



INCLUSIVE ASSISTIVE TECHNOLOGY LEARNING APPROACHES FOR ENHANCED LEARNING AMONG STUDENTS WITH HEARING LOSS: RESEARCH IMPLICATION

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ABSTRACT

The study investigated the inclusive assistive technology learning approaches for enhanced learning among students with hearing loss: Research Implication. Three research questions and hypotheses were raised. Literature was reviewed according to the sub-variables of the study. The population of the study comprised all the students with hearing impairment in the Department of Special Education, University of Calabar, Cross River State numbering seventy-five (75) in all. Census sampling was used in selecting the sample which also represented 100% of the population of the study. The instrument used for data collection was developed by the researchers, named: "Inclusive Assistive Technology Learning Approaches Questionnaire (IATLAQ)". The instrument was validated by experts in the fields of study. The data were statistically analyzed using simple mean, standard deviation, Pearson Product Moment Correlation, and population t-test. The result showed that the types of assistive technology used by the students were significantly low. There was also a significant relationship between assistive technologies (hearing aids, Bluetooth, and cochlear implants) in motivating the academic achievement of students with hearing impairment at the University of Calabar. The result further revealed that challenges facing students with hearing loss without using assistive technology include poor vocabulary in school, difficulty in understanding classroom instructions, difficulty of expression in a class by students with hearing loss, poor academic performance, and poor participation and engagement with their hearing counterparts in school activities among others. Based on the findings, it was therefore, recommended among others that capable individual lecturers, university authorities, and governments should partner with key stakeholders in Education in order to make assistive technology devices readily available and encourage students to have access to such devices in the Special Education Departments in Universities in Cross River State, Nigeria.

Keywords: Inclusive, Assistive Technology, Learning Approaches, and Hearing Loss.

INTRODUCTION

Assistive technology has been defined by different educators and professionals around the world. According to Olayi (2017), assistive technology is a technology that “increases, improves, or maintains the functional capabilities of students with disabilities generally and those with hearing impairment”. In the common sense of the researcher of this study, assistive technology devices are equipment meant to help a person with a disability in many ways depending on the nature of the disability. For the deaf, assistive technology may be used to improve their hearing capabilities, and for the blind, their assistive technology devices may include tape recorders to record lectures and speech and also a talking calculator when solving simple mathematical problems. Assistive technology devices according to IDEA (2004) as any item, piece of equipment, or product system, whether acquired commercially or off-shelf modified, or customized, that is used to increase, maintain, or improve the functional capabilities of individuals with disabilities including those with hearing impairment. Assistive technology is also used to describe a variety of devices and services that help ensure that students with disabilities are included in a full range of social experiences and can function more independently, thus improving their quality of life. Examples of these devices include Braille machines, wheelchairs, electronic communication devices, pencil grips, and computers. Assistive technology devices can reduce barriers in the environment, enhance the ability to communicate, and also improve independence (Shikden, 2015). It enhances the educational attainment of persons with disabilities which helps them gain employment and become contributors to the development of society instead of begging on the streets. This implies that without these devices, learning for children with special needs becomes a big problem.

It is not a hear-say that assistive technology devices help those with disabilities especially those with hearing impairment. Learning can be meaningful if an individual has his/her sense organs active. The realist school of thought epistemology has it that an individual can know something through seeing, hearing, touching, smelling, and tasting because by touching or hearing a sound (speech), for instance, a connection is made between object and mind (Lantang 2016). This assertion is in line with IDEA (2004) that assistive technology device is a great equalizing force in education and meaningful inclusion of students with disabilities both in terms of access to the general curriculum and in facilitating the ability of students to demonstrate mastery of their areas of study.

This implies that promoting students’ academic achievement has been the concern and the reason for most educational research and programmes. Academic achievement of students especially at the higher level is not only a pointer to the effectiveness or otherwise of Universities but a major determinant of the future of youths in particular and the nation in general. Learning outcomes have become a phenomenon of interest to all and this account for the reason why scholars have been working hard to untangle factors that militate against good academic performance (Aremu and Sokan, 2002). The academic achievement of learners has attracted the attention of scholars, parents, policymakers, and planners. Adeyemo (2001) opined that the major goal of the school is to work towards the attainment of academic excellence by students. Everybody concerned with education places a premium on academic achievement and excellent academic achievement of students is often the expectation of parents (Osiki, 2001). Academic achievement is the educational outcome that indicates the extent to which the specific goal of education has been accomplished in an instructional environment. This is normally shown in terms of students’ scores and grades in test examinations or assignments. Magnuson

(2007) describes academic achievement as commonly measured by examination or continuous assessment but maintains that there is no general agreement on how academic achievement is best tested.

Maximize educational gains (Alnahdi, 2014). Often because of a lack of training and support, students reported they were unprepared to benefit from the available technology. Edyburn (2004) indicates there is little proof that preservice teachers receive sufficient training in the use of assistive technology to prepare them for their responsibilities to evaluate the need for, and even consider assistive technology in Individualized Educational Program (IEP) meetings. Likewise, in-service teachers have obtained inadequate preparation. Edyburn found that the majority of the members of the IEP team had little preparation in assistive technology or no training whatsoever. Similarly, Judge (2000) stated that in some special education teacher preparation programs, most of the time the course in assistive technology is not obligatory; consequently, preservice teachers do not get the preparation they need regarding assistive technology. Assistive technology devices play an important role in the education of persons with hearing impairment. Students who have hearing problems in perceiving or receiving information through their hearing organs may need hearing aids as one of the most popular assistive technology devices used worldwide by those with hearing impairment to acquire information within their environment including school. Lack of information during the teaching and learning process may hinder or slow the pace of learners with hearing impairment in the classroom. Lantang (2016) investigated the effect of assistive technology in enhancing the academic performance of students with hearing impairment in Buea, South West Region of Cameroon. The purpose of the study was to find out whether students with hearing impairment who are taught using assistive technology perform academically better than those taught without using assistive technology. The result of the study shows that assistive technology helped to improve the academic performance of students with hearing impairment. The researcher concluded the study with appropriate recommendations to the government, parents, and non-governmental organizations for proper intervention in providing these devices to hearing-impaired learners in higher institutions of learning.

In another study, Coulon (2015) explored the impact of assistive technologies in the classroom for students with disabilities. Findings indicate that when students with physical, intellectual, and developmental disabilities use assistive technology such as iPads®, software, speech generators, electronic notebooks, and computer-assisted instruction, there was an increase in academic achievement (e.g. spelling or writing skills) and an increase in student engagement. assistive technology may be effective for one student; however, it may not be effective for another student with the same disability. When making decisions about assistive technology in the classroom, teachers must consider the unique, individual needs of students.

Farooq, Aasma & Umaira Iftikhar (2017) also investigated the learning process of hearing-impaired students through assistive devices. The sample comprised 100 students of Grade 4 from seven schools of hearing-impaired children. The sample was selected purposively by proper screening of students using high-tech and low-tech assistive technologies. The sample was selected with equal participation of high and low tech. assistive technology which was being used. The selected sample also included 60 volunteer parents of children with hearing impairment to find out their perceptions regarding the assistive technology used by their children. The findings from the study revealed that the students with hearing impairment are getting benefits from the use of assistive aids and are performing differently depending upon the nature of their devices. They also reported that the students using these devices were better

performers than the students using Cochlear implants. The nature of the technology used by the students with hearing impairment also contributed to their betterment in academic achievement. They concluded that assistive technologies are good tools for students with hearing impairment, as it increases the overall learning opportunities and independence of children to make them good learners.

Svensson, Nordström, Lindeblad, Gustafson, Björn, Sand, Almgren/Bäck, and Nilsson (2019) investigated the effects of assistive technology on students with reading and writing disabilities. The study included 149 (53 girls, 96 boys) participants distributed among grades 4 and 8 in lower and middle school and year one in high school. Students and teachers were selected from various schools representing both rural and urban locations in the southern part of Sweden. According to student self-reports, assistive technology seems to work out best for students with the most severe difficulties in written language. When using assistive technology, the motivation for reading/listening to text increased and the motivation for schoolwork, in general, increased too. Several students in the study realized the benefit of having access to assistive technology in everyday schoolwork.

Smith (2012) investigated the effect of assistive technology use on the writing performance of students with developmental disabilities. Students selected for the study were in the 10-12th grades in a self-contained function skills classroom. The study found that students made significant gains in both writing speed as well as the mechanics of writing when using the co-writer software. In general, when using Co-Writer students increased both the number of total words written and well as the number of correct writing sequences. The use of a Co-writer seemed to have a larger effect on the total words written a measure of speed and a smaller effect on the correct writing sequences measure of writing mechanics. Based on the findings from their study, the use of assistive writing technology to increase the writing skills of students with developmental disabilities is promising. This means that schools should provide assistive technology for students with hearing impairment to help them learn better,

Mull and Sitlington (2003) reviewed the literature regarding the use of assistive technology to help students with learning disabilities that succeeded after leaving high school. Based on their comprehensive review of the literature, they came up with the following: the demands of the postsecondary environment should align with assistive technologies that need to be employed. Properly training students in the use of assistive technology will help them to increase their educational goals (Alnahdi, 2014). Assistive technology could play a significant role in helping students with disabilities overcome academic difficulties. Examples of the important role that technology can play in helping students to overcome academic difficulties can be found in the study conducted by McInerney, Riley & Osher (1999) who examined six research projects conducted on students with hearing disabilities. They found that text highlighting and supportive captions with digital instructional material resulted in consistent academic gains for students with hearing disabilities (Alnahdi, 2014).

Spencer, Bruce, Gantz, and Knutson (2004) also investigated the outcomes and achievements of students who grew up with access to cochlear implants. This was a retrospective study using consecutive referrals of prelingually, profoundly deaf children at the University of Iowa Hospitals and Clinics. Twenty-seven prelingually deaf young adults who received a cochlear implant between the ages of 2 12 years participated. Outcome measures included device-use information, perceptual information, reading results for all participants and educational achievement results for 17 of 27 participants, educational placement information/vocational information for all students, as well as a comparison of the child's

educational/vocational outcome with that of the parent's educational/vocational outcome. Speech perception and production scores were highly correlated. Achievement test results indicated that scores were within 1 SD from normative data based on hearing individuals. Over 50% of college-age eligible students enrolled in college. This initial group of implant users had a nonuse rate of 11% in the first 3 years. Eighty-nine percent of the users maintained full-time use for 7 years, and 71% of this group have maintained full-time use to date. This cohort of cochlear implant users compared favorably with their hearing peers on academic achievement measures. Although there was a wide distribution of educational and vocational outcomes, the children tended to follow the educational/vocational patterns of their parents.

Statement of the Problem

Education is a primary need in this time of globalization. This implies that education does not only give insight but also grows the personality, inculcates moral values, added knowledge, and gives skill. It accommodates diversity whereby those living with disability are not left behind in every tier of education because the state has the sole role to provide quality education to every child, student, and citizen. However, it has been observed that there is a large gulf in academic achievement between students who are deaf and their counterparts who are not. This poses a huge problem, not only to the researcher but also to the individuals themselves, because, as a result of this perceived poor academic achievement, many special needs particularly students with hearing impairment have dropped out of school thereby undermining their prospects. This can hinder their contribution to national development and can also pose a security challenge to the country, as these individuals may become nuisances to the society where they are found. This poor academic achievement of students may be attributed to one of the following reasons: Lack of interpreter during lectures, lack of assistive technology equipment like cochlear implants, infrared systems, hearing aids, loop systems, the attitude of lecturers and hearing counterparts, laziness on the part of the students (persons with hearing impairment), negative attitude of students with hearing impairment towards assignments, continuous assessment, and preparation for the examination and lack of effective communication. It is this above problem that prompted the researcher to study the assessment of assistive technology in motivating academic achievement among students with hearing impairment in the university of Calabar, Cross River State, Nigeria

Research Questions

1. What are the possible challenges Facing Students with hearing impairment without using Assistive Technology?

Research Hypotheses

1. The level of assistive technology (hearing aids, Bluetooth, and Cochlear implants) used by the students with hearing impairment is significantly low
2. This hypothesis states that there is no significant relationship between assistive technologies (hearing aids, Bluetooth) in motivating the academic achievement of students with hearing impairment.
3. There is no significant relationship between the uses of cochlear implants in motivating academic achievement of students with hearing impairment in the study area

RESEARCH METHODS

The population for the study involved all students with hearing impairment in the Department of Special Education, University of Calabar, Cross River State numbering seventy-five (75) in all. The population was obtained from the National Association of deaf students, UNICAL Chapter. The sampling technique used for this study was census sampling since all the population was used in the study. All the respondents (75 students) with hearing impairment in the Department of Special Education, University of Calabar, Cross River State were used as samples for the study. The instrument that was used by the researcher of this study to collect information about respondents regarding this study was a questionnaire. The instrument was titled “the use of assistive technology in motivating academic achievement of Students with hearing impairment in the University of Calabar (UATMAASHI)”. The instrument consisted of twenty-seven (27) items. The instrument comprised of two sections: A and B. Section A was demographic requesting the respondents to indicate their sex, age, and level of study. Section B consisted of 24 items which were based on a modified 4-point scale ranging from strongly Agree (SA), Agree (A), Disagree (D), and Strongly disagree (SD). The researcher after constructing the items for the questionnaire submitted it to three experts: two (2) in the researchers’ department and one expert in measurement and evaluation for necessary corrections to be made. With all the corrections noted and affected, the questionnaire was considered valid for use. The researchers administered the questionnaires to the respondents in their lecture halls. The researchers read and signed out the items in the questionnaire to the respondents and asked them to tick the best option that shows their opinion. The researcher checked the instrument on the printed copy base on the opinion of the respondents. The researcher waited patiently to get the instrument back and this contributed to the 100% rate of return. The statistical test was adopted by the researcher to analyze data after the collection was chi-square with the aid of Statistical Package of Social Science (SPSS) software. This was used in analyzing data on the relationship between assistive technologies in motivating the academic achievement of students. A mean value of 2.50 was also used as a benchmark. This implies that any value that is 2.50 and above was accepted and any mean value that is below 2.50 was rejected. The hypotheses were also tested using Pearson Product Moment Correlation Coefficient (PPMC) and population t-test.

Presentation of result

In this section, each of the hypotheses of the study was re-stated, the independent and dependent variables identified as well as a description of the statistical analysis technique used to test the hypothesis. Pearson Product Moment Correlation Coefficient (PPMC) was used to analyze the second and third hypotheses while the population t-test was used to analyze the first hypothesis due to the nature of the variables involved and were all tested at 0.05 level of significance.

Research question one

What are the possible challenges Facing Students with hearing impairment without using Assistive Technology? To answer this research question, the mean and standard deviation was employed as presented in Table 1.

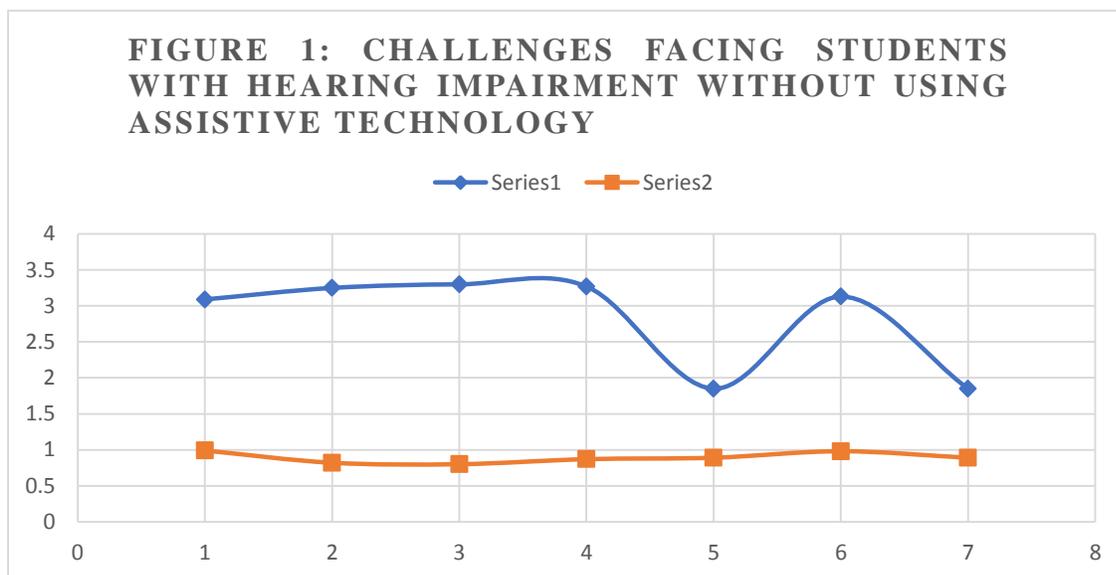
Table 1: Challenges facing students with hearing impairment without using assistive technology

S/N	Challenges facing students with hearing impairment without using assistive technology.	Mean (X)	SD	Remark
1.	Students with hearing impairment (SHI) without the use of assistive technology devices develop poor vocabulary in school.	3.09	0.99	A
2.	SHI finds it very difficult to understand teachings in the classroom without assistive technology devices.	3.25	0.82	A
3.	SHI without assistive technology devices find it very difficult to express themselves in classrooms.	3.30	0.80	A
4.	SHI without assistive technology devices does not perform well academically in school.	3.27	0.87	A
5.	SHI without assistive technology devices have poor writing, reading, and learning abilities.	1.85	0.89	D
6.	SHI without assistive technology devices do not participate and engage well with their hearing counterpart in school activities.	3.13	0.98	A
7.	SHI without assistive technology devices develop poor self-confidence and a low level of independence in school.	1.85	0.89	D

Criterion Mean (X) = 2.50; SD = Standard Deviation; A = Agree; D = Disagree

Table 1 shows the mean, standard deviation, and line graphs of challenges facing students with hearing impairment without using assistive technology. The analysis reveals that the challenges facing students with hearing impairment without using assistive technology to items 1, 2, 3, 4, and 6 are more than the 2.50 criterion mean. In addition, it reveals that the respondents disagreed on items 5 and 7 as challenges facing students with hearing impairment without using assistive technology. This implies that items 1, 2, 3, 4, and 6 are the challenges facing students with hearing impairment without using assistive technology. Consequently, the students agree that the challenges facing students with hearing impairment without using assistive technology include poor vocabulary in school, difficulty in understanding teachings in the classroom, the difficulty of students with hearing impairment to express themselves in classrooms, poor academic performance, poor participation and engagement with their hearing counterpart in school activities.

Figure 1:



Hypothesis 1:

The level of assistive technology (hearing aids, Bluetooth and Cochlear implants) used by students with hearing impairment is significantly low. To test this hypothesis, one sample t-test was employed as shown in Table 2.

Table 2: level of assistive technology (hearing aids, Bluetooth, and Cochlear implant) used by the students with hearing impairment

Sample Mean	Population mean	t-Calculated	Critical. t-value	df	Ls	Remark
6.20	6.16	0.22	2.000	74	0.05	Significant

Level of Significance at 0.05, degree of freedom = 74, Tab value= 2.000, Cal value= 0.68

From Table 2, it was observed that the calculated t value of 0.22 is less than the critical t value of 2.000 at 0.05 level of significance and 74 degrees of freedom. This indicates that the null hypothesis which states that the type of assistive technology used by the students with hearing impairment in the University of Calabar is significantly low was accepted and rejected indicating a significantly low level towards the use of these assistive technology devices.

Hypothesis 2

This hypothesis states that there is no significant relationship between assistive technologies (hearing aids, Bluetooth) and the academic achievement of students with hearing impairment. In testing this hypothesis, assistive technologies were used as the independent variable (x), while the academic performance of hearing impairment was used as the dependent variable (y) and the Pearson Moment Correlation Analysis (PPMC) The analysis of this hypothesis, is presented in Table 3.

Table 3: Pearson Moment Correlation Analysis of the relationship between assistive technologies (hearing aids and Bluetooth) and academic achievement of students with hearing impairment

Variable	$\sum x$ $\sum y$	$\sum x^2$ $\sum y^2$	$\sum xy$	Cal. t-value
Hearing aids and Bluetooth (X)	193	3739	3467	0.68
Academic achievement (Y)	179	3227		

Level of Significance at 0.05, degree of freedom = 73, Tab value= 0.250, Cal value= 0.6
From Table 3 it can be observed that the calculated r-value of 0.68 is greater than the critical r-value of 0.250 at a 0.05 level of significance and 73 degrees of freedom. This indicates that the null hypothesis of no significant relationship between assistive technologies (hearing aids, Bluetooth) in motivating academic achievement of students with hearing impairment at the University of Calabar was rejected. The result then revealed that there is a significant relationship between assistive technologies (hearing aids, Bluetooth) in motivating academic achievement of students with hearing impairment in the study area.

Hypothesis 3

There is no significant relationship between the use of cochlear implants in motivating the academic achievement of students with hearing impairment in the study area
The analysis of this hypothesis is presented in Table 4.

Table 4. Pearson Moment Correlation Analysis of the relationship between the uses of cochlear implants in motivating academic achievement of students with hearing impairment at the University of Calabar

Variable	$\sum x$ $\sum y$	$\sum x^2$ $\sum y^2$	$\sum xy$	Cal. t-value
Cochlear implant (X)	144	3739	2588	0.62
Academic achievement	179	3227		

Level of Significance at 0.05, degree of freedom = 73, Tab value= 0.250, Cal value= 0.62

The result of the above analysis as presented in Table 4 shows that the calculated r-value of 0.62 is higher than the critical r-value of 0.250 at a 0.05 level of significance and 73 degrees of freedom. The alternate hypothesis was retained. This result, therefore, implies that there is a significant relationship between the use of cochlear implants in motivating the academic achievement of students with hearing impairment at the University of Calabar. This proves that students who use cochlear implants will have better academic achievement than students who do not use a cochlear implant.

DISCUSSION OF FINDINGS

The study findings were discussed based on the research questions and hypothesis as shown below.

Challenges Facing Students with hearing impairment without using Assistive Technology

The descriptive analysis showed that the challenges facing students with hearing impairment without using assistive technology include poor vocabulary in school, difficulty in understanding teachings in the classroom, the difficulty of students with hearing impairment to express themselves in classrooms, poor academic performance, poor participation and engagement with their hearing counterpart in school activities. In addition, the finding revealed that the students disagreed that students without assistive technology have poor writing, reading, and learning abilities and poor self-confidence, and low level of independence in school. This finding agrees with McNicholl, Casey, Desmond, and Gallagher (2019) who found that students with disability without the use of assistive technology have poor academic engagement and social participation. This finding, therefore, reveals that assistive technology has the potential to support students with hearing impairment engagement with their academic work. This includes enabling students with hearing impairment to perform common academic tasks more easily, allowing students with hearing impairment to access and engage with educational material related to their course, increasing their learning, and promoting improved academic performance. Malcolm and Roll (2017) in their studies measured the impact of assistive technology and found that assistive technology use, in general, was associated with increased performance in educational tasks such as note-taking, test-taking, studying, reading, and writing for students with disability. Bhardwaj and Kumar (2017) also reported that assistive technology improved grades or enabled students with disability to perform better. Assistive technology use was also shown by McNicholl Casey, Desmond & Gallagher (2019) to increase social interactions, provide opportunities for learning support, promote active engagement with peers in course-related discussions, promote engagement in clubs or groups and encourage the creation of a social group of AT users. If the students with hearing impairment at the University of Calabar can utilize assistive technology in school, it may not only enhance the performance of academic tasks and learning but may also provide additional opportunities for integration and more diverse social interactions

The level of assistive technology (hearing aids, Bluetooth, and Cochlear implants) used by the students with hearing impairment

The result of this hypothesis revealed that the level of assistive technology (hearing aids, Bluetooth, and Cochlear implants) used by students with hearing impairment is significantly low. The respondents from this study reported they had very low or no usage of these assistive technology types. Many kinds of literature on students' use of assistive technology has also reported significantly low levels which may be because they do not have the knowledge, skills, and experiences that are necessary for using assistive technology (Prensky, 2001). Almekhalfi (2011) stated that students with disabilities were deprived of access to assistive technology devices. They also reported a positive result towards the use of assistive technology by students which is due to inadequate training and the inability of the students to maintain these devices. This calls for the need for students with hearing impairment to be fully knowledgeable about assistive technology devices and their usage if they want to become lifelong learners who can use and manipulate information now and in the future. Providing access to assistive technology is not the resolution. Expertise in its usage must be aligned with its importance (Michaels, Prezant, Morabito & Jackson, 2002). Students with hearing impairment need to consider the

types of assistive technology available to them and how they could use these devices and integrate them into their everyday learning.

The finding of this study also agrees with the study of Kaye *et al.* (2008) who reported that rate of assistive technology use among students with disabilities is significantly low and increasing. Bouck *et al.* (2011) in their study also reported that 7.8% of students were using assistive technology devices in school while a higher percentage (92.2%) were reportedly not using assistive technology devices.

The influence of assistive technologies (hearing aids, Bluetooth) in motivating academic achievement of students with hearing impairment at the University of Calabar.

The result of this hypothesis revealed that there is a significant relationship between the use of hearing aids and Bluetooth in motivating the academic achievement of students with hearing impairment at the University of Calabar. This finding agrees with the findings of Lantang (2016) who reported that assistive technologies such as hearing aid helped to improve the academic achievement of students with hearing impairment. Lantang also asserted that assistive technologies such as hearing aids are significant as it helps to improve the learning of students with hearing impairment and help students with hearing impairment to perform better academically. The findings from this study justify that there is a need for students with hearing impairment at the University of Calabar to be provided with enough hearing aids that could help them in the teaching and learning process, thus, improving their academic achievement. Hearing aids are worn by learners with hearing impairment in their ears to help to amplify sounds, hence helping them to hear sounds in the process of teaching and learning (Booth & Ainscow, 2003). Rishaelly (2017) in his study also revealed that variables like regular use of hearing aids and Bluetooth have a vital role to play in the academic achievement of students with hearing impairment. URT (2008) also added that curriculum and teaching such as lack of hearing aids can be barriers to students with hearing impairment during the learning process. Analysis of the impact of hearing aids on speech understanding for students with hearing impairment by Robyn, Jani & Jingjing (2014) also students reacted positively to hearing aids. The speech understanding and quality of life of the students were substantially improved with hearing aids. A recent study by Jamie Desjardins Ph.D, an assistant professor in the speech-language pathology program at the University of Texas at El Paso, found that hearing aids improve brain function in persons with hearing loss. Desjardins (2016) studied a group of individuals in their 50s and 60s with hearing loss who had previously never used hearing aids. They took cognitive tests to measure their working memory, selective attention, and processing speed abilities before and after using the hearing aids. After two weeks of hearing aid use, tests revealed an increase in percent scores for recalling words in working memory and selective attention tests, and the processing speed at which participants selected the correct response was faster. By the end of the two weeks, participants had exhibited significant improvement in their cognitive function.

Assistive technology (cochlear implants) and academic achievement of students with hearing impairment.

The result of this hypothesis revealed that there is a significant relationship between the use of hearing aids and Bluetooth in motivating the academic achievement of students with hearing impairment at the University of Calabar. This finding agrees with the findings of Farooq *et al.* (2017) who reported that the students using cochlear implants were better performers than the students not using Cochlear implants. They also asserted that a cochlear implant is a good tool for students with hearing impairment, as it increases the overall learning opportunities and independence of students to make them good learners. Tajudeen *et al.* (2010) also reported that

the use of a cochlear implant gives a deaf child the possibility of acquiring communication skills as good as those of their hearing peers. The finding from this study is also in agreement with the findings of Zgoda *et al.* (2019) who evaluated the scores on a primary school competency test from children using cochlear implants and compared them with scores from their typical hearing peers from Poland. The mean scores achieved by the students with a cochlear implant who did the standard version of the school test were slightly better than the mean results of the typical hearing group sitting on the same test. Spencer *et al.* (2004) equally found out that the outcomes and achievement of students who grew up with access to cochlear implants compared favorably with their hearing peers on academic achievement measures. Cochlear implants can provide many students with hearing impairment with greater access to sound than ever before. By having greater access to sound, and to spoken language in particular, those students with cochlear implants frequently gain greater speech reception and speech intelligibility when compared to peers who do not use cochlear implants (Marschark, Sarchet, Sapere & Convertino, 2019). The finding of this study also correlates with the study of Duarte, Santos, Rego & Nunes (2016) who evaluated the impact of cochlear implants on the school failure of students with hearing impairment who attend mainstream classes by comparing them to their normal-hearing peers as well as deaf without cochlear implants. They reported that cochlear implants provide educational opportunities for hearing-impaired students, yet those without cochlear implants remain at a great disadvantage. They also reported that the median percentages of repeated school years of the cochlear-implanted students were lower than that of students without cochlear implants which further suggested that cochlear implants reduced the number of school failures. Duarte *et al.* (2016) also reported that deaf students without cochlear implants appear to fail more than deaf students with cochlear implants. Several studies have also reported that students with a cochlear implant can benefit considerably from cochlear implants (Peixoto, Spratley, Oliveira, Martins, Bastos & Ribeiro, 2013). Although the cochlear implant does not transform a student who has hearing impairment into a normal-hearing child, it helps students with hearing impairment make gains despite their remaining educational needs and challenges (Chute & Nevins, 2006). Venail, Vieu, Artieres, Mondain & Uziel (2010) submitted that to minimize delays in schools and improve academic success, early oral education and cochlear implantation are important.

The finding from this study also agrees well with that of Spencer, Tomblin & Gantz (2012) who carried out a study involving 41 participants with cochlear implants. They found that these individuals reached high levels of educational achievement and reported very high levels of satisfaction with life, comparable to those without a cochlear implant

SUMMARY OF THE FINDINGS

1. The result indicated that the type of assistive technology (hearing aids, Bluetooth, and cochlear implants) used by the students was significantly low.
2. The findings revealed that assistive technologies such as Bluetooth, hearing aids, and cochlear implants can significantly motivate the academic achievement of students with hearing impairment.
3. The study also indicated that poor vocabulary in school, difficulty in understanding teachings in the classroom, the difficulty of students with hearing impairment to express themselves in classrooms, poor academic performance, and poor participation and engagement with their hearing counterparts in school activities are some of the challenges faced by students with hearing impairment without the use of assistive technology.

SUMMARY OF THE STUDY

The main purpose of the study was to assess the use of assistive technology in motivating the academic achievement of a student with hearing impairment at University of Calabar. The assistive technologies were based on three sub-variables which include: types of assistive technology used, uses of hearing aids, and Bluetooth and cochlear implants. Research questions and three null hypotheses were formulated and tested at a 0.05 level of significance to guide the study. The study made use of one theoretical framework. A literature review was done based on the sub-variable enlisted for the study.

The population of the study comprised seventy-five (75) students from the Department of Special Education, University of Calabar. Census sampling was used in selecting all the respondents (75 students) with hearing impairment in the Department of Special Education, University of Calabar, Cross River State were used as samples for study which constituted 100 percent of the entire population. The instrument used for data collection was developed by the researcher named: “the use of assistive technology in motivating academic achievement of a student with hearing impairment in University of Calabar (UATMAASHI)”. The questionnaire was divided into three sections (A and B). The instrument was validated by two lecturers in the researchers’ department and one (2) expert in measurement and evaluation. Data were collected and analyzed, using mean, standard deviation, Pearson Product Moment Correlation, and population t-test. The result of the analysis revealed that:

1. The types of assistive technology (hearing aids, Bluetooth, and cochlear implants) used by the students are significantly low.
2. There is a significant relationship between assistive technologies (hearing aids, Bluetooth) in motivating the academic achievement of students with hearing impairment at the University of Calabar.
3. There is a significant relationship between the uses of cochlear implants in motivating the academic achievement of students with hearing impairment at the University of Calabar.
4. Challenges facing students with hearing impairment without using assistive technology include poor vocabulary in school, difficulty in understanding teachings in the classroom, the difficulty of students with hearing impairment to express themselves in classrooms, poor academic performance, and poor participation and engagement with their hearing counterpart in school activities.

CONCLUSION

From the study findings of this study, it can be concluded that assistive technologies such as Bluetooth, cochlear implants, and hearing aids can be used to motivate the academic achievement of students with hearing impairment in the Department of Special Education, University of Calabar. Findings from the study showed a significant relationship between these devices in motivating students’ academic achievement. The result also showed that the uses of these devices by the students were significantly low. This study also showed that students with hearing impairment without assistive technology faced challenges in school such as poor vocabulary in school, difficulty in understanding teachings in the classroom, the difficulty of students with hearing impairment to express themselves in classrooms, poor academic performance, and poor participation and engagement with their hearing counterparts in school activities.

The introduction of assistive technology in the Department of Special Education, University of Calabar is a giant and magnificent effort towards academic excellence. Hence, the importance of assistive technology in education cannot be overemphasized. Educational administrators should put more effort to ensure that these assistive technology devices are available and in good condition for the effective delivery of lectures and students when and due.

RECOMMENDATIONS

Based on the findings made from this study, the following recommendations were made;

- i. That the government, NGOs, parents, immediate community, rehabilitation centers, and the school should partner with key stakeholders in education and make available assistive technology devices for students in higher institutions.
- ii. Students should be trained on the utilization of adaptive technology devices to improve the teaching and learning of students with hearing impairment.
- iii. Students and all stakeholders of institutions managing students with hearing impairment should be sensitized about the enormous benefits associated with assistive technology so that everybody can work towards embracing it for sustainable educational independence.
- iv. Lecturers should be given skills-improving services such as workshops, training, and seminars, which will increase their ability to handle modern technology for delivering their services.

RESEARCH IMPLICATION

Research is a very important area of discipline irrespective of one's professionalism. This is because of its relevance to all in the noble profession. The primary aim of every research undertaking is to facilitate the search for knowledge. It shows how to make provision for solutions to problems in a scientific and methodical manner. In implication, research is a systematic effort to acquire new knowledge in all disciplines. In the educational field, research is termed as providing solutions to any educational problem. As it focused on the intensive process of carrying out a scientific method of analysis. The main purpose of educational research is to focus on scientific investigation and provide solutions to problems in the field of education. In social science, research represents an activity, directed toward the development of an organized body of scientific knowledge about the events with which educators are concerned. To this end, educational research is the part of behavioral sciences, in which, emphasis has been put upon understanding, explaining, predicting, and to some degree controlling human behaviour. Irrespective of the area of discipline, research is a method of scientific analysis to produce information, needed to make improvements in educational planning, decision-making, teaching and learning, curriculum development, use of instructional media, school organization, and education management. In implication research in all fields enables substantial progress to be made in curriculum development and reform, educating slow learners, understanding the psychological traits of physically challenged individuals, and adapting methods of instruction to the needs of individual learners

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