THE EFFECT OF INDUCTIVE LEARNING STRATEGY ON STUDENTS' ACADEMIC ACHIEVMENT IN MATHEMATICS

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Abstract

The study determined the effect of inductive learning strategy on students' academic achievement in mathematics. Data were collected from one hundred and forty-four (144) senior secondary school class three (SSS3) students randomly selected from five secondary school out of the twenty-five secondary schools in Epelocal government area of Lagos state using mathematics achievement test. A post mathematics achievement test was administered on the subjects after treatment for three weeks. Analysis of variance(ANOVA) was employed in analyzing the data obtained from the study. Result from the study revealed that students taught mathematics using inductive learning strategy achieved more in mathematics content than control group, the high ability students were significantly better than the average and low ability students, while the average ability students were significantly better than the low ability students, and male student were not significantly better than their female counterpart in academic achievement when they were taught mathematics using inductive leaning strategy, Base of the findings of this study, the following recommendations were made; Mathematics teacher should incorporate inductive learning strategy in teaching various concepts in mathematics; Teacher training institutions should include the inductive learning strategy in the mathematics methodology course content to use this techniques; Federal and State ministries of education, Professional Bodies such as the Mathematical Association of Nigeria (MAN) etc, should organize workshops/Seminars on the use of inductive learning strategy so as to sensitize the mathematics teachers on the benefit derivable from using inductive learning Strategy.

***Key words**: inductive learning strategy, Mathematics students, Academic Achievement.*

Introduction

Inductive learning strategy is like the inquiries which begin with a question or series of unknown facts or concepts and move towards known information (Logoke, 2012). Learners search for answers to these 'unknown' in an active fashion. Instead of lecturing, teachers take on the role of facilitator or coach when using inductive approach. Example when teaching similarities and difference of geometric plane shapes. A teacher can employ a questioning technique identifying the similarities and differences of different plane shapes. Similarly, in mathematics instructional processes, questioning has always been a major activity. The teacher asks question to stimulate learners thought while the learners ask question to get answers to their own thought.

There is an on-going debate as to whether or not the standard of education in Nigeria is falling (Sofolahan, 1986) Arguments in support of a rise in standard centers around two major issues. First is that the school curriculum in now more enriched and it is loaded with topics that would be perceived to be difficult by those who were in school many years ago. Secondly, pupils now enter and finish school at a much earlier age than it was in the past. The evidence of a rise in standard of education is that pupils are now able to undertake academic tasks that pupils of identical age in the past would find to be formidable feats.

A teaching method comprises the principles and methods used by teachers to enable student learning. These strategies are determined party on subject matter to be taught and party by the nature of the learner. For a particular teaching method to be appropriate and efficient it has to be in relation with the characteristic of the learner and the type of learning it is supposed to bring about. Suggestions are there to design and selection of teaching method must take into account not only the nature of the subject matter but also how students learn. In today's school the trend is that it encourages much creativity. It is a known fact that human advancement come through reasoning. [Citation needed] this reasoning and original thought enhances creativity.

The approaches for teaching can be broadly classified into teacher centered and student centered. In a teacher-centered approach to leaning, teachers are the main authority figure in this model. Student are viewed as ''empty vessels'' whose primary role is to passively receive I formation (via lecturer and direct instruction) with an end goal of testing and assessment. It is the primary role of teachers to pass knowledge and information onto their student. In this model, teaching and assessment are viewed as two separate entities. Student learning is measured through objectively scored tests and assessments. In student-Centered Approach to Learning, while teachers are the authority figure in the model, teachers and students play an equally active role in the learning process. The teacher's primary role is to coach and facilitate student learning and overall comprehension of materials. Student learning is measured through both formal and informal forms of assessment, including group projects, student portfolios, and class participation. Teaching and assessment are connected; student learning is continuously measured during teacher instruction. Commonly used teaching methods may include class participation, demonstration, recitation, memorization, or combinations of these.

This study investigated the effectiveness of inductive learning strategy on students' academic achievement in mathematics.

Research Questions

The following research questions were formulated to guide the study

1. What are the mean achievement score of student taught mathematics using inductive learning strategy and those taught with lecture method?
2. What are the mean achievement score of the high average and low ability student taught mathematics using inductive learning strategy?
3. What are the mean achievement score of male female student who were taught mathematics using inductive learning strategy?

Hypotheses

The following research hypotheses were tested in the study

i. There is no significant difference between the academic achievement of students taught mathematics using inductive learning strategy and those who were not.
ii. There is no significant difference in the academic achievement of high, average and low ability students taught mathematics using inductive learning strategy.
iii. There is no significant difference between the academic performance of male and female students taught mathematics using inductive learning strategy.

Methodology

Two intact classes of junior secondary school three students were given texts dealing with topics in mathematics. The topics included a range of cost of various articles, simple equation in one variable, area of irregular and regular shapes, bar charts and pie charts. For the control group, the topics were taught with lecture method. While for the experimental group, the topics were taught through inductive learning strategy. The duration of the study was three weeks.

Because intact classes were used, the students were first administered a pretest before exposure to the teaching. A posttest was administered immediately after the teaching.

Mathematics achievement test (MAT) was used. This consisted of (50) multiple choice items constructed on the topics, a range of cost of various articles, simple equation in one variable, area of irregular and regular shapes, frequency tables, bar charts and pie charts. The test was used to determine the achievment of students across the two groups in the topics taught. The same instrument was administered in the pretest and post test. The instrument was faced and contest validated by two mathematics experts and a lecture in measurement and Evaluation. The instrument has reliability co-efficient of 0.86 when subjected to kuder-richardon formula 21. The data collected were analyzed using descriptive statistics and Analysis of variance (ANOVA). All hypotheses were tested at 0.05 level of significant.

Result

Research Question One

1. What are the mean achievement score of student taught mathematics using inductive learning strategy and those taught with lecture method?

Table 1: the mean Achievement Scores and Standard Deviation of Mathematics Achievement Test (MAT) score of the subjects.

S/N	Group	No of subject	Pre-mat		Post-mat	
			Mean	S.D	Mean	S.D
1	With inductive learning strategy	74	28.83	9.16	37.49	10.53
2	Without inductive learning Strategy	70	27.72	8.78	23.47	10.70

Research Question Two

What are the mean achievement score of the high average and low ability student taught mathematics using inductive learning strategy?

Group	Number of student N	Posttest Course	
		Mean	SD
High	32	44.31	5.00
Average	25	34.18	5.23
Low	24	28.10	5.05

Table 2: Inductive Learning Strategy of Variance of Pretest Students

Source of variance	Degree of Freedom	Mean sum of squares	Mean square	Calculated F-Value	Critical F-value
Between group	1	37.77	37.77	0.38	3.91
Within group	142	4935.12	100.23		
Total	143	4972.9			

Ns= not significant at $p<0.05$

Research Question Three

1. What are the mean achievement score of male female student who were taught mathematics using inductive learning strategy?

Table 6: descriptive Statistics of post score male and female taught mathematics using inductive learning strategy

Gender	N	Means score	Standard deviation SD
Male	42	39.09	10.1
Female	39	35.97	10.69
Mean difference		3.12	

Hypothesis one

The null hypothesis state that, there is no significant difference between the academic performance of student taught Mathematics using inductive learning strategy and those who were not.

The hypothesis was tested using a one way analysis of variance

Table 3: inductive Learning Strategy of Variance of post test students

Source of Variance	Degree of freedom	Sum of squares	Means squares	Calculated F-value	Critical F-value
Between group	1	227.6	227.6	41.76	6.91
Within groups	142	8001.93	59.96		
Total	143	10248.79			

Significant at p<05.

The result in table 3 show that, there is a significant difference between the posttest achievement score of the two groups. The calculated F-value as show in table 3, 38.76 is greater than the critical value. 3.91 at p<05. The null hypothesis which states that there is no significant difference between the academic performance of student taught Mathematics using inductive learning strategy and those who were not is rejected.

Therefore, the students taught some topics in Mathematics using inductive learning strategy performed significantly better on achievement score than the student who were taught without inductive learning strategy.

The null hypothesis states that, there is no significant difference between the academic performances of high, high, average and low ability student taught Mathematics using inductive learning strategy.

Hypothesis Two:

There is no significant difference in the academic achievement of high, average and low ability students taught mathematics using inductive learning strategy.

Table 5: analysis of Variance of post-Test Score of student Taught Mathematics Using inductive Learning Strategy According to Ability Levels

Source of variance	Degree of freedom	Sum of squares	Mean square	Calculated F-value	Critical F-Value
Between groups	2	3373.7	1688.35	179.85	5.12
Within groups	74	68.29	12.53		
Total	74	4027.99			

Significant at p<05

The result of the analysis of variance presented in table 5, show that, ability level has a significant effect. The calculated F-value, 176.85 is greater than the critical value, 3.13 at p<05. Therefore the null hypothesis which stated there is no significant difference the academic performance of high, average and low ability student taught Mathematics inductive learning strategy is rejected. The result shows that, the achievement levels differed significant from each other. The high ability students were significant better than the average and low ability students, while the average ability students were significant better than the low ability students.

Research Question Three

Hypothesis Three

The null hypothesis states that there is no significant difference between the academic performance of male and female student taught Mathematics using inductive learning strategy.

Hypothesis Three

i. There is no significant difference between the academic performance of male and female students taught mathematics using inductive learning strategy.

Table 7: Analysis of variances of post test score of male and female student taught mathematics using inductive learning strategy

Sources of variance	Degree of freedom	Sum of square means square	Means square	Calculated F-values	Critical F-value
Between group	1	177.26	177.26	6.16	6.18
Within group	74	3861.73	58.13		
Total	75	4030.99			

NS= not significant at p<05

The analysis presented in table 7, show that gender has no significant effect on academic achievement when male and female student are taught Mathematics using inductive learning strategy. Table 7, show the calculated F-value, 3.16 is less than the critical value, 3.18 at $p<05$.

The null hypothesis which stated that there is no significant difference between the academic performance of male and female student taught mathematics using inductive learning strategy is therefore accepted. it follows therefore, that male student are not significant better than their female counterpart in academic performance when they are taught mathematics using inductive learning strategy.

Discussion of findings

The data analysis for hypothesis one show that there is significant difference between the posttest achievement score of students taught mathematics using inductive learning strategy and those who were not. The result leads to the rejection of the null hypothesis.

The finding of significant difference between the students taught using inductive learning strategy and those who were not agree with finding to Lagoke (2012), Glynn (1998), Duit (1991) and Dagha (1995).

The result for hypothesis two show that there is a significant difference between the academic performance of high, average and how abilities student taught mathematics using inductive learning strategy. This indicates with high abilities perform better than student in the other groups. This indicates that student were significantly better than low ability student. The finding agrees with the result of Rigas and Valanides (2001).

The result for hypothesis three show that there was no significant difference between male and female student posttest achievement when they were taught mathematics using inductive learning strategy. This indicates that neither of the gender in the student is superior to the other in terms of student achievement when taught mathematics using inductive learning strategy. The finding agree with the result of rigas (2001) and Valandies (2001) who did not find any significant difference in the posttest achievement score of male and female students.

Conclusion

The result indicate that learning with inductive learning strategy could improve student performance in mathematics more than learning without inductive learning strategy. Learning with inductive learning strategy was easier to comprehend for both male and female student and student of high, average and low ability. There result support that the use of inductive learning strategy in mathematics teaching may influence better understanding of the subject.

Recommendation

Based on the finding of the study, the following recommendation was made.

Mathematics teachers should incorporate inductive learning strategy in teaching various concepts in mathematics.

Teacher training institution should include the inductive learning strategy in the mathematics methodology course content to use this technique.

Federal and state ministries of education, professional bodies such as the Mathematical Association of Nigeria (MAN) etc, should organize workshops/seminars on the use of inductive learning strategy so as to sensitize the mathematics teachers on the benefit derivable from using inductive learning strategies.

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