

An Investigation of the Effects of Teachers' Classroom Questioning Techniques on the Performance of Senior Secondary School Students in Mathematics, Zamfara State, Nigeria

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Abstract: Majority of the research finding shows that questioning techniques is one the major factors affecting the teaching and learning mathematics in our schools. This study is designed to seek views of the Students on the effects of teachers' classroom questioning techniques on their performance in mathematics. The opinion of 1000 Senior Secondary Schools Students level from same selected schools in Bungudu Local Government of Zamfara state was sought on a four Likert scale questionnaire. The instrument consisting of forty statement on how they perceived the effects of the teacher's classroom questioning techniques in mathematics. The results showed that the respondents agreed that their teachers' classroom questioning techniques were having a positive impact in their learning outcome performance in mathematics. The t-test results showed that there was gender significant difference on the effects of the teacher's questioning techniques in relation to mathematics performance. The result also revealed that there was significant difference existed between the choice of subject and students learning experiences. However, based on the findings of the study, the researchers recommended that workshops, seminars, conferences and in-service training be organize for the mathematics teachers on how to use effective classroom questioning techniques in the teaching and learning mathematics senior secondary school level. It was also recommended that the classroom questioning techniques be included in the mathematics curriculum for teacher's education programmes.

Keywords: Investigation, Effects, Teacher questioning techniques, Performance

Introduction

The pursuit for general development along with scientific, technological growth and self -reliance are harmonized with corresponding advanced in mathematics. However, any laudable achievement in technological development will be hindered if the potential scientists, engineers and technologist are not equipped with sound knowledge of mathematics. Therefore, it can be concluded that no other subject has greater application than mathematics. It is the prime instrument for understanding and for exploring scientific, economic and social world. Agwagah(2013) affirms that mathematic is an indispensable tool in virtually all human endeavours of life as there is hardly any field where mathematics is not useful. That is why mathematics is offered as a compulsory subject both at the primary and secondary school levels in Nigeria.

In spite of the importance attached to mathematics both as an academic discipline and the body of knowledge that everybody needs in society coupled with the effort of the government in making mathematics a compulsory subject at the primary and secondary schools, the performance of students in mathematics at secondary school level in Nigeria is discouraging. The teaching of mathematics has been observed to be confronted with many problems such as teacher's approaches of teaching, students' attitude and unavailability of learning materials among others; thus, making it matter of concern to parents, researchers and educators.

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Findings from recent studies (Adebola and Ajilogba, 2012), have revealed that students mass failure in mathematics in internal and external examinations are real and the trends project a danger for the nation's quest for scientific advancement. The researchers note that the deplorable state of performance in mathematics is attributed to a number of variables, such as classroom teachers' non-utilization of appropriate questioning techniques. One of the major responsibilities of a mathematics teacher is to advance thought and inspire inquiry in students, and one effective way of doing this, is through proper questioning techniques in the classroom (Omobola, 2010). Teachers' classroom techniques influence student's motivation, effect learning styles and perfection of self-efficacy as well as teaching practice and teacher-students relationship. This was supported by Croom and Strair (2005) when teachers questioning techniques are used appropriately, it can enhance students the teaching and learning by developing critical thinking skills. It can also reinforce students understanding, correct students misunderstanding, provide feedback for students and stimulate classroom discussion. Also, MCHill and Dunkin (2002) discovered that a good question is a powerful teaching tool and a good teacher should know how to use questions for maximum impact because it is important to use classroom question well in order to teach effectively (Omolola, 2010). Fawowe (2013) indicated that, learning of mathematics improves when teachers allow their students to ask question/participate actively in the activities of the lesson than allow them to engage solemnly in a passive intake of information. It is worthwhile to look at researches conducted on some specific aspects of classroom questioning on techniques.

Ghandoura (2002) studied the effect of teachers written comments on the students' homework papers in geometry among fourth, sixths and ninths grade mathematics classes in Mecca, Saudi Arabia. Two classes for each teacher were randomly assigned, one as the control group (no comment) and the other class as the experiment group (comment). For ten weeks, the teacher collected homework papers three times a week. The homework papers in the control group were graded by marking problems right or wrong. Homework papers in the experimental group were graded the same way and had teachers comment such as, very good, well done, good, fair, poor etc. The result revealed a significant difference between effectiveness of teachers' comment and student's achievement.

Howkins (2009) investigated the effect on feedback on geometrical lesson of seventh and eighth grades according to sex, grade level and test scores. Mathematics Diagnostic Test was administered to diagnose students' abilities in geometry. Pre-assessment were conducted by the classroom teachers and mathematics diagnostic test were administered. Groups were randomly assigned to one of the three feedback treatment or the denied treatment groups as follows:

- F1 return pre-mathematics test papers with corrected incorrect answer.
- F2 return pre-mathematics test papers without corrected incorrect answers.

Purpose of Study

This study is designed to:

- a. Seek the opinion of the senior secondary school students on their teacher's classroom questioning techniques as having in their learning experience?
- b. Also determine the gender differences regarding the perceptions of students on the effects of teachers' classroom questioning techniques on their achievement.

Research Questions

The following research questions were used to guide the study:

- 1. Did students perceived their teacher classroom questioning techniques as having effect in their learning experiences?
- 2. Is there any difference between male and female students' perception on their teacher classroom questioning techniques as having effect in their learning experiences?
- 3. Will there be any difference between the science and arts student's perception on effect of teachers' questioning techniques in their learning maths?

Research Hypothesis

- 1. There is no significant significant difference between male and female students' perception on their teacher classroom questioning techniques as having effect in their learning experiences

2. There is no significant significant difference between Science and Arts students' perception on their teacher classroom questioning techniques as having effect in their learning experiences

Method

The data was generated through a questionnaire which was adapted based on a literature on the important and effectiveness of teachers' classroom questions developed and validated by Adedoyin (2010). The questionnaire consisted of two sections A and B. in section A students were asked about their background information. While section B consisted of forty (40) closed ended question statements form on the effectiveness of teachers' classroom questions on the performance or learning outcome in mathematics. The instrument is four point-likert rating includes strongly Agree (SA), Agree (A), Disagree (D) and strongly Disagree (SD). A total 1000 students were randomly selected for the study. The mean response was used to analyse the data generated from the questionnaire. In other to determine degree of agreement/disagreement in each of the scaling statements in the questionnaire, nominal values of 4 to 1 were assigned to the different scaling statement where 4 was for strongly agree, 3 for agree, 2 for disagree and 1 for strongly disagree. The teachers' classroom questioning techniques was designed to seek the opinion of students on the effect of their mathematics teacher's classroom questions on their performance. The mean response was used to analyse the data generated from the questionnaire. Consequently, any response with a mean of 2.5 or more was regarded as agree and any response that was below 2.5 was regarded as disagreed.

Research question I:

Table 1. Mean and standard deviation on student's perception on Teachers Questioning Techniques

Statement	N	Mean	Std. Deviation	Remark
1. My teacher's classroom questions raises pupils attention and participation in the mathematics lesson.	1000	3.2940	.79511	Agreed
2. My teacher's classroom Questions reinforce pupil's mathematics learning.	1000	3.2860	.73263	Agreed
3. My teacher's classroom questions make the teaching of mathematics interesting.	1000	3.2000	.78525	Agreed
4. My teacher's classroom questions motivate pupils to learn mathematics.	1000	3.2640	.73949	Agreed
5. My teacher' classroom Questions improve pupil's high level thinking skills in mathematics.	1000	3.0840	.67037	Agreed
6. My teacher's classroom questions are used to identify student's existing knowledge in mathematics.	1000	3.1200	.66486	Agreed
7. My teacher's classroom questions help pupils to participate in mathematics classes.	1000	3.0540	.77180	Agreed
8. My teacher's questioning techniques is an effective measure to manage and control classroom for effective learning mathematics.	1000	3.3000	.60528	Agreed
9. My teacher's classroom questions can be an effective way to find out what pupils have mastered after the teaching process.	1000	3.1920	.66902	Agreed

10. My teacher's classroom questions in mathematics classroom are very useful for feedback purposes.	1000	3.1700	.63364	Agreed
11. My teacher's classroom questions are always based on students needs.	1000	2.2260	.73448	Disagreed
12. My teacher's classroom questions can be used as a follow up to help learning mathematics.	1000	2.9980	.66516	Agreed
13. My teacher's classroom questions are very useful to probe students understanding.	1000	3.3300	.71387	Agreed
14. My teacher's classroom questions are very useful for prompting student's thinking skills in mathematics.	1000	3.3960	.65697	Agreed
15. My teacher's classroom questions are used to diagnose students learning problems in mathematics.	1000	3.2900	.74192	Agreed
16. My teacher's classroom questions develop deep cognitive critical thinking for mathematics learning.	1000	3.3220	2.02939	Agreed
17. My teacher's classroom questions are use as positive reinforcement for student learning.	1000	3.1440	.59297	Agreed
18. Teacher's classroom questions are always geared students towards positive learning outcomes.	1000	2.9740	.78098	Agreed
19. My teacher's classroom questions are used to gain further insight of student's mathematical ideas.	1000	3.0820	.66912	Agreed
20. My teacher's classroom questions always have an impact on students' mathematical understanding.	1000	3.0820	.75089	Agreed
21. My teacher's classroom questions lead to discussions and communication of mathematical ideas.	1000	3.3180	.69955	Agreed
22. My teacher's classroom questions prompt students to express themselves freely.	1000	3.1240	.68782	Agreed
23. My teacher's classroom questions stimulate students to pursue maths knowledge on their own.	1000	3.1080	.76480	Agreed
24. My teacher's classroom questions can be used to evaluate students' readiness to learn mathematics.	1000	3.1900	.61178	Agreed
25. My teacher's classroom				

questions help to identify students retention in mathematics knowledge.	1000	3.2740	.68658	Agreed
26. My teacher's classroom questions help to stimulate students' thinking abilities in solving mathematics problems.	1000	3.0540	.72084	Agreed
27. My teacher's classroom questions develop students inquiring attitudes in mathematics.	1000	3.2080	.70798	Agreed
28. My teacher's classroom questions help in assessing achievements of instructional goals and objectives during mathematics lessons.	1000	3.0100	.80905	Agreed
29. My teacher's classroom questions always make students active in mathematics lesson.	1000	3.0340	.71928	Agreed
30. My teacher's classroom questions help in reviewing and summarising of previous lessons.	1000	2.9820	.74983	Agreed
31. My teacher's classroom questions encourage students to pay attention in mathematics lessons.	1000	2.3860	1.00738	Disagreed
32. My teacher's classroom questions encourage students to think during mathematics lessons.	1000	3.8180	4.14464	Agreed
33. My teacher's classroom questions empower students to do well in mathematics.	1000	3.1600	.75827	Agreed
34. My mathematics teacher asks a lot of questions during lessons.	1000	3.1940	.71054	Agreed
35. Teacher's classroom questions always have an impact on students understanding of mathematical concepts.	1000	3.0680	.73206	Agreed
36. My teachers' classroom questions have an impact on student's performance in mathematics.	1000	3.9080	5.47773	Agreed
37. My teacher's classroom questions do help students to pass mathematics examination/test.	1000	3.0520	.71681	Agreed
38. Students do not need teachers' classroom questions to be able to do well in mathematics.	1000	2.2540	1.08197	Disagreed
39. My teacher's classroom questions make me to learn mathematics better.	1000	3.3980	.62609	Agreed
40. A lot of time is wasted in learning mathematics, when the teacher asks questions.	1000	3.2340	.70693	Agreed

Research Question 2:

Is there any difference between male and female students' perception their teacher classroom questioning techniques as having effect in their learning experiences?

To find it there were significance differences between the male and female in the perception of the students on the effect of the students' classroom questioning techniques in the performance in mathematics, the responses of the students to the questionnaire were analyse using t-test. Out of the forty items on the questionnaire seven items exhibited gender significant differences at 0.05 alpha levels. The results of the independent t-test, which showed that there were gender significant differences at 0.05 alpha level in the perceptions of students on the effects of teachers' classroom questioning techniques in mathematics lesson in the following areas:

- (Item 2) My teacher's classroom questions reinforce pupil's mathematics learning (mean for male students is 3.24 and the mean for female is 3.36, significant at 0.01)
- (Item 4) My teacher's classroom questions motivate pupils to learn mathematics. (mean for male students is 3.22 and the mean for female is 3.34, significant at 0.01)
- (Item 17) My teacher's classroom questions are used as positive reinforcement for student learning (mean for male is 3.19 and the mean for female is 3.52, significant at 0.03)
- (Item 24) My teacher's classroom questions can be used to evaluate students' readiness to learn mathematics (mean for male is 3.01 and mean for female is 3.13, significant at 0.04)
- (Item 34) my mathematics teacher asks a lot of questions during lessons (mean for male is 3.59 and mean for female is 4.15, significant at 0.03)
- (Item 36) My teacher's classroom questions have an impact on students' performance in mathematics (mean for male is 3.51 and mean for female is 4.40, significant at 0.04)
- (Item 40) A lot of time is wasted in learning mathematics, when the teacher asks questions (mean for male is 3.19 and mean for female is 3.31, significant at 0.01)

Research Hypothesis 1

There is no significant significant difference between male and female students' perception on their teacher classroom questioning techniques as having effect in their learning experiences

Table 2: T-test of male and female students on their perception on the questioning techniques.

Gender	N	Mean	SD	Df	T.cal	T-tab	Decision
Male	600	3.27	0.34	998	-0.4	0.95	NS
Female	400	3.28	0.20				

From Table 2, t-calculated of -0.4 is less than table value of 0.95, which indicates that the difference in the mean is insignificant. Therefore, the hypothesis is accepted. This show that male and female students perception on their teachers questioning techniques are the same.

Research Question 3

Will there be any difference between the science and arts student's perception on effect of teachers' questioning techniques in their maths learning?

- To find it there were significance differences between the Science and Arts in the perception of the students on the effect of the students' classroom questioning techniques in the performance in mathematics, the responses of the students to the questionnaire were analyse using t-test. Out of the forty items on the questionnaire seven items exhibited significant differences at 0.05 alpha levels. The results of the independent t-test, which showed that there were significant differences between science and arts students at 0.05 alpha level in the perceptions of students on the effects of teachers' classroom questioning techniques in mathematics lesson in the following areas:
 - (Item 2) My teacher's classroom questions reinforce pupil's mathematics learning (mean for science students is 3.12 and mean for arts is 3.38, significant at 0.01)
 - (Item 4) My teacher's classroom questions motivate pupils to learn mathematics (mean for science students is 3.19 and mean for arts is 3.38, significant at 0.01)
 - (Item 21) My teacher's classroom questions lead to discussions and communication of mathematical ideas (mean for science students is 0.62 and mean for arts is 3.09, significant at 0.01)

- (Item 30) My teacher’s classroom questions help in reviewing and summarizing of previous lessons (mean for science students is 3.15 and mean for arts is 5.25, significant at 0.02)
- (Item 35) Teacher’s classroom questions always have an impact on students understanding of mathematical concepts (mean for science students is 4.15 and mean for arts is 6.95, significant at 0.04)

Research Hypothesis 2

There is no significant significant difference between Science and Arts students’ perception on their teacher classroom questioning techniques as having effect in their learning experiences

Table 3. T-test of Science and Arts students on perception of Teachers’ Questioning Techniques

Subjects	N	Mean	SD	Df	T.cal	T-tab	Decision
Science	500	4.38	1.42	998	0.62	0.95	NS
Arts	500	3.03	1.03				

From table 111, calculated t-value od 0.62 is less than table value of 0.95 and this shows that there is no significant difference in the Science and Arts students opinion on their teachers questioning techniques. For this the hypothesis is accepted.

Findings

The study sought to seek the opinion of SSII students at the Bungudu Local Government Area of Zamfara State on the effects of teachers questioning techniques with regards to their performance in mathematics. The research of mathematics teacher’s classroom questioning techniques is very important not only for facilitating students’ teaching and learning but also improving teacher proficiency in the classroom at secondary schools. The result showed that significant difference existed between genders in learning maths. The finding is consistent with the available literature by Omobola (2010) and Adebola & Ajibogba (2012) that stated the role of teachers’ classroom questioning techniques as an important teacher-quality which influences students’ academic performance. In a similar finding, Croom and Stair (2005) established that teachers’ classroom questioning techniques enhances students teaching and learning by developing critical thinking skills. The result also revealed that significant difference exists between the science and art students on their perception on effect of teachers’ questioning techniques.

Conclusion

From the results it can be recommended that in-service workshops should be provided for mathematics teachers on how to use effective classroom questioning techniques to improve learning experiences of students. Also teachers should be exposed to various questioning techniques and it is important at the Colleges of Educations, Faculty of Education and other Teacher Education Institutions. The issue of good use of teachers’ classroom questioning for effective learning outcome should be incorporated in the various teacher training colleges in Nigeria.

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