

## **AVAILABILITY, ADEQUACY AND UTILIZATION OF HIGH-TECH ASSISTIVE TECHNOLOGY IN SPECIAL EDUCATION SCHOOLS IN NORTH WEST NIGERIA**

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### **Abstract**

*This study assessed availability, adequacy and use of high-tech assistive technologies in special education schools in North West Nigeria. The study used descriptive survey method to sought data from 120 teachers who were drawn using simple random sampling technique from teachers of students with physical disabilities. Four research questions were raised to guide the study. Researchers designed questionnaire and observation checklist were used to collect data. The two instruments were subjected to expert assessment for face and content validity check. The reliability of the instruments were established through pilot study using 20 teachers from two special needs schools within the study area, but not part of the sampled schools. The reliability values of 0.80 and 0.74 were obtained for the questionnaire and Checklist using Cronbach Alpha formula and Cohen's Kappa inter-rater reliability formula. The data collected were analysed using percentage, mean and standard deviation. The findings revealed that high-tech assistive technologies were not adequately available in special education schools. The few available assistive devices were not adequate. However, special education teachers do not use the available high-tech assistive devices to teach students with physical disabilities. It was recommended among other things that both the federal and state governments should improve on funding special education so as to ensure that the necessary assistive devices are made available in special education schools.*

**Key Words:** Availability, Adequacy, Utilization, High-tech, Assistive Technology, Special Education

### **Introduction**

Education is accepted globally as the cornerstone for the advancement of individuals and for national development. For this reasons Nigeria as a nation has emphasised in its National Policy on Education that every child irrespective of location, social, economic or physical characteristics must receive basic education (FRN, 2004). In order to provide efficient and productive education for the citizens, especially in this era of technological advancement, education in all regards need to be integrated with technology that can improve performance capabilities, encourage students' participation in instructional activities and facilitate their overall academic achievement. Thus, technology integration in education encompasses hardware and software applications deeply rooted in Information and Communication Technology (ICT).

Information and Communication Technology cut across wide range of computerised and electronic technologies used in the acquisition, processing, transmission, and storage of information (Adebisi, 2014). Advancement in ICT, its acceptance and use in education is indeed promising. Increasing involvement of ICT in education is bringing changes to the way teachers teach and learners learn. Information and Communication-based Technology is facilitating the growth of special education technology in Nigeria (Felicia, Sharif, Wong & Marriappan, 2014). Implementation of new teaching and learning tools, especially within the scope of special education is a blessing at the right time. Hence, the use of appropriate technological tools,

devices, equipment, and gadgets in the classroom is significant to facilitating effective teaching and learning, which in turn will enhance positive performance and achievement of both instructors and learners. Thus, teacher's ability to integrate technology, pedagogy, and content in his/her classroom is paramount to a successful teaching and learning process.

The term Special education according to the National Policy on Education (2004) is "a customized education programme, designed to meet the unique needs of persons with special needs that the general education programme cannot provide". As a means for meeting special education needs, it is concerned with the elimination of barriers to educational participation. This involves setting the right place with appropriate technologies. Because of the support technologies offered to individuals with disabilities, they are addressed as assistive technology.

In recent years, the concept of assistive technology has emerged to dominate the field of special education. Assistive Technology encompasses any item, piece of equipment or system that helps a child with disability bypass, work around or compensate for the areas of difficulties (Raskind, 2009). Assistive technologies differ widely in quality and effectiveness. Today, different assistive technologies (low-tech, mid-tech and high-tech) are used to provide individuals with disabilities with educational opportunities, bringing out the cognitive potential in them, while enabling the curricula and teachers to achieve their objectives and enable the students with disabilities to participate in the learning process.

Students with disabilities connotes persons who have long-time physical, mental, emotional, or sensory impairments, whose interaction with the different attitudinal and environmental barriers prevent them from full and or effective performance within the classroom on an equal basis with others (Convention on the Rights of Persons with Disabilities, 2016). Students with physical disabilities are just a segment of students with disabilities. Students with physical disabilities are faced with abnormality or loss of function of physical structure. Thus, physical disability whether partial or total loss of ability, reduces the ability of the students to learn freely. Visual impairment, speech impairment, hearing impairment, and mobility limitation are the most common physical challenges found in special needs schools in Nigeria (Adebisi, 2014). United Nations International Children's Emergency Fund and World Health Organization joint report (UNICEF & WHO, 2015) acclaimed the need for the implementation of technology to support them in their functional deficits and to assist them access instruction and thus learn better.

In Nigeria, the provision of assistive technology in special education is significantly left in the hand of the government. Consequently upon this, schools in Nigeria experienced infrastructural decay which has reduced their use in the classroom setting (Shikden, 2015). Notwithstanding this, it is important to note that the use of assistive technologies to facilitate teaching and learning activities within the special education ecosystem cannot be over emphasised. This is because they are considered as students allies capable of enhancing functional capabilities and encouraging their participation in education. Assistive technology helps students with special needs to improve their academic achievement. Nevertheless, not all assistive technologies can offer help to all students with special needs at all time. As students with physical disabilities progresses in learning, their technological needs also increase (Coleman, 2011). Researchers noticed that with the current technological development, traditional assistive technologies are becoming more of crutch than support tools (Rowlands, 2015). Thus, integrating emerging technologies into special education programmes will not only offer help but increase the opportunities of students with disabilities to meeting their educational aspirations.

Because of its potential in improving the living and learning condition of Individuals with disabilities high-tech assistive technology is becoming popular among families of people with disabilities and professional (Adedapo, Nwosu, & Ibitoye, 2009). Hence, for the purpose of facilitating academic achievement of students with physical disabilities in the 21<sup>st</sup> century, effective and efficient mobilization and utilization 21<sup>st</sup> century assistive technologies should not be compromised.

Although, there is a gradual involvement, acceptance and utilization of new innovation in Nigeria; it is a mistake to think narrowly about assistive technology in this country (Oyundoyin, 2013). The entire assistive technology spectrum could be obtainable and holds promise for individuals with disabilities in Nigeria. Even though, there is no records indicating the widespread use of emerging phenomenon (high tech assistive technologies) in Nigeria, but index available shows that computers are available for classroom use in special schools. Findings from earlier researches show that students with disabilities use computers as often as their abled peers from the conventional schools. Although computers are the technology most often associated with high tech, there could be many other potentially valuable devices available in Nigeria. Considering its educational significance, it is therefore important that availability, adequacy and utilization of high-tech AT should be the central focus of stakeholders concerned with development of special education programme in Nigeria.

More so, as an emerging technology, there are still a little quantitative evaluations of their availability, adequacy, use and performance (Wosu, Charles, & Samuel, 2016). Additionally, very little is known about special education teachers' use of high tech AT to perform teaching tasks in the special school in Nigeria. Therefore, there is the need to conduct an investigative research so as to assess the level of availability, adequacy and utilization of high technologies currently in special education programmes for the physically challenged students in special needs schools in North West Nigeria.

### **Research Problem**

Since the inception of 21<sup>st</sup> century, individuals increasingly became immersed of technological changes and innovation; yet the situation in classrooms has not change. The problem of students domantness fed by a static pedagogical method is as old as the classroom itself.

However, the emphasis of today's education is student-centred learning which aimed at developing today's learner with problem solving skills, critical thinking ability and other skills necessary for survival beyond the four wall of the classroom. How learners access curriculum is crucial for the attainment of these current educational demands. For students with physical disabilities, access to the curriculum will require the use of assistive technologies. Assistive technology's Success is best evaluated by how it enables an individual with a disability to exercise self-determination and greater independence. The technology we used in education in the past lacked the necessary accessibility features available to guarantee the 21<sup>st</sup> century survival skills amidst the strong competition from able bodies. Research findings shows that despite the adoption of traditional technologies, still many of the students with disabilities in developing countries like Nigeria were experiencing barriers to their learning. These include difficulties in reading, writing and reception of information. Physically challenged students continue to learn under frustrating conditions. This causes drop out of many physically challenged students from school for street begging. Furthermore, the very few who manage to

graduate from school certainly do so without necessary skills for survival and as such they found it difficult to be absorbed by today's labour market. Additionally, the few that were lucky to be employed on condition of their status find it difficult to perform on the job because they weren't adequately trained using today's technologies. Therefore, providing low technologies is not enough to meeting the needs of people with disabilities effectively. High-Tech assistive options were developed to offer the best way of assist to individuals with disabilities to succeed in the classroom, community, and workplace.

Research in the area of high-tech assistive technology availability and use is relatively narrow due to it being a relatively new phenomenon in education, the scaring price tag of some of these life-changing devices as well as slow nature of developing countries like Nigeria to accepting new innovation. In essence, there are no home-based studies that see the development and use of high-tech assistive technology for teaching and learning of students in special schools, even though, some were reported to existed. It is this gap in research and development that prompt the desire from the researchers to undertake research on the availability, adequacy and use of high-tech assistive technology in special needs schools in North West Nigeria.

### **Research Questions**

The following research questions were raised to guide the study.

- (i) What are the available high-tech assistive technology for teaching and learning of the physically challenged students in special education schools in North West Nigeria?
- (ii) How adequate are the available high-tech assistive technology for effective teaching and learning of students with physical disabilities in special education schools in North West Nigeria?
- (iii) How often do teachers make use of the available high-tech assistive technology for the teaching of physically challenged students in special education schools in North West Nigeria?
- (iv) What are the major factors that are preventing teachers from effective utilization of high-tech assistive devices in teaching the physically challenged students in special education schools in North West Nigeria?

### **Research Methodology**

The research deign adopted for this study is the descriptive survey research method because the designed made it possible for the researchers to have a broad view from a sample of special education teachers in the special education schools in order to draw conclusions regarding availability, adequacy and utilization of high-tech assistive technology.

The population for this study include all teachers of special education schools in North West Nigeria. There are 354 special education teachers spread across seven public special education schools in North West Nigeria. The target population for this study comprised of special education teachers from the comprehensive special education schools in North West Nigeria. One hundred and twenty (120) special education teachers were sampled from the population through simple random sampling technique from three comprehensive special education schools. The three selected special education schools were Kaduna State Special Education School, Kaduna, Kebbi State Special Needs School, Birnin-kebbi and Special Education School, Tudun Maliki Kano.

Two different instruments were used to collect the required information for the study. The two instruments used were questionnaire and observation checklist. The questionnaire titled "Teachers High-Tech Assistive Technology Utilization Questionnaire (THATUQ)". The questionnaire has two sections: Section A and Section B. Section A sought information in line with the respondents' personal data, including information regarding teaching domain and gender among others. On the other hand, section B sought relevant information needed to address the problem under study. It is structured in Likert Scale pattern with options of Frequently (F) = 5 points, Sometimes (S) = 4, Rarely (R) = 3, Once (O) = 2, and Not at all (N) = 1, respectively. The checklist titled: "High-Tech Assistive Technology Availability in Special Education Schools (HATASES)". The checklist included a list of some of high-tech assistive devices/software needed for the education of individuals with physical disabilities. HATASES has provision for name of school as well as location of the school. Additionally, it has provision for the researcher to assess adequacy of these technologies. The checklist is divided into five sections: Section A,B,C,D&E which consisted of high-tech assistive devices/software for visual impairments, hearing impairments, speech impairments, motor impairments, and multiple impairments, respectively.

The instruments were subjected to expert assessment in order to determine their face and content validity. Three lecturers from the Department of Educational Technology, Federal University of Technology, Minna, and two special education experts from Niger State College of Education, Minna assessed the comprehensiveness, adequacy and clarity of the items. Corrections and suggestions raised by these experts were effected accordingly in the final drafted questionnaires. The reliability of the instruments used were established through pilot testing with 20 teachers from two special needs schools within the study area, but not part of the sampled schools. The reliability value of 0.81 was obtained for the questionnaire using Cronbach Alpha formula and 0.74 was obtained for the checklist using Cohen's Kappa's inter-rater reliability formula. The data collected was analysed using descriptive statistics such as percentage, mean and standard deviation.

### 3.0 Results

**Table 1: Demographic Distribution of Respondents According to Teaching Areas**

Teaching Area	KSSSES		KSSNS		SESK	
	F	%	F	%	F	%
Teachers of Visually Impaired Students (VI)	15	37.5	10	25	12	30
Teachers of Hearing Impaired Students (HI)	16	40	13	32.5	10	25
Teachers of Speech Impaired Students (SI)	-	-	4	10	5	12.5
Teachers of Students with Motor Limitation (ML)	-	-	6	15	5	12.5
Teachers of Students with Multiple Physical Impairment (MPI)	9	22.5	7	17.5	8	20
<b>Total</b>	40	100	40	100	40	100

Table 1 shows the distribution of the respondents according to teaching domains in the three sampled schools. It shows that, out of 40 respondents in Kaduna State Special Education School, 15 (37.5%) are VI teachers, 16 (40%) are HI teachers and 9 (22.5%) are MPI teachers; Kebbi State Special Needs School (KSSNS) has 10 (25%) VI teachers, 13 (32.5%) HI teachers, 4 (10%) SI teachers, 6 (15%) MI teachers and 7 (17.5%) MPI teachers; while Special education School, Tudun Maliki, Kano has 12 (30%) VI teachers, 10 (25%) HI teachers, 5

(12.5%) SI teachers, 5 (12.5%) ML teachers and 8 (20%) MPI teachers. Cumulatively, there are 37 (30.8%) VI teachers, 39 (32.5%) HI teachers, 9 (7.5%) SI teachers, 11 (9.2%) ML teachers and 24 (20%) MPI teachers, respectively.

**Research Question 1:** What are the available high-tech assistive technology for teaching and learning of the physically challenged students in special education schools in North West Nigeria?

**Research Question 2:** How adequate are the available high-tech assistive technology for effective teaching and learning of students with physical disabilities in special education schools in North West Nigeria?

**Table 2.1: Teachers Response on Availability and Adequacy of High-Tech Assistive Devices and Software for Teaching and Learning of the Visually Impaired Students.**

SN	AT Devices / Software	School	Available and Adequate		Available but Not Adequate		Not Available		Decision
			F	%	F	%	F	%	
1	Computer	KSES	3	20	12	80	-	-	ANA
		KSSNS	1	10	10	90	-	-	ANA
		SESK	-	-	11	91.7	1	8.3	ANA
2	Screen Reader	KSES	2	13	9	60	4	26.7	ANA
		KSSNS	-	-	10	100	-	-	ANA
		SESK	1	8.3	10	83.4	1	8.3	ANA
3	Optical Character Recognitions	KSES	5	33.3	8	53.4	2	13.3	ANA
		KSSNS	2	20	6	60	2	20	ANA
		SESK	4	33.4	6	50	2	16.6	ANA
4	Power Braille NoteTaker	KSES	1	6.7	3	20	11	73.3	NA
		KSSNS	-	-	3	30	7	70	NA
		SESK	2	16.6	4	33.4	6	50	NA
5	Descriptive Video Service	KSES	-	-	1	6.7	14	93.3	NA
		KSSNS	-	-	2	20	8	80	NA
		SESK	-	-	1	8.3	11	91.7	NA
6	Computer Manification	KSES	6	40	8	53.3	1	6.7	ANA
		KSSNS	3	30	5	50	2	20	ANA
		SESK	4	33.4	7	58.3	1	8.3	ANA
7	Book Scanner	KSES	1	6.7	5	33.3	9	60	NA
		KSSNS	2	20	7	70	1	10	ANA
		SESK	3	25	8	66.7	1	8.3	ANA
8	Zoom Text	KSES	-	-	8	53.3	7	46.7	ANA
		KSSNS	1	10	7	70	2	20	ANA
		SESK	-	-	5	41.7	7	53.8	NA
9	MP3	KSES	3	20	7	46.7	5	33.3	ANA

		KSSNS	1	10	9	90	-	-	ANA
		SESK	2	16.7	6	50	4	33.3	ANA
10	Reading Pen	KSSES	-	-	1	6.7	14	93.3	NA
		KSSNS	1	10	1	10	8	80	NA
		SESK	-	-	2	16.7	10	83.3	NA

Decision Percentage Score = 50%

From the decision in table 2.1, it can be observed that of all the assistive devices and software presented, none is adequately available as reported by the respondents. The analysed data showed that computer and other software (Screen Reader, Zoom Text, Optical Character Recognition and Magnification software) received higher percentage scores. This showed that they are available. However, they are not adequate. Other assistive devices including Power Braille NoteTaker, Descriptive Video service and Reading pen received below 50% scores, which showed that they are not available. From these results, it can be deduced that most high-tech assistive devices and software necessary for the teaching and learning of students with visual impairments in special education schools were not adequately available.

**Table 2.2: Teachers Response on the Availability and Adequacy of High-Tech Assistive Devices and Software for Teaching and Learning of Hearing Impaired Students.**

SN	AT Devices / Software	School	Available and Adequate		Available but Not Adequate		Not Available		Decision
			F	%	F	%	F	%	
1	FM Amplified System	KSSES	3	18.7	5	31.3	8	50	NA
		KSSNS	1	7.7	3	23.1	9	69.2	NA
		SESK	-	-	3	30	7	70	NA
2	Audio Loops	KSSES	1	6.3	-	-	15	93.7	NA
		KSSNS	-	-	2	15.4	11	84.6	NA
		SESK	1	10	1	10	8	80	NA
3	Infrared System	KSSES	-	-	-	-	16	100	NA
		KSSNS	-	-	3	23.1	10	76.9	NA
		SESK	-	-	-	-	10	100	NA
4	Telecommunication Device for the Deaf	KSSES	2	12.5	8	50	6	37.5	ANA
		KSSNS	1	7.7	9	69.2	3	23.1	ANA
		SESK	-	-	2	20	8	80	NA
5	Live Speech Captioning Device	KSSES	-	-	2	12.5	14	87.5	NA
		KSSNS	1	7.7	4	30.8	8	61.5	NA
		SESK	-	-	-	-	10	100	NA
6	Behind the Air Audio Enhancer	KSSES	4	25	11	68.8	1	6.2	ANA
		KSSNS	1	7.7	7	53.9	5	38.4	ANA
		SESK	2	20	6	60	2	20	ANA
7	In the Air Audio Enhancer	KSSES	1	6.3	13	81.2	2	12.5	ANA

		KSSNS	2	15.4	9	69.2	2	15.4	ANA
		SESK	-	-	8	80	2	20	ANA
8	Mobile Phone	KSSNS	4	25	9	56.2	3	18.8	ANA
		KSSNS	2	15.4	7	53.8	4	30.8	ANA
		SESK	1	10	8	70	2	20	ANA
9	Sign Language Software	KSSNS	1	6.3	9	56.2	6	37.5	ANA
		KSSNS	-	-	10	76.9	3	23.1	ANA
		SESK	-	-	2	20	8	80	NA
10	Captioning Television	KSSNS	-	-	3	18.8	13	81.2	NA
		KSSNS	1	7.7	1	7.7	11	84.6	NA
		SESK	-	-	-	-	10	100	NA

Decision Percentage Score = 50%

Table 2.2 showed that out of the 10 high-tech assistive devices/software presented, only three (in and behind the air audio enhancer and mobile phones) representing (30%) unanimously received above fifty percent (50%) rating, indicating they are available. However, they are not adequate. Two of the three special schools representing (71%) had telecommunication device for the deaf and sign language software that is not adequate. The three schools surveyed unanimously reported that they did not have high-tech assistive devices like FM amplified system, audio loops, infrared system, live speech captioning device and captioning television. Therefore, it can be deduced from these results that the schools do not have most of the high-tech assistive devices used in teaching and learning of students with hearing impairments.

**Table 2.3: Teachers' Response on the Availability and Adequacy of the High-Tech Assistive Devices and Software for Teaching and Learning of Speech Impaired Students.**

SN	AT Devices / Software	School	Available and Adequate		Available but Not Adequate		Not Available		Decision
			F	%	F	%	F	%	
1	Dragon Naturally Speaking	KSSNS	-	-	1	16.7	5	83.3	NA
		SESK	-	-	-	-	5	100	NA
2	Talking Calculator	KSSNS	2	33.3	4	66.7	-	-	ANA
		SESK	1	20	3	60	1	20	ANA
3	Word Selection Device	KSSNS	1	16.7	3	50	2	33.3	ANA
		SESK	-	-	1	20	4	80	NA
4	Speech 4-Good App	KSSNS	-	-	1	16.7	5	83.3	NA
		SESK	-	-	2	40	3	60	NA
5	Computer	KSSNS	1	16.7	3	50	2	33.3	ANA
		SESK	-	-	4	80	1	20	ANA
6	Screen Reader	KSSNS	1	16.7	5	83.3	-	-	ANA
		SESK	1	20	3	60	1	20	ANA
7	Touch Sensitive pad	KSSNS	-	-	1	16.7	5	83.3	NA
		SESK	-	-	-	-	5	100	NA
8	Device Using Picture and Graphics	KSSNS	-	-	-	-	5	100	NA
		SESK	-	-	-	-	6	100	NA
9	Selection Switches	KSSNS	-	-	2	33.3	3	66.7	NA



10	Talking Dictionary	SESK	-	-	-	-	5	100	NA
		KSSNS	-	-	5	83.3	-	-	ANA
		SESK	-	-	4	80	1	20	ANA

Decision Percentage Score = 50%

From Table 2.3, it could be seen that only two schools were used in the analysis. This is because the other school (KSSNS) does not enrol students with speech impairments. Therefore, there were neither teachers nor equipment available for the teaching and learning of students with these disabilities. Nevertheless, results in table 4 shows that only talking calculator, screen reader, computer and talking dictionary were available but not adequate in the sampled schools. Other assistive devices and software, which include dragon naturally speaking, word selection device, speech 4-good, touch sensitive pad, device using pictures and graphics and selection switches received rating of below fifty percent (<50%) scores. Therefore, they are not available in the sampled schools. Hence, it can be deduced from these results that the schools do not have most of the high-tech assistive devices used in teaching and learning of students with speech impairments.

**Table 2.4: Teachers Response on the Availability and Adequacy of High-Tech Assistive Devices and Software for Teaching and Learning of Students with Mobility Limitation.**

SN	AT Devices / Software	School	Available and Adequate		Available but Not Adequate		Not Available		Decision
			F	%	F	%	F	%	
1	Book Scanner	KSSNS	1	14.3	5	71.4	1	14.3	ANA
		SESK	2	25	4	50	2	25	ANA
2	Power Wheelchair	KSSNS	-	-	-	-	7	100	NA
		SESK	1	12.5	1	12.5	6	75	NA
3	Stand Alone Device with Remote Control	KSSNS	1	14.3	-	-	6	85.7	NA
		SESK	1	12.5	2	25	5	62.5	NA
4	Computer	KSSNS	2	28.6	4	57.1	1	14.3	ANA
		SESK	1	12.5	5	62.5	2	25	ANA
5	Mouth Stick	KSSNS	-	-	-	-	7	100	NA
		SESK	-	-	1	12.5	7	87.5	NA
6	Speech Recognition	KSSNS	-	-	4	57.1	3	42.9	ANA
		SESK	1	12.5	5	62.5	2	25	ANA
7	Portable Digital Assistant	KSSNS	1	14.3	-	-	6	85.7	NA
		SESK	-	-	-	-	8	100	NA
8	Mobile Phone	KSSNS	-	-	6	85.7	1	14.3	ANA
		SESK	1	12.5	6	75	1	12.5	ANA
9	Infrared Technology	KSSNS	-	-	4	57.1	3	42.9	ANA
		SESK	-	-	-	-	8	100	NA
10	Internet Service	KSSNS	4	57.1	2	28.6	1	14.3	AA
		SESK	2	25	1	12.5	6	62.5	ANA

Decision Percentage Score = 50%

From Table 2.4, it could be observed that only two schools were used in the analysis. This is because the other school (KSSSES) does not enrol students with mobility impairments. Therefore, there were neither teachers nor equipment available for the teaching and learning of students with these disabilities. However, results in table 4 shows that only book scanner, computer, speech recognition software and mobile phones received slightly above (50%) scores which showed that they are not adequately available in the sampled schools. Other assistive devices and services (power wheelchair, standalone device with remote control, mouth stick, portable digital assistant, infrared technology and internet service) constituting (60%) of the high-tech assistive devices for motor impaired, were reported not available with scores of above fifty percent (50%). Therefore, it can be deduced from these results that the schools do not have most of the high-tech assistive devices used in teaching and learning of students with motor impairments.

**Table 2.5: Teachers Response on the Availability and Adequacy of the High-Tech Assistive Devices and Software for Teaching and Learning of Students with Multiple Physical Disabilities.**

SN	AT Devices / Software	School	Available and Adequate		Available but Not Adequate		Not Available		Decision
			F	%	F	%	F	%	
1	Mouth Control Stick	KSES	-	-	1	11.1	8	88.9	NA
		KSSNS	-	-	-	-	4	100	NA
		SESK	-	-	2	40	3	60	NA
2	Adaptive Keyboard	KSES	1	11.1	5	55.6	3	33.3	ANA
		KSSNS	-	-	4	100	-	-	ANA
		SESK	2	40	3	60	-	-	ANA
3	Voice Activation System	KSES	-	-	2	22.2	7	77.8	NA
		KSSNS	-	-	1	25	3	75	NA
		SESK	-	-	1	20	4	80	NA
4	Computer	KSES	2	22.2	7	77.8	-	-	ANA
		KSSNS	1	25	2	50	1	25	ANA
		SESK	1	20	4	80	-	-	ANA
5	Portable Writing Device	KSES	-	-	-	-	9	100	NA
		KSSNS	-	-	1	25	3	75	NA
		SESK	-	-	-	-	5	100	NA
6	Infrared Sensor	KSES	-	-	-	-	9	100	NA
		KSSNS	-	-	3	75	1	25	ANA
		SESK	-	-	-	-	5	100	NA
7	Portable Digital Assistants	KSES	-	-	1	11.1	8	88.9	NA
		KSSNS	-	-	1	25	3	75	NA
		SESK	-	-	1	20	4	80	NA
8	Mobile Phone	KSES	2	22.2	4	44.5	3	33.3	ANA
		KSSNS	-	-	3	75	1	25	ANA
		SESK	2	40	3	60	-	-	ANA
9	Voice Recognition System	KSES	1	11.1	1	11.1	7	77.8	NA
		KSSNS	-	-	1	25	3	75	NA
		SESK	1	20	1	20	3	60	NA
10	Switches	KSES	-	-	1	11.1	8	88.9	NA
		KSSNS	-	-	1	25	3	75	NA
		SESK	-	-	-	-	5	100	NA

Decision Percentage Score = 50%

Results in Table 2.5 showed that out of the ten assistive devices and software presented, only computer, mobile phones and adaptive keyboard representing (30%) unanimously received above fifty percent (50%) scores of available but not adequate from the three schools. One of the three sampled schools have infrared sensor available but not adequate. The three schools surveyed unanimously reported that they did not have mouth stick, voice activation system,

portable writing device, voice recognition system, and switches available for teaching and learning of students with multiple physical disabilities. Therefore, it can be deduced from these results that special schools do not have most of the high-tech assistive devices necessary for the teaching and learning of students with multiple Physical impairments.

**Research Question 3:** How often do you use assistive device(s) or software when teaching physically challenged students in your school?

The extent to which special education teachers make use of high-tech assistive devices and software in teaching students with physical disabilities was analysed based on their utilization of assistive devices/software on the domains of frequently, sometimes, rarely, once, or not at all. The mean and standard deviation of their responses was calculated and shown in table 3 below.

**Table 3: Mean and Standard Deviation on the Use of High-Tech Assistive Devices and Software by Special Education Teachers**

SN	Items	School	N	$\bar{X}$	SD	Decision
I	I ..... use high-tech assistive device(s) / software to facilitate teaching and learning in the classroom.	KSSES	40	2.3	1.11	Not At All
		KSSNS	40	2.9	1.49	Not At All
		SESK	40	2.9	1.45	Not At All
II	I ..... use high-tech assistive device(s) / software to actively engage the physically challenged students in the classroom.	KSSES	40	2.7	1.32	Not At All
		KSSNS	40	2.3	1.31	Not At All
		SESK	40	2.6	1.63	Not At All
III	I ..... use high-tech assistive device(s) / software to assess the physically challenged students in the classroom.	KSSES	40	2.6	1.48	Not At All
		KSSNS	40	2.8	1.50	Not At All
		SESK	40	2.9	1.42	Not At All
IV	I ..... use high-tech assistive device(s) / software to generate teaching aids for classroom presentation.	KSSES	40	2.7	1.28	Not At All
		KSSNS	40	2.1	1.18	Not At All
		SESK	40	2.7	1.20	Not At All
V	I ..... use high-tech assistive device(s) / software to enhance physically challenged students' participation in the classroom.	KSSES	40	2.4	1.22	Not At All
		KSSNS	40	2.5	1.57	Not At All
		SESK	40	2.6	1.53	Not At All
<b>Grand Mean</b>				<b>2.6</b>		<b>Not At All</b>

Decision Mean =3.0

Table 3 shows the mean and standard deviation analysis on the extent of special education teachers' use of assistive devices in special education schools. Specifically, item one which states that "I ... use assistive devices to facilitate teaching and learning in the classroom" has mean scores of 2.3, 2.9 and 2.9 with standard deviation of 1.11, 1.49, and 1.45, respectively. Similarly, item 2 which states that "I ... use assistive devices to actively engage students with physical disabilities in the classroom" has mean scores of 2.7, 2.3 and 2.6 with standard deviation of 1.32, 1.31 and 1.63, respectively. Item three which states that "I ... use assistive devices to assess students with physical disabilities in the classroom" has mean scores of 2.6, 2.8 and 2.9 with standard deviation of 1.48, 1.50 and 1.42, respectively. Also, item four which states that "I ... use assistive devices to generate teaching aids for classroom presentation" has mean scores of 2.7, 2.1 and 2.7 with standard deviation of 1.28, 1.18 and 1.20, respectively. Furthermore, item five which states that "I ... use high-tech assistive devices to enhance students with physical disabilities participation in the classroom" has mean scores of 2.4, 2.5 and 2.6 with the standard deviation of 1.22, 1.57 and 1.53, respectively. On a general note, it

can be deduced from the results presented in Table 3 that teachers do not make use of high-tech assistive devices and software in teaching students with physical disabilities in special education schools. This is because all the items that measure teachers' level of utilization of assistive devices had mean scores that were below the decision mean score of 3.0.

**Research Question 4:** What are the factors that prevent you from effective utilization of high-tech assistive devices in teaching the physically challenged students in special needs schools in North West Nigeria?

**Table 4: Mean and Standard Deviation on Factors Preventing Special Education Teachers from making Effective Use of High-Tech Assistive Devices and Software in Teaching the Physically Challenged Students**

SN	Items	School	N	$\bar{X}$	SD	Decision
I	Inadequacy of assistive devices and software limits their use in the classroom	KSSES	40	3.6	1.19	Agree
		KSSNS	40	3.4	1.37	Agree
		SESK	40	3.4	1.43	Agree
II	Inadequate electricity supply reduces the use of assistive devices and software in the classroom	KSSES	40	3.6	1.24	Agree
		KSSNS	40	3.7	1.32	Agree
		SESK	40	3.3	1.40	Agree
III	Poor classroom setting hinders the use of assistive devices in the classroom	KSSES	40	3.5	1.24	Agree
		KSSNS	40	3.4	1.56	Agree
		SESK	40	3.9	1.08	Agree
IV	Lack of awareness on the existence of assistive devices in schools hinders their use	KSSES	40	3.8	1.34	Agree
		KSSNS	40	4.1	0.92	Agree
		SESK	40	3.9	1.05	Agree
V	Lack of training reduces the use of assistive devices/software in the classroom	KSSES	40	3.5	1.28	Agree
		KSSNS	40	3.7	1.33	Agree
		SESK	40	3.8	1.17	Agree
<b>Grand Mean</b>				<b>3.6</b>		<b>Agree</b>

Decision Mean = 3.0

Table 4 shows the mean and standard deviation of special education teachers' response on the factors that hinders their effective use of assistive devices in the classroom. The analysis of the table reveals the mean scores of 3.6, 3.4 and 3.4 with standard deviation of 1.19, 1.37 and 1.43, respectively for item one which states that "inadequacy of assistive devices limits their use in the classroom". Also, item two which states that "inadequate electricity supply reduces the use of assistive devices in the classroom" has mean scores of 3.6, 3.7 and 3.3 with standard deviation of 1.24, 1.32 and 1.40, respectively. Item three which states that "poor classroom setting hinders the use of assistive devices in the classroom" has mean scores of 3.5, 3.4 and 3.9 and standard deviation of 1.24, 1.56 and 1.08, respectively. In the same manner, item four which states that "lack of awareness on the existence of assistive devices hinders their use in the classroom" has mean scores of 3.8, 4.1 and 3.9 with standard deviation of 1.34, 0.92, and 1.05, respectively. Furthermore, item five which states that "lack of training reduces the use of assistive devices in the classroom" has mean scores of 3.5, 3.7 and 3.8 with standard deviation of 1.28, 1.33 and 1.17, respectively. Generally, the table reveals the grand mean score of 3.6 which is greater than the decision mean score of 3.0. This implies to a greater extent that the presented significantly hindered special education teachers from effective use of assistive devices in the classroom.

## Summary of Major Findings

The summary of major findings from this study includes:

- (i) It was discovered that high-tech assistive devices and software necessary for teaching and learning of students with physical disabilities are not largely available in the selected special education schools.
- (ii) The available assistive devices and software were not adequate as required for the teaching and learning of students with physical disabilities in the selected schools.
- (iii) Special education teachers do not effectively use assistive devices and software in teaching students with physical disabilities in the selected special education schools.
- (iv) Factors such as inadequacy of assistive devices, inadequate power supply, classroom setting, lack of training and lack of knowledge on the present of these assistive devices in schools hindered their utilization in special education schools.

## Discussion of Findings

This aim of this research is to assess availability, determine adequacy and extent to which special education teachers use high-tech assistive devices and software in teaching students with physical disabilities in special education schools in North West Nigeria. In line with research question one and two, table 2.1, 2.2, 2.3, 2.4, and 2.5 were analysed using percentage. Special education teachers from different teaching domain revealed that assistive devices and software require for teaching and learning of students with physical disabilities were not adequately available in special education schools. This finding might be due to the fact that special education unit like any other education unit in Nigeria is grossly underfunded. This finding is in agreement with the finding of Yusuf and Fakomogbon (2008) who found that due to the scaring price tag of assistive devices for the visually impaired, government have put a halt to the supply of these basic teaching and learning devices for quite some years in the past. The finding is also in consistent with that of Yusuf, Fakomogbon, and Issa (2012) which discovered a gross inadequacy of assistive technologies for special education. Additionally, this finding is in line with the finding of Shikden (2015) which discovered that most of special education schools in North Central Nigeria did not have most of the assistive devices that are required for the education of students with special needs. Schools that had these devices did not have them in sufficient.

The assessment on the extent at which special education teachers used assistive devices available in their school was based on five different items as shown in Table 3. Unfortunately, most special education teachers do not use assistive devices and software at all in teaching students with physical disabilities. This may be due to teachers' lack of awareness of the existence of such devices in their respective schools, and perhaps because of the inadequacy of the device. This finding corroborates with the finding of Maraizu (2014) which maintained that most of special education coordinator surveyed in Enugu state, Nigerian reported that teachers do not use technology to teach because of the insufficient supply of such devices in special education schools. This is indeed alarming considering the significance of technology to special need students learning. However, the finding of this study is not in agreement with finding of Shikden (2015) which concluded that special education teachers used assistive devices regularly in the classroom. On the contrary, this finding agreed with the finding of Onivehu, Ohawuiro, and Oyeniran (2017) which discovered that teachers of students with physical disabilities were not using assistive devices to teach because of their high-tech nature and because they were not adequately available and accessible by teachers.

Another finding that aroused from this study also revealed some major factors that hindered the special education teachers in North West geopolitical zone of Nigeria from effectively using assistive devices available in their respective schools in classroom presentation. The finding revealed problems that include inadequacy of assistive devices, inadequate power supply, poor classroom setting, lack of training and lack of awareness on the present of these assistive devices in schools as major barriers to the effective use of assistive devices by teachers in special education school within the geopolitical zone under study. This finding corroborates with the finding of Coleman (2011) which discovered unused assistive devices sitting on shelves and stored in schools stores while teachers were not aware of their existence in the school. Similarly, the finding agreed with the finding of Shikden (2015) which found out that teachers lack of competency in assistive technology, insufficiency of assistive technologies and lack of regular electricity supply were among the major factors that hindered the effective use of assistive devices in special education schools in North Central Nigeria. The finding is also in line with the finding of AJuwon and Chitiyo (2015) which discovered that lack of training in the use of assistive devices, lack of appropriate assistive devices and services in the classroom and irregular electricity supply as the biggest challenges regarding assistive technology utilization in special education schools in Nigeria. The similarities of these findings may be attributed to the fact that the studies focused on the use of assistive devices by special education teachers who were expected to use assistive technology to facilitate teaching and learning of students with disabilities in special education schools.

### **Implications of Findings**

Based on the findings of this study, the following implications were drawn.

The integration of emerging technologies in teaching and learning has become a global trend. Hence, no country would like to be left out this development because of the enormous benefits attached to it. Consequently upon this, finding of this study shows that most high-tech assistive technologies required for the teaching and learning of students with special needs were not adequately available in special education schools. The implication of this finding is that special education teachers would not be able to effectively integrate these forms of innovation in the teaching and learning process in order to enhance quality special education.

Integration of high-tech assistive technologies in teaching and learning of special education students will help to improve the quality of special education. High-tech assistive devices provide students with special needs the opportunity to acquire necessary skills for 21<sup>st</sup> century survival. However, it is disheartening to note that majority of special education teachers do not make use of the available high-tech assistive devices and software in the classroom. This implies that teachers lack the skills to implement new innovations in special education. Therefore, even when government and other stakeholders provide high-tech assistive technologies for special education, the hope of quality special education may not be attained because special education teachers do not make use of innovative pedagogies regularly to implement curriculum.

The application of high-tech assistive technologies is paramount to providing quality special education. Unfortunately certain factors such as poor electricity supply, traditional classroom setting, lack of training and inadequacy of these technologies among others poses barriers which prevent it from becoming a reality. By implication, quality special education in Nigeria can only be achieved when such barriers identified by teachers are adequately addressed.

## Conclusion

Based on the findings from the analysis of the data collected for this study, the researchers concludes that high-tech assistive devices and software that are required for the effective teaching and learning of students with physical disabilities in special education schools across North West Nigeria were not largely available. Only few assistive devices and software were found available in special education schools, however they were not adequate. This inadequacy of assistive devices necessary for teaching and learning of students with special needs can be attributes to poor funding of special education and lack of regular supply of assistive technology by the government. The study also concluded that the few assistive devices available in special education schools were found not in good condition. The poor state of assistive technology in special education schools can be attributed to fact that some of these devices and software are over stretched and some might have faced the taste of time and because they are not properly kept, they developed faults and malfunction.

In terms of use, the study discovered that special education teachers do not use high-tech assistive devices available in teaching students with physical disabilities in special education schools. The unused can be attributed to inadequacy of the available assistive devices and software, lack of awareness on the existing assistive devices in schools, irregular power supply and inability to operate high-tech assistive devices.

## Recommendations

Based on the findings of this study, the following recommendations were given.

- (i) Both the federal and state governments should improve on funding special education technologies so as to ensure that the necessary assistive devices are made available in a required quantity in special education schools.
- (ii) Government and other stakeholders should organize workshop, seminars and other capacity building training regularly for teachers as means of updating their knowledge and skills in the use of emerging assistive devices considering the dynamic nature of special education technology.
- (iii) Government, school administrators and other stakeholders in special education should work towards improving power supply, upgrading classrooms to a standard that will guarantee assistive technology utilization and creating awareness regarding assistive technologies available in special education schools. This will help to curb the problem of abandonment and underuse of assistive technologies in special education schools.

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