

Effects of Mathematics Laboratory on Perception and Performance of Female Students In (STM) Science, Techonology And Mathematics Education.

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Abstract

The concept of mathematics laboratory has become very popular in recent years. This study investigated the effect of Mathematics Laboratory on the perception of mathematics and how this affects female students performance in the subject. A total of 150 SSSI students were involved in the study. Results of this study were analyzed using the mean, standard deviation and analysis of co- variance (ANCOVA). The findings revealed that the use of mathematics laboratory positively altered the perception of SSSI female students to mathematics. The results also revealed that there is a significant difference in the performance of female student to mathematics taught with mathematics laboratory. This study recommends the following; That every school should have a mathematics laboratory at its grass root (i. e Kindergarten, Nursery, Primary), secondary to tertiary levels; the mathematics laboratory should be introduced in mathematics curriculum by NERDC and NABTEB; Mathematics students teachers should be tutored on use of the laboratory in their methodology class. In conclusion, the study recommends that mathematics teachers should be encouraged to use mathematics laboratory in the teaching of plane geometry and algebraic expression.

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I. Introduction

Progressive education in science, technology and mathematics for all citizens male and female alike is the most effective developmental investment any society can make to attain social sophistication with high powered technological advancement. Mathematics is the bedrock of science and technology. The functional role of mathematics to science and technology in multifaceted and multifarious that no area of science, technology or business escapes its application (Okereke, 2006). Mathematics is the pillar on which science is built. Auhiven (1970) argued that with the fast automation and computerization of jobs, only persons with appreciable knowledge, skills and abilities in mathematics, science and technology will be required in the job market.

The Mathematics Laboratory is a demonstration and or construction center where various mathematics objects are constructed and many mathematical principles are demonstrated with availability of assorted teaching aids Obodo (2004). The importance of mathematics laboratory cannot be overemphasized. Obodo (2004) elaborated the importance of mathematics laboratory to include: mathematical relations and properties are discovered through exploration of mathematical application enhanced by incorporating experiments thereby stimulating and maintaining interest through mathematical exploration and manipulation which keeps students alive.

Secondly it assists in the illustration of basic principles, laws or rules of mathematics thereby removing abstractness and increasing effective teaching and learning which creates positive attitude towards mathematics.

In addition, Mathematics Laboratory provides opportunity of pool of storage of mathematical materials for easy access aiding students to familiarize with such mental process as counting, measuring, observing classifying, inferring, hypothesizing, interpretation of data and other scientific processes.

More so, it provides a non-threatening environment conducive to learning which allows the students to take responsibility for his own learning, progress at his own rate thereby making the students to verify interesting problems.

It is obvious from the foregoing that mathematics laboratory fine-tunes students' perception to mathematics and this enhances their performance in the subject thereby reducing and/or nullifying the abstract nature of the subject.

There is evidence that women and girls are not participating fully in Science, Technology and Mathematics. This makes it paramount to seek for a strategy for teaching mathematics that aims at improving

the performance of students. Research evidence (Okigbo and Osuafor, 2008) reveals that lack of mathematics laboratory and mathematics teachers non-use of laboratory technique in teaching mathematics is one of the major factor that contribute to poor achievement in mathematics by secondary school students. This study is therefore designed to investigate the effect of mathematics laboratory on the perception of mathematics of SSS1 (senior secondary school) female students and this affects their achievement in the subject, this is the statement of the problem of this study. Specifically the study aimed at the following:

1. To investigate the effect of using mathematics laboratory on the perception of SSS1 female students of the subject.
2. To compare the achievement of female students taught with mathematics laboratory with those not taught with mathematics laboratory.

Hence the following research questions;

Research Questions

1. To what extent does the use of mathematics Laboratory affect SSS1 female students perception
2. Is there any difference in the achievement of SSS 1 female students taught with Mathematics Laboratory and those not taught with a Mathematics Laboratory

II. Methodology

Research Hypothesis

Ho1: There is no significant difference in perception of Mathematics of SSS1 female student taught with a mathematics laboratory

Ho2: There is no significant difference in the performance of SSS1 female students taught with a mathematics laboratory and those not taught with a mathematics laboratory.

DESIGN

The study is an experimental type which made use of control and experimental group with equal number of subjects. Pre-test and post-test were used. The control group was taught using the normal lecture method and chalk board, while the experimental group was taught same algebra with the aid of mathematics laboratory assisted instruction (MLAI).

Population and Subject

The population was made up of SSS1 students Boriye and Osogbo Local government Area of Osun State. A total of one hundred and fifty (150) randomly selected students were used for the study. Two schools were purposively selected from the public schools in the state. Both schools are privately owned, one without a mathematics laboratory, Baptist Girls High school Osogbo (assigned as school A) –the control group and the other – Osogbo Grammar school with a mathematics laboratory (assigned group B) – the experimental group.

The pre-test was carried out with 75 SSS1 female student randomly selected from each of the school/group. The pretest was to test for difference in performance of mathematics in two schools. The pre-test had a mean score of 50% and the result reveal that the performance of the students in school A was 41.3% in mathematics, while that in school B was 59.4%.

The researcher ensured that certain extraneous variables are controlled by ensuring that both schools A and B had male mathematics teachers with not less than seven year experience. The teaching methodology i.e use of the lesson note supervised by the researcher was also held constant. Thus, the researcher was able to focus mainly on mathematics laboratory as a variable.

Research Instruments/Procedure

The instrument for the study was firstly the questionnaire which is a four point Likert scale of strongly agree, agree, disagree and strongly disagree. These are assigned weight of 4, 3, 2 and 1 respectively. The questionnaire has 7 items on the students' perception of mathematics where mathematics laboratory is used.

The other instruments for the study were a pretest and post-test. There were note of lesson on mathematics for the control group (MCG) and mathematics laboratory assisted instruction (MLAI) with lesson note packaged for the experimental group. The pretest and post-test were given before and after the lessons respectively and the scores extracted for the hypothesis testing.

(MLAI) lesson was in algebraic expansion and plane geometry in which the laboratory was designed to have typical laboratory building with all the necessary fittings and equipment to include a square board, (made of plywood with lines or symbols written with felt pins), (geobard, cards measuring 5cm x 9cm each containing values of x and y, lido game and dice, abacus, close and open cylinder and many more as listed by Srinivasa N. (1978). The content of both of the lesson note used for control group (MCG) and (MLAI) package used for the experimental group were the same, each taught for the duration of 45 minutes. The major concentration was in the use of card (30 in number) and a square board game to expand algebraic expression. The MLAI was designed in such a way that 4 students interacted and played algebraic expression as a game on score cards.

The teaching in both schools took four week and was concurrently done in both school by the researcher. The duration of the experiment was sufficient as not to permit the pre-test to affect the post-test scores. The text were marked and cored in percent for each school/group, and all the scores were collated and used for data analysis. Independent test was used in testing the hypothesis.

Validity of Instrument

The validity of the items was assessed by three mathematical education experts and two secondary school mathematics teachers. The instrument was trial tested with 60 students not participating in the study but within the same area of study. The Kunder Richardson formula ‘21’ was used to establish the coefficient of internal consistency for (MCG) and value is 0.75. The questionnaire was also given to two lectures of the Faculty of Vocational and Technical Education of Osun state Polytechnic Iree to scrutinize the item in relation to the research questions. Their suggestions aided in improving the validity of the instrument. Their reliability was established using Combach Alpha reliability test and the reliability of the total instrument was up to 0.60.

Method of Data Analysis

The data collected were analyzed using mean, standard deviation, percentage and analysis of covariance (ANCOVA). Independent t-test was used in testing the hypothesis.

III. Results

Hypothesis 1

There is no significant difference in perception of mathematics of SSS1 female students taught with a mathematics laboratory with those not taught with a mathematics laboratory.

The result of data analysis for this hypothesis is shown in table I below.

Table I
Summary of SSS1 female students’ perception of mathematics laboratory on mathematics

Variable	Mean	Standard deviation	Percentage mean	t	p-value
Perception of SS1female students of mathematics laboratory					0.001
School A (control group A) n=75	21.33	7.8	42.6%		
School B (experiment group B) n=75	40.03	9.0	66.1%		

Table I also shows a t-test value of -9.7 and a p value of .001, testing at an alpha level of .05, the p-value is less than the alpha level. Hence the null hypothesis, that there is no significant difference in perception of mathematics of SSS1 female students’ taught with a mathematics laboratory with those not taught with a mathematics laboratory is rejected

Table I also shows a mean value of 21.33 for school A with a percentage mean of 42.6%. The acceptable percentage mean for high or good perception is 50% and above. Therefore the percentage mean value of 42.6 reveals a poor perception of SSS1 female students who lack the use of mathematics laboratory. On the other hand, a mean value of 40.03 for school B with a percentage mean of 66.1 reveals a good perception of mathematics as a result of use of mathematics laboratory in the teaching of the subject in the school B,

Hypothesis 2

There is no significant difference in the achievement of SS1 female students whose perception has been altered through use of mathematics laboratory and those not taught with a mathematics laboratory.

Table 2:
Summary of Mathematics Laboratory Perception on Achievement

Group	N	Mean	Standard deviation	T	P-value
Control	75	21.5867	7.3505	-8.874	.000
Experimental	75	30.9067	9.1566		

Table 2 shows a t-test value of -8.874 and a p value of .000. Testing at an alpha level of .05, the p value is less than the alpha level. Hence the null hypothesis, that there is no significant difference in the achievement of SS1 female students’ taught with a mathematics laboratory with those not taught with a mathematics laboratory is rejected. It is also worthy to note that since the mean of the experimental group; 30.9067 is greater than that of the control group 21.5867, it means that the treatment is effective.

IV. Discussion

The paper is aimed at discovering the effect of mathematics laboratory instruction on the perception and performance (achievement) of SS1 female students in mathematics. The results revealed that the use of mathematics laboratory instruction positively altered the perception of SS1 female students in school B as against school A with a mean percent of Osuafor (2008) where the advantages of using mathematics laboratory was highlighted to include providing opportunity to internalize the basics mathematical concepts with a t-test value of -9.7 and p-value of .001 less than the tested alpha level of .05, it is revealed that the use mathematics laboratory positively improved the perception of SS1 female students of mathematics thereby affecting their achievement positively. The implication of this finding is that females and women can participate more fully in STM since mathematics-the bedrock of science has been simplified and made real to them. This is in agreement with Obodo (2004) who opined that the Mathematics Laboratory assist students in the illustration of laws and rules of mathematics thereby removing abstractness and increasing effective teaching and learning.

V. Conclusion

From the findings in this study, the following tangible conclusions were derived:

1. Use of mathematics laboratory positively altered the perception of SSSI female students of the subject mathematics.
2. There exists a significant difference in the performance (achievement) of SSSI female students taught with mathematics laboratory to those not taught with a Mathematics Laboratory.

Recommendations and Implications for Teachers

The following recommendations are based on findings of this research.

1. Mathematics Laboratory should be a compulsory laboratory in our Junior Secondary School (primary 4-9) and senior secondary school (SSI-3) as in Physics, Chemistry and Biology by the Government.
2. Mathematics teachers need to be trained on how to prepare and use the six tool box materials that should be available in a Mathematics Laboratory according to Srinivasa N. (1978).
3. In service training should be provided for mathematics teachers who are vested with the knowledge of laboratory technique and games and it's usage in the classroom setting.
4. The Mathematics Laboratory should be introduced in the mathematics curriculum by NERDC and NABTEB if Nigeria hopes to achieve the MGOs goal.
5. The National Commission for Colleges of Education and NABTEB should insist that every Mathematics Department in Colleges of Education and Polytechnic should have a Mathematics Laboratory so student teachers can be tutored on the use of the laboratory equipment in their methodology class.
6. Use of Mathematics Laboratory in the teaching of plane geometry and algebraic expressions inculcates a high degree of interest for students.

References

- [1]. Ahiven, R. (1970). Women and Work: Social attitudes and Women's careers. Impact on Science and Society. Xx (i) 73-81.
- [2]. Obodo G.C. (2004). "Principles and Practice of Mathematics Education in Nigeria Floxtoine press, Enugu.
- [3]. Okereke S.C. (2006). Effects of prior knowledge of Implications of Mathematical tasks/concepts to career types and gender students' achievements. In G.A. Badmus and C.O. Ocho (Eds.). Science Mathematics and Technology Education in Nigeria Lagos. Eyes lead press.
- [4]. Okigbo C.E. and Osuafor M.A. (2008). Effects of using Mathematics Laboratory in teaching mathematics on the achievement of mathematics students. Educational research and review vol.3 (8). Pp257- 261. <http://www.academicjournals.org/eRR>.
- [5]. Srinivasa N. (1978): A laboratory for teaching Mathematics: JSTAN 9(1):22-24.

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