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Effects of Visual Aids on the Achievement of Persons with Hearing Impairment in Mathematics in Special School, Hadejia, Jigawa State, Nigeria

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Abstract

This study examined the effects of visual aids on the achievement of persons with hearing impairment in mathematics in special school, Hadejia Jigawa State, Nigeria. The study was guided by two research objectives, two research questions and two null hypotheses. A Quasi-experimental pre-test, post-test non-equivalent design was adopted in the study. The population of the study consisted of 274 students, comprising both female and male, out of which a total of 35 students were sampled using purposive sampling technique. Data for the study were collected using Mathematics Achievement Test and analysed statistically using descriptive statistics (frequencies, mean and standard deviation) and inferential statistics (independent t-test). The Major findings revealed among others, that a difference existed in the mean scores of students before and after exposure to treatment. A high magnitude of positive effect of visual aids on the achievement of students in mathematics was recorded. Also, the analysis of the results revealed that, there was no significant different between the male and female students achievement in the experimental group. Some recommendations were made, among which that the teachers should take into cognizant, the use of visual aids while teaching Mathematics to students with hearing impairment as this can improve Students' achievement in the subject.

Keyword: *visual aids, persons with hearing impairment, achievement in mathematics and special school*

Introduction

The world today is witnessing rapid growth and development in technology, as such; students were groom with mathematical knowledge in order to function in technological society. Mathematics is a subject that equipped students with essential knowledge of science and technology and enables them to solve a practical problem that involves arithmetic. National Mathematics Advisory Panel, (2020) viewed Mathematics as something that an individual used daily because it affects human life in all ramifications.

In Nigeria, people used mathematical knowledge in all their daily transactions. Due to the relevance of Mathematics in the life of an individual, it has occupied a central position in the school curriculum and remained a core subject from basic classes to secondary level of education. The importance of Mathematics in the curriculum is borne out of the role it plays in national development. Dauda (2014) consider Mathematics as the important subject not only from the points of view of getting an academic qualification in tertiary institutions, but it is also a subject that prepares students for the future regardless of the work the person will do in life. Mefor (2014) summarizes it all by saying that Mathematics is connected to daily life and everybody's lifelong planning. Mathematics is an indispensable subject in education and human life. Simply because, one cannot function effectively in the society without the knowledge of Mathematics and the economic development of a given nation depends largely on it.

In Nigeria, the government has confirmed the importance of Mathematics by making it a core and compulsory subject at junior and senior secondary levels (Federal Republic of Nigeria [FRN], 2004). Despite all the efforts put in developing an acceptable general Mathematics curriculum, students' achievement appeared to be declining over the years (Shitu, 2015). The poor achievement of students in Mathematics hindered the realisation of the objectives of mathematics education, could it be because of the schools' locations as argued by some scholars? Shitu, (2015) reported in a study that students in urban area performed below those in rural area because the educational institutions in urban share common features of learning impediments such as reading retardation, high absenteeism, drug abuse, students' vandalism, apathy and overcrowding in a class account for the cause of poor achievement of students in Mathematics in urban schools as compared to schools in rural areas. The persistence poor achievement in mathematics does not limit to regular secondary school student, the menace also elongated to students in special education or inclusive education settings. Literature has shown that students in regular schools performed significantly higher in mathematics as compare to students in special education setting (Dauda, 2014). Specifically, Persons with hearing impairment achievement in problem solving tasks and word problems fall below that of their hearing counterpart.

Ayse, et al, (2015) stated that learners with hearing impairment can learn Mathematics just as their hearing counterparts but with delay and difficulty and it make them to be behind in Mathematics' achievement. Gender of persons with hearing impairment is a mediating variable that can also affect students' performance in mathematics. This follow the general belief that Mathematics is a male domain which makes young girls always feel discouraged about studying Mathematics. Particularly in Nigeria, where boys hold more positive attitudes toward Mathematics than girls, the expectation of male students having a good problem-solving behaviour made boys more confident than the girls who felt insecure in the subject (Shitu, 2015). More so, in mathematics instruction for person with hearing impairment, the use of visual aids such as diagram, map and projector enhance and stimulate learning ability, regardless of the

gender or physical defect of the learners, instructional materials such as visual, audio and audio-visual aids help students to learn at the same pace because it carries all the learners along.

Furthermore, Visual aids are items which the teacher uses to make lesson real and enjoyable, the visual aids provide concrete and realistic experience that make learners develop faster understanding of the concept to be learned. The importance of good visual aids in any educational system especially in teaching persons with hearing impairment cannot be overemphasized. Providing Mathematics teachers with effective visual aids would support them in performing their duties professionally. Owino, (2011) states that learners with hearing impairment lack required resources and skills needed for solving Mathematic problem. Nwafor and Aboniyi, (2016) carried out a study on pre-school knowledge and attitude towards the use of visual media in instruction when teaching mathematics but did not include strategies for enhancing performance in Mathematics among classes 5-8 learners with hearing impairment which create a gap that need to be filled. In essence, the researcher desires to check whether using visual aids in teaching Mathematics to persons with hearing impairment can yield positive result since many researches were carried out to find the causes of poor achievement of students in Mathematics.

AIM AND OBJECTIVES OF THE STUDY

The aim of the study is to find out the effects of visual aids on mathematics achievement of persons with hearing impairment in Special School Hadejia, Jigawa State, Nigeria. Specifically, the researcher intends to find out:

1. The extent to which the use of visual aids enhances the mathematics achievement score of persons with hearing impairment in special school Hadejia, Jigawa state, Nigeria.
2. The mathematics achievement of persons with hearing impairment who exposed to visual aids based on gender.

RESEARCH QUESTIONS

The following research questions were formulated to guide the study:

1. What is the mathematics achievement score of persons with hearing impairment after exposure to intervention?
2. To what extend does mathematics achievement of persons with hearing impairment who exposed to visual aids differ according to gender?

HYPOTHESES

The following null hypotheses were made for this study and tested at 0.05 level of significance:

1. There is no significant difference between the mathematics achievement mean score of persons with hearing impairment taught with visual aids and those taught without visual aids.
2. There is no significant difference between the mathematics achievement mean score of male and female persons with hearing impairment in the experimental group.

METHODOLOGY

This study used a quasi-experimental design, specifically the pre-test, post-test non-equivalent control group design. The population of the study consisted of all the classes in Special School, Hadejia Local Government Area of Jigawa State with 274 students made up of 190 males and 84 females (school record, 2025). Simple random sampling technique was used in selecting SS I

class out of twelve available classes in the study area. The two arms of SS I were used as intact classes. The experimental group has 20 students, while the control group has 15 students, giving a sample of 35 SS I students. Therefore, the choice of sample size of 35 students was in line with the view of Muhammad (2013) who stated that the central limit theory recommended that for every experimental study sample size of 30 participants is effective. The instrument for data collection was Mathematics Achievement Test with 25 multiple-choice items that was designed to assess students with hearing impairment level of mathematics achievement. The face and content validity were established with the help of three experts two from Research, Measurements and Evaluation unit and one from Mathematics Education unit of University of Jos. The reliability of the instrument was determined using Kuder-Richardson formula 20 (KR-20) and coefficient of 0.82 was obtained. The intervention was administered to experimental group using visual aids while the control group was taught with conventional method. The researcher adopted the descriptive statistics (mean and standard deviation) to answer the research questions while inferential statistics (independent t-test) was used to test the hypothesis at 0.05 level of significance.

Results

Answering of Research Questions

Research question One.

What are the mathematics achievement scores of persons with hearing impairment after exposure to intervention?

Table 1

Showing the Mean Achievement Scores of Students in Mathematics in The Experimental and Control groups.

Group	N	X	SD	Gain score
Experimental	20	59.20	20.13	
				24.66
Control	15	34.53	16. 186	

Source (Field work, 2025)

Table 1 showed the mean and standard deviation of person with hearing impairment achievement in mathematics. The analysis revealed that the experimental group had a post-test mean achievement score of 59.20 with a standard deviation of 20.13, while the control group had a post-test mean achievement score of 34.53 with a standard deviation of 16.186. The mean gain score of the experimental and control groups was 24.66. This implies that exposure to visual aids enhances the mean achievement scores of persons with hearing impairment in mathematics. Also, the use of visual aids was effective in teaching mathematics.

Research Question Two

To what extend does mathematics achievement of persons with hearing impairment who are exposed to visual aids differ according to gender?

Table 2
Showing the mean achievement score of Male and Female in Mathematics in the Experimental Group.

Group	N	X	SD	Mean difference
Male	11	59.821	8.099	
				1.38
Female	9	59.443	3.495	

Source (Field work, 2025)

Table 2 showed the post-test mean achievement and standard deviation in mathematics of male and female persons with hearing impairment in the experimental group. The results indicated that male had a mean score of 59.821 with standard deviation of 8.099, while female had a mean score of 59.443 with standard deviation of 3.495. The mean gain difference in mathematics was 1.38. This implies that male recorded higher mean score than that of the female mean score. Indicating that male benefited more from the intervention given to the Experimental Group.

Answering of hypotheses

Hypothesis One

There is no significant difference between the mathematics achievement mean scores of persons with hearing impairment taught with visual aids and those taught without visual aids.

Table 3

Showing Statistical value for testing hypothesis one

Group	N	X	SD	DF	T-value	P-Value
Experimental	20	59.20	20. 133			
				33	3.891	0.000
Control	15	34.53	16.186			

Source (Field work, 2025)

Table 3 showed that the probability associated with t-value (3.891) at $p \geq 0.05$ level of significance for hypotheses one was 0.000. Since the probability value of 0.000 is less than 0.05 level of significance set as a bench mark in the present study, the null hypothesis was rejected. This implies that there was significant difference between the mathematics achievements mean scores of the persons with hearing impairment taught with visual aids and those taught without visual aids in Special school Hadejia.

Hypothesis Two

There is no significant difference between the mathematics achievement mean scores of male and female persons with hearing impairment in the experimental group.

Table 4

Show Statistical value for testing research hypothesis 2

Group	N	X	SD	DF	T-value	P-Value
Male	21	59.82	18.099			
				18	.148	.884
Female	14	58.44	23.495			

Source (Field work, 2025)

Table 4 showed that the probability associated with t-value (.148) at p $\geq$0.05 level of significance for hypotheses two was .884. Since the probability value of .884 is greater than 0.05 level of significance set as a bench mark in the present study, the null hypotheses was retained, indicating that there was no significant difference between the mean scores of the male and female persons with hearing impairment taught in Mathematics with visual aids in Hadejia. This implies that the male and female are at the same ability level and comparable.

Discussion of Result

The study was on the effects of visual aids on achievement of persons with hearing impairment in Mathematics in special school Hadedia, Jigawa State, Nigeria. Data was collected, analysed, interpreted and the outcome was discussed in line with the research questions and formulated hypotheses.

The first research question sought to find out the extent to which the use of visual aids enhanced the mean achievement score of persons with hearing impairment in Mathematics in special school Hadejia Jigawa State. The result revealed that exposure to visual aids enhanced the mean scores of the persons with hearing impairment in Mathematics. That is, the use of visual aids was effective in teaching Mathematics to persons with hearing impairment. The finding agreed with that of Apondi (2015) who found out that children taught mathematics using instructional materials perform better than those taught mathematics using abstract mathematics symbols. Similarly, the finding aligns with the view of Vera and Alexander (2017) on effectiveness of using instructional material in teaching mathematics to students.

Furthermore, the research question two was on ascertaining the extent to which achievement in Mathematics of persons with hearing impairment exposed to visual aids differs according to gender. The findings indicated that there was a noticeable difference between experimental and control groups. The mean scores of students with hearing impairment exposed to visual aids were higher compared to those who were not exposed. The result implies that gender did not affect the persons with hearing impairment achievement in Mathematics when taught with visual aids. Indeed, the finding is in disagreement with the findings of Ayodele, et al. (2014) whose investigation indicated that achievement in Mathematics of male students out weighted that of female students. The variation in the findings may be because the former used persons with hearing impairment and the later used normal students and in a single topic. This findings aligns with earlier finding of Vale (2009) who reported that many studies conducted between 2000 and 2004 in Australasia showed no significant difference in achievement in Mathematics

between male and female students.

Conclusion

The analyses of the result presented and the discussion that followed showed that visual aids had effects on the achievement of persons with hearing impairment. Hence, the study revealed that the male and female scores did not differ significantly, and implied that persons with hearing impairment are at the same ability level and comparable. The reason is that visual aids enable students to remember easily and answer questions correctly, it also helps in concretizing the abstract concept or symbols. Since, persons with hearing impairment cannot hear via verbal instruction it help in maintaining their attentiveness during the process of teaching and learning

Recommendations

The recommendations given are drawn from the discussion, observations and implication of this study; they are suggested for teachers, students, curriculum planners and government.

1. Teachers should bear in mind that the use of related visual aids in teaching Mathematics to persons with hearing impairment enhanced the effectiveness of their teaching.
2. Seminars, workshop, conferences and symposiums should be organized regularly in order to train Mathematics teachers on how to use visual aids during the teaching and learning process of persons with hearing impairment
3. Students should be encouraged to engage intensively on the process the teacher adopted during the teaching of Mathematics with visual aids
4. Adequate facilities and visual aids related to each topic in Mathematics should be provided by government, donor agencies, parents, and old students associations to facilitate the learning of persons with hearing impairment
5. Curriculum planners should include the use of visual aids as a means of teaching persons with hearing impairment in the next review of the mathematics curriculum

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