 27/08/21



HOD | HEAD OF SECTION

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

ar Sir/Madam,

Postgraduate/Researcher Introduction Form

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Dept of Educational Technology
Fed. University of Technology
12 MAR 2020
Minna Niger State

12/03/2020

ad of Department (Signature, Date & Official Stamp)

udent's Surname ABUBAKAR Other Names IBRAHIM BELLO

egistrationNumber PHD/SSTE/18/8029 Programme EDUCATIONAL TECHNOLOGY

tle of the Instrument FACTORS INFLUENCING LECTURERS INTENTION TO USE ASSISTIVE TECHNOLOGIES FOR TEACHING STUDENTS WITH DISABILITIES IN COLLEGES OF EDUCATION IN NORTH WEST NIGERIA

TTESTATION SECTION

ereby attest that the above named student brough his instrument for consideration

ame of Attester Kabir Ahmed

ea/Department Special Education (H-O.D.)

ame and Address of Institution Federal Col of Educ Katsina

one Number 08066799000 E-Mail kabirahmed101958@gmail

gnature/Date/stamp 24th Aug 2021

DEAN STUDENT AFFAIRS
F.C.E KATSINA
SIGN
DATE

Appendix V

Analyzed Instrument

SPSS Output of Data Analysis Result

Research Questions

```
DESCRIPTIVES VARIABLES=PUAT1 PUAT2 PUAT3 PUAT4 PUAT5 PUAT6
PUAT7 PUAT8 PUAT9 PUAT10 PUAT11 PUAT12
   PUAT13 PUAT14 PUAT15
 /STATISTICS=MEAN STDDEV.
```

Descriptive Statistics

	N	Mean	Std. Deviation
PUAT1	210	3.50	1.331
PUAT2	210	3.47	1.360
PUAT3	210	3.50	1.418
PUAT4	210	3.47	1.345
PUAT5	210	3.43	1.376
PUAT6	210	3.40	1.401
PUAT7	210	3.49	1.302
PUAT8	210	3.55	1.316
PUAT9	210	3.44	1.355
PUAT10	210	3.53	1.313
PUAT11	210	3.49	1.302
PUAT12	210	3.50	1.405
PUAT13	210	3.46	1.363
PUAT14	210	3.55	1.290
PUAT15	210	3.52	1.391
Valid N (listwise)	210		

```
DESCRIPTIVES VARIABLES=PEUAT1 PEUAT2 PEUAT3 PEUAT4 PEUAT5
PEUAT6 PEUAT7 PEUAT8 PEUAT9 PEUAT10
   PEUAT11 PEUAT12 PEUAT13 PEUAT14 PEUAT15
 /STATISTICS=MEAN STDDEV.
```

Descriptive Statistics

	N	Mean	Std. Deviation
PEUAT1	210	3.49	1.273
PEUAT2	210	3.46	1.366
PEUAT3	210	3.50	1.356
PEUAT4	210	3.57	1.326
PEUAT5	210	3.54	1.349
PEUAT6	210	3.58	1.372
PEUAT7	210	3.50	1.370
PEUAT8	210	3.52	1.388
PEUAT9	210	3.55	1.394
PEUAT10	210	3.47	1.411
PEUAT11	210	3.49	1.398
PEUAT12	210	3.53	1.394
PEUAT13	210	3.51	1.360
PEUAT14	210	3.47	1.377
PEUAT15	210	3.50	1.374
Valid N (listwise)	210		

```
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 /STATISTICS=MEAN STDDEV.
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Descriptive Statistics

	N	Mean	Std. Deviation
PUATo	210	52.31	17.088
BITo	210	53.08	17.830
Valid N (listwise)	210		

```
DATASET ACTIVATE DataSet1.
DESCRIPTIVES VARIABLES=PUATotBITot
  /STATISTICS=MEAN STDDEV
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Descriptive Statistics

	N	Mean	Std. Deviation
PUATot	210	69.75	22.783
BITot	210	70.77	23.774
Valid N (listwise)	210		

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DESCRIPTIVES VARIABLES=BITotPEUATOt
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Descriptive Statistics

	N	Mean	Std. Deviation
BITot	210	70.77	23.774
PEUATOt	210	70.25	23.803
Valid N (listwise)	210		

```
DESCRIPTIVES VARIABLES=TSETotBITot
  /STATISTICS=MEAN STDDEV.
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Descriptive Statistics

	N	Mean	Std. Deviation
TSETot	210	70.58	23.640
BITot	210	70.77	23.774
Valid N (listwise)	210		

```
DESCRIPTIVES VARIABLES=Gender BITot
  /STATISTICS=MEAN STDDEV.
```

Descriptive Statistics

	N	Mean	Std. Deviation
Gender	210	1.39	.489
BITot	210	70.77	23.774
Valid N (listwise)	210		

```
DESCRIPTIVES VARIABLES=PUATotPEUATOtTSETotBITot
  /STATISTICS=MEAN STDDEV.
```

Descriptive Statistics

	N	Mean	Std. Deviation
PUATot	210	69.75	22.783
PEUATOt	210	70.25	23.803
TSETot	210	70.58	23.640
BITot	210	70.77	23.774
Valid N (listwise)	210		

```
DATASET ACTIVATE DataSet2.DATASET CLOSE DataSet1.SAVE
OUTFILE='C:\Users\Yaki\Desktop\RQ12.sa /COMPRESSED.
```

Hypothesis

```
REGRESSION
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT BI
/METHOD=ENTER PUAT.
```

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PUAT[b]	.	Enter

a. Dependent Variable: BI

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.944[a]	.891	.890	7.880

a. Predictors: (Constant), PUAT

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	105207.790	1	105207.790	1694.238	.000[b]
	Residual	12916.265	208	62.097		
	Total	118124.055	209			

a. Dependent Variable: BI

b. Predictors: (Constant), PUAT

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.085	1.755		1.188	.236
PUAT	.985	.024	.944	41.161	.000

a. Dependent Variable: BI

```
REGRESSION
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT BI
/METHOD=ENTER PEUAT.
```

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PEUAT[b]	.	Enter

a. Dependent Variable: BI

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.953[a]	.907	.907	7.249

a. Predictors: (Constant), PEUAT

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	107192.611	1	107192.611	2039.626	.000[b]
	Residual	10931.444	208	52.555		
	Total	118124.055	209			

a. Dependent Variable: BI

b. Predictors: (Constant), PEUAT

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.932	1.562		2.517	.013
PEUAT	.951	.021	.953	45.162	.000

a. Dependent Variable: BI

```
REGRESSION
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT BI
/METHOD=ENTER TSE.
```

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	TSE[b]	.	Enter

a. Dependent Variable: BI

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.964[a]	.928	.928	6.376

a. Predictors: (Constant), TSE

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	109669.252	1	109669.252	2698.017	.000[b]
	Residual	8454.803	208	40.648		
	Total	118124.055	209			

a. Dependent Variable: BI

b. Predictors: (Constant), TSE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.373	1.388		1.709	.089
	TSE	969	.019	.964	51.942	.000

a. Dependent Variable: BI

```
CORRELATIONS
/VARIABLES=Gender BI
/PRINT=TWOTAIL NOSIG
/MISSING=PAIRWISE.
```

Correlations

Correlations

		Gender	BI
Gender	Pearson Correlation	1	-.157*
	Sig. (2-tailed)		.023
	N	210	210
BI	Pearson Correlation	-.157*	1
	Sig. (2-tailed)	.023	
	N	210	210

*. Correlation is significant at the 0.05 level (2-tailed).

```
CORRELATIONS
/VARIABLES=BI YOP
/PRINT=TWOTAIL NOSIG
/MISSING=PAIRWISE.
```

Correlations

		BI	YOP
BI	Pearson Correlation	1	-.159*
	Sig. (2-tailed)		.021
	N	210	210
YOP	Pearson Correlation	-.159*	1
	Sig. (2-tailed)	.021	
	N	210	210

*. Correlation is significant at the 0.05 level (2-tailed).

```
REGRESSION
 /MISSING LISTWISE
 /STATISTICS COEFF OUTS R ANOVA
 /CRITERIA=PIN(.05) POUT(.10)
 /NOORIGIN
 /DEPENDENT BI
 /METHOD=ENTER PUAT PEUAT TSE.
```

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	TSE, PUAT, PEUAT[b]	.	Enter

a. Dependent Variable: BI

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.976[a]	.953	.952	5.197

a. Predictors: (Constant), TSE, PUAT, PEUAT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.207	1.168		-.177	.859
	PUAT	.250	.053	.240	4.707	.000
	PEUAT	.229	.058	.229	3.975	.000
	TSE	.531	.046	.528	11.594	.000

a. Dependent Variable: BI

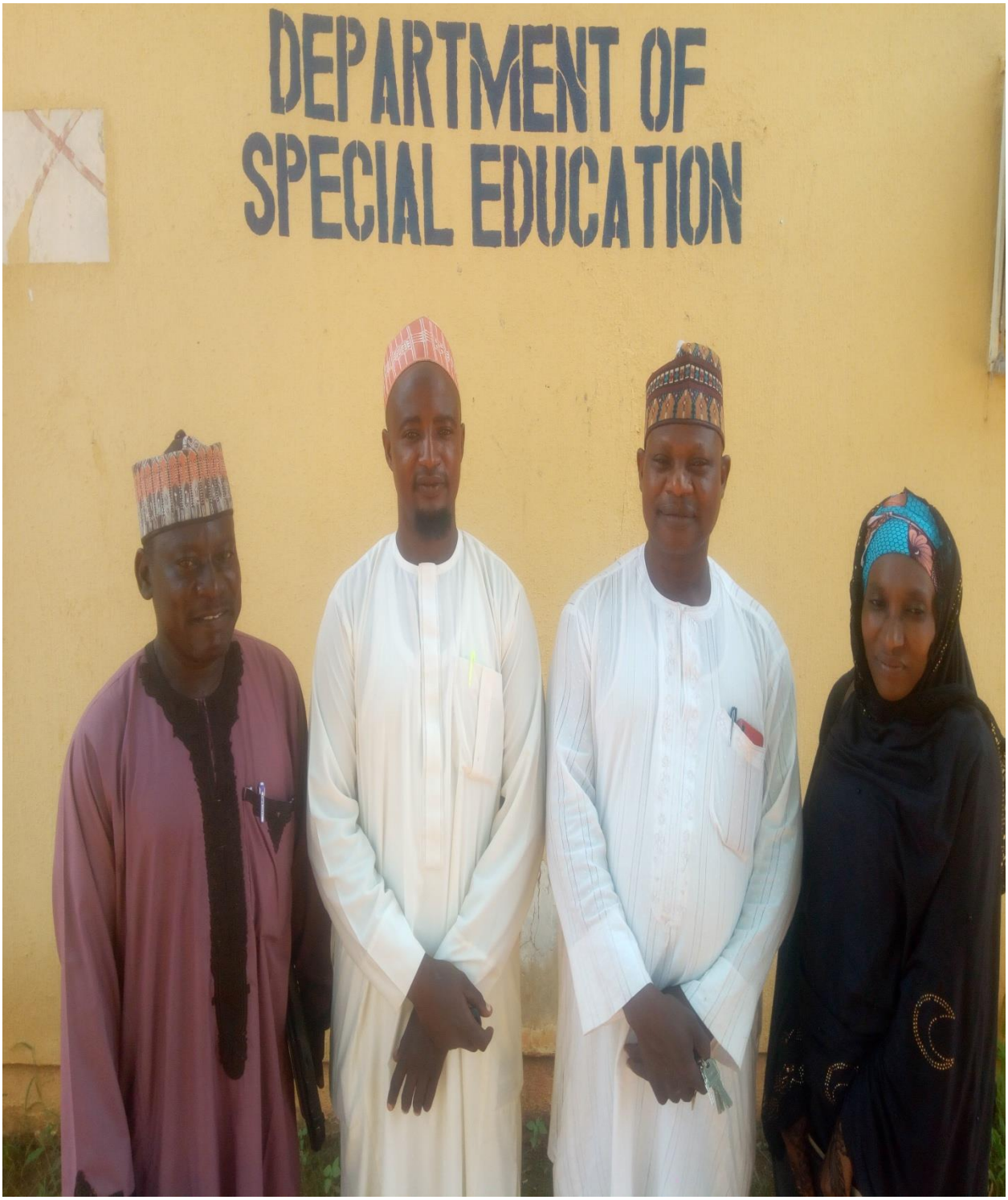
b. Predictors: (Constant), TSE, PUAT, PEUAT

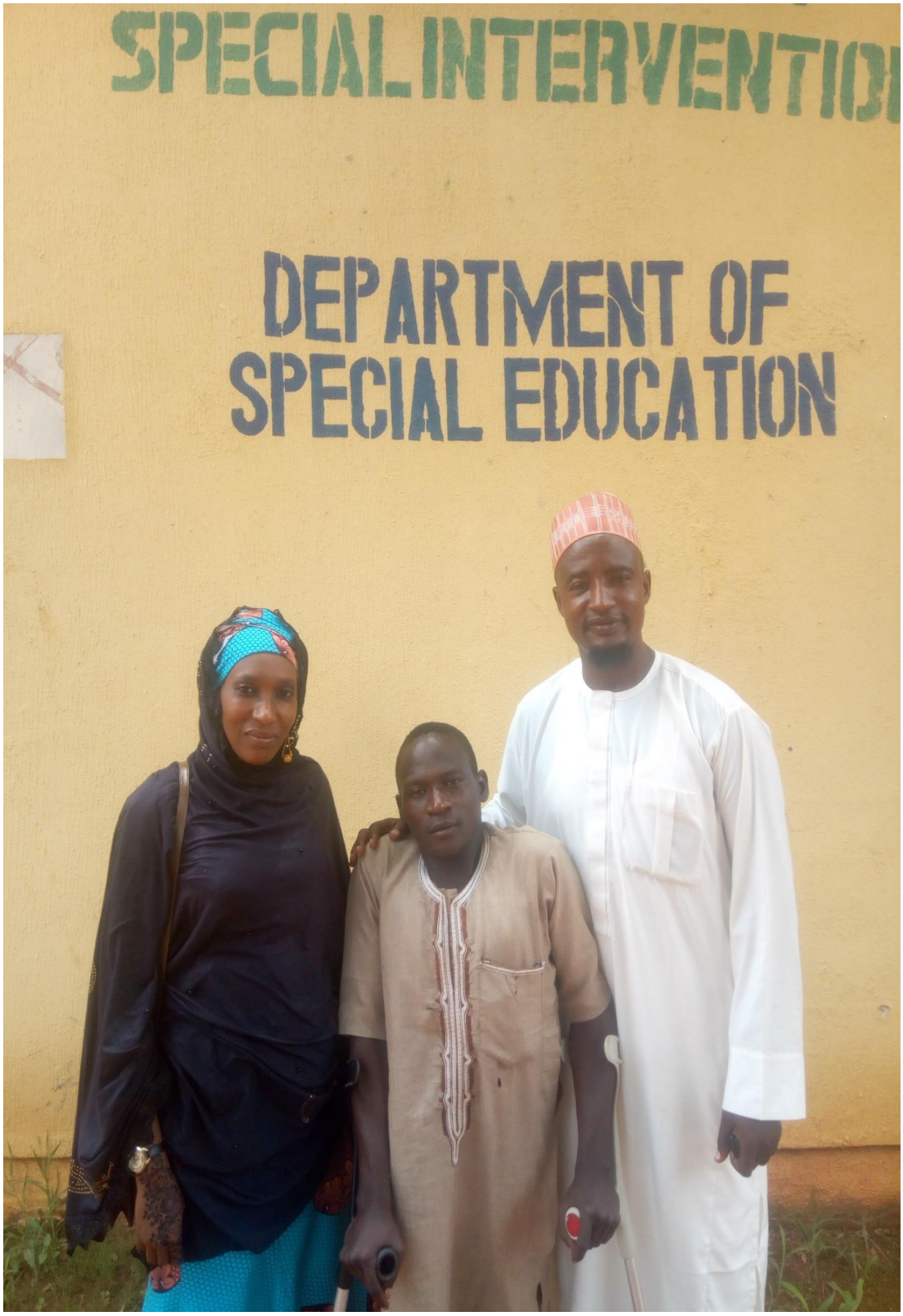
Appendix vi
Pictures of various places visited

Researcher, researched assistant and lecturers of special needs in F.C.E. Katsina


FEDERAL COLLEGE
EDUCATION. KATSINA

OUR ARRIVAL TO F.C.E.T. BICHI, KANO STATE

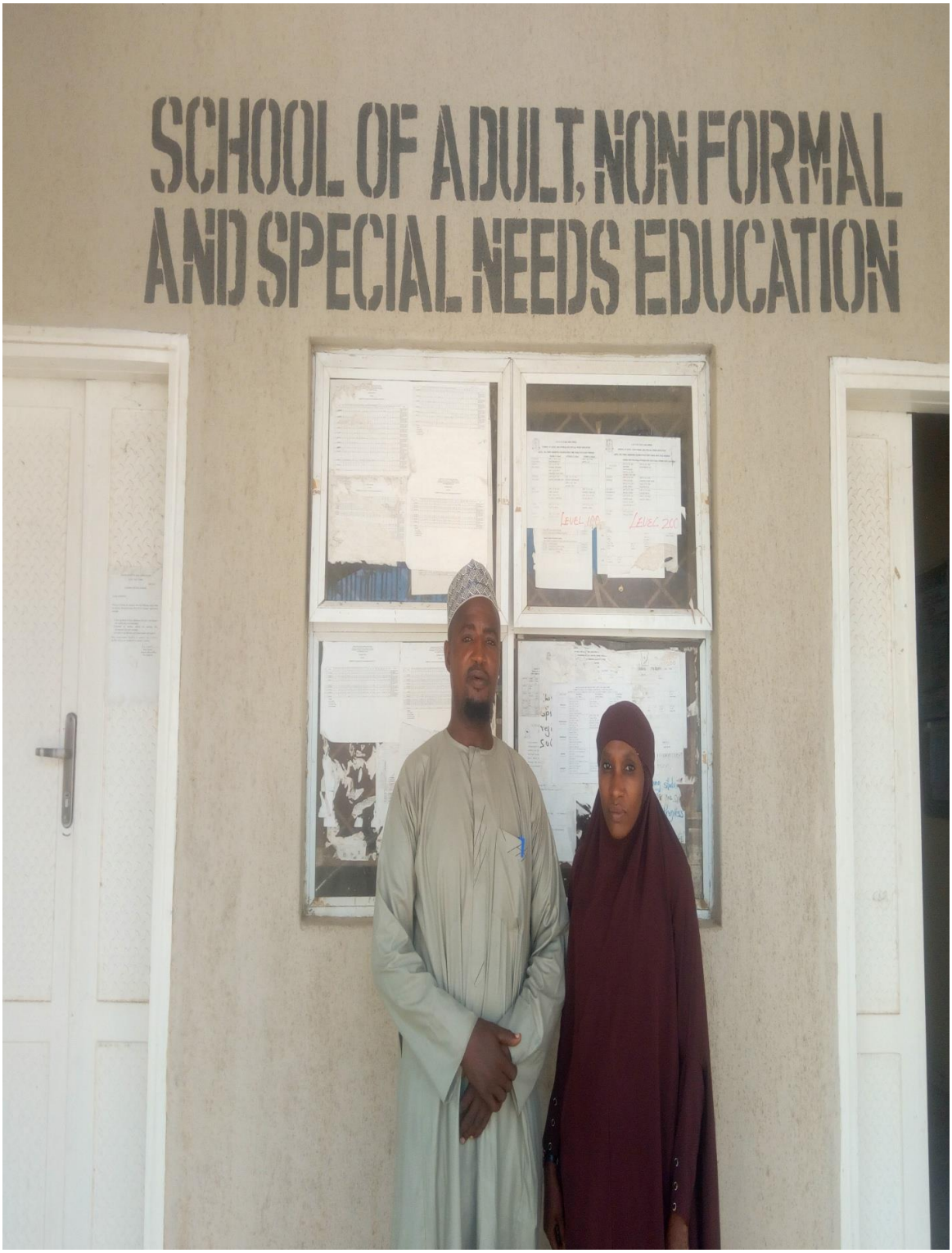

DEPARTMENT OF
SPECIAL EDUCATION



SPECIAL NEEDS STUDENTS, MYSELF AND MY WIFE AS ONE OF THE RESEARCH ASSISTANTS IN FCE TECH BICHI

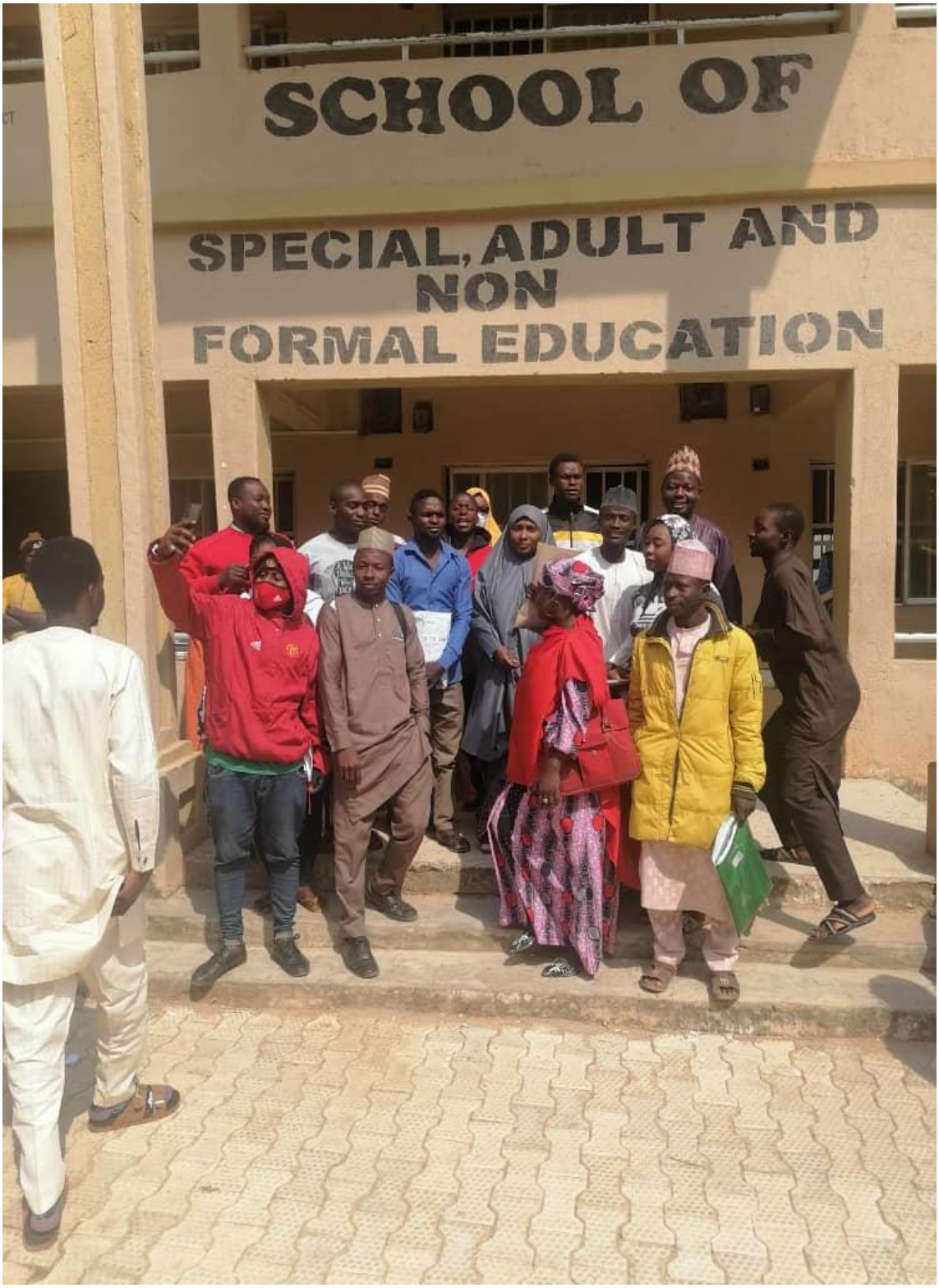
ON ARIVAL AT JIGAWA STATE COLLEGE OF EDUCATION GUMAL

ASSISTIVE TECHNOLOGIST, MYSELF AND MY WIFE AS A RESEARCH ASSISTANT IN JIGAWA STATE COLLEGE OF EDUCATION GUMAL



MYSELF AND MY WIFE AS A RESEARCH ASSISTANT IN JIGAWA STATE COLLEGE OF EDUCATION GUMAL

RESEARCH ASSISTANT ARRIVING THE GATE



FCE ZARIA SPECIAL NEEDS STUDENTS WITH RESEARCH ASSISTANT