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Effect of Hands on Instructional Activities on Students Retention of Mathematics Concepts Among Senior Secondary Schools in Jalingo Metropolis

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Abstract

This study focuses the effect of Hands on Instructional Activities in Students' Retention of Mathematics concepts in Jalingo Metropolis. The area of the study was carried out in Jalingo local government area. The research design used for the study was Quasi- experimental design. The population for the study was made up of all the senior secondary school Students. A total population of 5,236 students made up the study out of which 2,431 were female and 2,805 were male. A sample of thirty (30) students were considered for the findings from Government College Jalingo. Simple random sampling was used for the study. The instrument used for the research findings was an Achievement test for data collection and lesson plan was used for instruction. Data was obtained through administering the instruction and Achievement test to the students of the selected school. The researcher used t-test for the results. At 5 % level of significance, the test of hypothesis was carried out to compare the results of the two groups. Findings revealed that the male students in the experimental group were reported a lower score than male of the control group and that the performance of female students in the experimental group perform higher than the female student in control group. Findings further revealed that there is no significance differences in gender performance of

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students taught using hands on instructional activities on their retention level in learning of mathematics concepts. It was recommended in this study that Mathematics teachers at the basic education level should always make available instructional aids in their classroom, it should cover the content of each steps covered on the lesson plan to enable full participation of the learners and Gender equality should play a significant role in their classroom. No student should be assessed based on teacher's favorite of the students' gender.

Keywords: Mathematics retention, Gender performance, Achievement test

INTRODUCTION

Mathematics is one of the most important subjects in the school curriculum. As modern societies have increased in complexity and as that complexity has accompanied rapid technological development, so the teaching of mathematics has come under increased scrutiny. In response to the on - going global reform in the educational and technological development of the society, teachers are expected to be the best minds of any country and mathematics should be the basic tool to achieve this national set goals (Azuka, 2013). According to Roger Becon (1214 – 1292), sees Mathematics as the Gateway and key of the sciences, neglect of mathematics works injury to all knowledge; since one who is ignorant of it cannot know the other things of the world, and what is worse, men who does ignorant are unable to perceive their own ignorance and so do not seek a remedy. According to the National Council of Teachers of Mathematics (2000), students should learn to value mathematics and become confident in their ability to do mathematics. Tom in Emaiku (2012) observed that the inability of conventional teaching models to improve students' interest, achievement and retention has become a source of concern to many educators in Nigeria. In fact, what constitutes good teaching and learning of school subjects is the use of appropriate methods of teaching.

According to Iji (2007), mathematics provides an important key to understanding of the world. In the areas of buying and selling, communication, timing, measurement, moulding, recording among others, the importance is highly acknowledged. Mathematics is one of the core subjects in both junior and senior secondary school curricula in Nigeria, which justifies its recognition as being essential in the development of technological advancement in Nigeria. Because of the impacts of mathematics in our educational system

in Nigeria, there is no school curriculum or a national development planning which does not take cognizance of the usefulness and development in school mathematics.

Educational researcher like Hosack, (2006)who in her research studyshowed some factors affecting students' achievement and attitudes toward science. Evidently, the researcher believes that hands on instruction can affects students' retention and achievement positively. Hosack (2006) reported on the Effects of Hands-on Instructional Strategies on Fourth Grade Students' Attitudes and Performance in Mathematics. A total of twenty-six (26) students were used for the study. Results of her study showed a positive change in students' attitude towards mathematics after using hands on instructional activity. Also,Randler and Hulde (2007) was related with the effect of hands-on programme on student's achievement about soil ecology. A total of 123 fifth and sixth grade students contributed in the study. Result indicated that students in the hands-on group demonstrated higher achievement than student in traditional textbook based programs.

In view of the above studies, a natural outflow of the constructivist philosophy of education, in general and also specifically in teaching mathematics, is hands-on learning. Thus, a hands-on approach plays a crucial role in constructivism (Bhagwanji, 2011). Hands-on learning refers to "learning by doing, or learning in which students are actively engaged in an activity or process." Tile (2013) describes hands-on activities as a situation whereby a learner uses his/her hands in carrying out activities that could enhance his/her experiences. Even, Abudullai (2013) describes hands-on activities as a method of teaching whereby students are engaged actively in class activities with the use of their hands and intellect under the guidance of the teacher.

Generally, Hands on Instructional activities materials are concrete models that can be touched and moved around by the students, thereby providing tangible investigative experiences for abstract mathematics concepts as well as how concepts are related. Time spent with manipulatives and model-based lessons at any level builds student confidence and increases their ability to apply skills in a real-world situation.Hands-on-instructional activities can actually be a means to increase students' academic achievement and understanding of scientific concepts by manipulating objects which may make abstract knowledge more concrete and clearer. Through hands-on-instructional activities, students are able to engage in real life illustrations and observe the effects of changes in different variables. Furthermore, it offers concrete illustrations of concepts. This method is learner-centered which allows the learner to see, touch and manipulate objects while learning as

mathematics are more of seeing and doing than hearing; so also with science that advocates "do it yourself".

Obanya (2012) in his convocation lecture confirmed the above statement by adding that the average retention rate of learning by lecture is 5% while that of practice by doing (Activity-oriented) is about 75%. It can be seen that retention rate increases progressively with the use of more interactive and activity-oriented teaching methods. On the contrary, Ekwueme and Meremikwu (2010) observed in their study that some teachers object to the use of interactive activity-oriented method stating that it is time consuming and do not permit total coverage of the syllabus. Fortunately, the new mathematics and basic science syllabus' coverage is determined by how much skills/knowledge students' have acquired rather than how much of the syllabus is covered as learner centeredness is highly advocated

Statement of the Problems

Mathematics learning as the bedrock of any civilization is expected to produce individuals that are capable of solving their problems as well as those of the society. Such an individual is expected to be autonomous, confident and self-reliant after his graduation from school. In recent times, applicability of what one learns in school to real life situation is very low. Understanding and applying abstract mathematics concepts is not always easy, especially for younger students. Incorporating hands on instructional activities with an emphasis upon the thought process of students provides an opportunity for the teacher to assess and meet the needs of students as they construct personal mathematical knowledge. Evenly, the National Council of Teachers of Mathematics, NCTM (2000) espouses that the kinds of experiences teachers provide clearly play a major role in determining the extent and quality of students' learning.Today, due to lack of training in the use of instructional materials for students to use in the classroom, teachers are often not comfortable with use of instructional activities in the class and hesitate or refuse to use them in classroom. Students now practice mathematical concept just to pass their examination, retention level of students in most cases in attempting to mathematics problems are very poor. The effect is not only affecting their career prospects but even the National goal of education are ruin. As Zady(2003) posit that Students in the text/lecture class were "less engaged, misbehaved, inattentive, and more passive. Parents and guardian of the children are put at arm's length, anxiety and lack of comfort are built by the students when it comes to learning mathematics especially areas that instructional aides are needed.Throughout the past four decades, numerous studies have been undertaken in an attempt to identify the relationships

among teachers' mathematics knowledge, instructional practices, and student learning. Researchers have differed in their approaches to explore these relationships. Studies, especially earlier ones, sought to demonstrate the impact of use of instruction and students' attitude and retention level in mathematics classroom. Studies like Yagci, (2010); Hosack, (2006); Korn, (2014) they investigated on the approaches to instruction and students' achievement, yet their study is not well enough to justify the improvement of used of hands on activity on students' retention in mathematics, that is why the present study sought to use hands on instructional activities to enhance students' retention in mathematics in Jalingo metropolis.

Purpose of the Study

The Purpose of this study is to determine if Hands on instructional activities could help students' Retention of Mathematics in Jalingo metropolis. The Specific objectives of the study were to:

i. Investigate the effect of hands on instructional activities on students' retention of mathematical concepts.
ii. Investigate gender difference in retention of mathematical concepts when hands-on instructional activities are used.

Research Questions

This Study sought to answer the following research questions:

i. What are the effects of hands on instructional activities toward students' retention level in mathematics?
ii. What are the effect of gender differences among secondary school students' in their retention of mathematics concept taught using hands on instructional activities?

Statement of the Hypotheses

The following null hypotheses were formulated and tested at $P \leq 0.05$ level of significance

i. There is no significant effect of hands on instructional activities toward students' retention level in mathematics.
ii. There is no significant effect of gender differences among secondary school students' in their retention of mathematics concept taught using hands on instructional activities.

METHODS

The study adopted quasi-experimental design. The reason for adopting quasi-experimental design is typically to allow the researcher to control the assignment to the treatment condition, but using some criterion other than random assignment. The study consisted of Senior secondary schools within the metropolis, which make a total of 5,236 students out of which 2,431 were female and 2,805 were male. The study sample consisted of 30 students selected from Government College Jalingo and have been exposed to use of hands on instructional activities. The samples of 30 students were selected through simple random sampling. Using hart cards and students were asked to picked one after another. Fifteen chances for the male and fifteen chances for the female, making 30 chances. Furthermore, fifteen students were taught using hands on instructional activities and the remaining fifteen were taught using the traditional teaching method. The researcher further selected 7 male students and 7 female students from each groups to find out the influence of gender difference on students' retention using the two different teaching procedure. The researcher developed lesson plan used as instruction and formulated research questions known as 'Students Achievement Test.' Collected data were analyzed using mean scores, standard deviation and t-test distribution. However, the hypotheses were at 5% level of significance.

RESULTS AND DISCUSSION

The presentation of data, analysis and interpretations are organized around the research questions and null hypotheses of the study. The description statistics are as follows:

Research Question I

What are the effects of hands on instructional activities toward students' retention level in mathematics?

Table 1: Mean scores, Standard deviation scores of Students Academic Performance in Mathematics (Geometry) using Hands on instructional activities and Teacher Centred Approach.

Group	N	Mean	SD	Mean Difference
Experimental	15	45.80	13.64	**1.60**
Control	15	44.20	98.27	

Source: Field Experiment, 2021

The results in Table 1. Showed that the students exposed to experimental group had a mean score of 45.80 while the control group scored 44.20. The mean difference was 1.60. These showed that the experimental group had higher performance than those with the Teacher centred method.

Research Question II

What are the effect of gender differences among secondary school students' in their retention of mathematics concept taught using hands on instructional activities?

Table 2:- Mean and Standard Deviations score of Male Students Score on Gender Difference among secondary school students in their retention of mathematics concept taught using hands on instructional activities.

Group	N	Mean	SD	Mean Difference
Experimental (M)	7	41.86	18.45	
				4.43
Control (M)	7	46.29	21.58	

The results in Table 2 Showed that the students exposed to experimental group of male had a mean score of 41.86 while the control group of male scored 46.29. The mean difference was 4.43. These showed that the male control group had higher performance than those with the use of hands on instructional activities.

Table 3 Summary of the Mean and Standard Deviations of Female Students Scores on Gender Difference among secondary school students in their retention of mathematics concept taught using hands on instructional activities.

Group	N	Mean	SD	Mean Difference
Experimental (F)	7	53.86	21.58	
				8.57
Control (F)	7	45.29	13.26	

The results in Table 4.2 Showed that the students exposed to experimental group of Female had a mean score of 53.86 while the control group of Female scored 45.29. The

mean difference was 8.57. These showed that the female experimental group had higher performance than those with control group.

Research Hypothesis I

There is no significant effect of hands on instructional activities toward students' retention level in mathematics.

Table 4: Post- test of Experimental and Control Group.

Variable	N	$\bar{X}$	SD	Df	t-cal	t-crit.	Remarks
Experimental Group	15	45.80	18.45				
				28	0.2183	**2.06**	* *
Control Group	15	44.20	21.58				

From the Table 4, t-calculated was 0.2183 and t-critical was 2.06, t-cal. < t-crit. therefore, not rejected. There is no significant effect of hands on instructional activities toward students' retention level in mathematics.

Research Hypothesis II

There is no significant effect of gender differences among secondary school students' in their retention of mathematics concept taught using hands on instructional activities.

Table 5: Experimental Group of Male and female students Performance in Mathematics

Variable	N	$\bar{X}$	SD	Df	t-cal.	t-crit.	Remarks
Experimental (M)	7	41.86	18.45				
				12	1.118	**2.18**	* *
Experimental (F)	7	53.86	21.58				

The result in table 5 indicates that the calculated t- value is 1.118. This value is less than the t- critical of 2.18 at alpha = 0.025 with the degree of freedom (df) = 12. This means that there is no significant effect of gender differences among secondary school students' in their retention of mathematics concept taught using hands on instructional

activities. Therefore, the null hypothesis two (HO_2) is accepted. This implies that the male experimental group taught using hands on instructional activities is not having significant difference with the female experimental group using hands on instructional activities.

DISCUSSION

Findings in this study revealed that the use of hands on instructional activities affect students' academic performance in mathematics. It is believe that it influences the retention level of students in learning mathematics and increases students' achievement in mathematics classroom. The findings are in support of Clements & Battista (1990) who admitted that in contrast to drilling mathematics facts, hands-on instruction gives more value to the development of mathematic concepts. Wenglisnsky, (2000) also hinted that when students are exposed to hands-on material on a weekly basis, they have shown to have a significant improvement of a grade level ahead in mathematics. So also, Korn (2014) maintained that using strategies that are hands-on activities can provide opportunities for various grouping options, which ties together well with differentiation. On the one hand, students learn "as individuals," that is, at different paces, and so educators will need to tailor activities to correspond to students' instructional levels. It was tested at 5% level of significance that there is no significant effect of hands on instructional activities toward students' retention level in mathematics. The findings is not in line with the finding of Ekwueme, Ekon & Ezenwa, (2015) positive improvement on both the students' performance and participation on mathematics and basic science activities.

Findings in this study revealed that the male students in the experimental group were reported a lower score than male of the control group and that the performance of female students in the experimental group perform higher than the female student in control group. Thus, based on the test of hypothesis II, findings revealed that there is no significance differences in gender performance of students taught using hands on instructional activities on their retention level in learning of mathematics. These was calculated using t-test distribution at 5% level of significance. It means that students' gender does not have an effect on their retention level in mathematics classroom. The findings is in support of Tertsea, Bolaji, Kajuru & Bala (2017) who reported that Female students exposed to the Concrete Manipulative Approach, performed equally with their males counterparts.

CONCLUSION

It was concluded from these findings that hands on instructional actives affect the retention level of students in learning of mathematics. Teachers of mathematics should encompass the used of hands on instructional activities to help cope the difficulty students faced in learning mathematics. As research findings revealed that there is no significant effect of hands on instructional activities toward students' retention level in mathematics. Study conclude in this findings that female students perform better than their male counterpart while using hands on instructional activities in mathematics classroom as performance of female student in the achievement test was high than the performance of male students in mathematics classroom.

Recommendations

The recommendations was derived based on the formulated research questions which are as follows:

i. Mathematics teachers at the basic education level should always make available instructional aids in their classroom, it should cover the content of each steps covered on the lesson plan to enable full participation of the learners.

ii. Gender equality should play a significant role in their classroom. No student should be assessed based on teacher's favourite of the students' gender.

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