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EFFECT OF CONTEXTUAL TEACHING STRATEGY ON GEOMETRY ACHIEVEMENT OF STUDENTS IN JUNIOR SECONDARY SCHOOLS IN KATSINA METROPOLIS OF KATSINA STATE

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ABSTRACT

This study was carried out on effects of contextual teaching strategy on the geometry achievement on secondary school students. The research adopted the Quasi-experimental nonequivalent control group design. Data were collected from a sample of 144 students comprising 78 boys and 66girls from two randomly selected private schools in Katsina metropolis of Katsina state. The schools were grouped into experimental and control group. Geometry Achievement Test (GAT) was used to gather data. The GAT was a researcher made instrument consisting of twenty (20) items based on JSII mathematics topics related to geometry. The GAT was administered twice, before experiment (Pre) and after experi ment (Post).The items were objectives questions scored over 100 (20× 5).The reliability coefficient of GAT was found to be 0.75. This shows that instrument was good and reliable. Data collected were analyzed using descriptive statistics of mean and standard deviation for answering the research questions and t-test at coefficient alpha level of 0.05 for testing the hypotheses. Major findings of this study are: there is significance difference between the mean achievement scores of students' taught

geometry with contextual teaching strategy and those taught with conventional method. There is no significant difference between the mean achievement score of male and female students' taught geometry with contextual teaching strategy. Based on these findings, it was recommended that efforts should be intensified by teachers in junior secondary schools to begin to utilize contextual teaching strategy which has proved to have positive impact on students' achievement in geometry. Teachers in training should be equipped with knowledge vast enough to implement contextual teaching strategy in teaching mathematics and for students to achieve maximally in geometry; conventional method should not be used to teach geometry to students in junior secondary school education.

Keywords: Geometry, Contextual Teaching, Strategies, Achievement and Conventional T eaching

Introduction

Creating good learning processes will always require the knowledge and skills of teachers regarding the approach, strategy or learning methods to suit the characteristics of the subject matter as well as to get the best understanding across to the learner. For many students, mathematics seems complex. Coping with this complexity in the practice of teaching is an everyday task for a mathematics teacher, teacher educator and researcher. Krainer (2013) considered that the field of mathematics education has moved toward a better understanding of this complexity. At the exploratory level, the complexity lies in the classroom interactions and the ways that the teacher is balancing mathematical goals with students' reasoning and thinking, and classroom management. Wood (2012) argued that traditional teaching strategies in mathematics often perpetuate the gap between learning by failing to stimulate interest and engage students in purposeful activities which are related to what they do at home and in the community. They cannot see the point of what they are doing in mathematics in school. While educators are aware of the shortfall in learning, the alternate forms of teaching have brought under consideration situations such as classroom norms, patterns of interaction, supporting students' mathematical thinking and reasoning. These are important issues in mathematics teaching that pose new challenges for teachers, educators and researchers to make effort towards ensuring that mathematics is viewed as realistic, contextual and relevant to student's daily lives. According to Allen (2014), effort can be realized by means of optimizing the participation of elements of the teaching/learning process, and optimizing the entire student participation. One possibility is to provide an opportunity for students to be able to find or construct their own knowledge to be mastered. Generally, it is widely believed that mathematics is an abstract subject that is important and yet with no relevance to daily activities. Frobisher and Orton (2016) viewed mathematics as a powerful tool with great relevance to the real world. Further, they suggested that for this to be appreciated by the learners they must have direct experiences of using mathematics in a wide range of contexts throughout the curriculum. Approaches that advocate contextualized teaching have been proposed in recent years and provide some solid evidence of progress toward reform.

Geometry is a branch of mathematics that deals with the study of shape, size and the property of space. Adu (2008) define Geometry as a branch of mathematics which deals with the study of different shapes and sizes as well as their properties.
Mathematics is also a subject of enjoyment and excitement, which offers students opportunit ies for creative work and moments of enlightenment and joy. When ideas are discovered an d insights gained, students are spurred to pursue mathematics beyond the classroom walls s ince practical approach is being used as teaching method.
Geometry is one of the most important branches of mathematics education, because the aim of the geometry teaching is to provide students with the ability of critical thinking, problem solving, and a better understanding of the other subjects in mathm atics by making the students have a high level of geometric thinking skills (Şahin, 2008). Difficulties arise from the need to understand mathematical language in the field of geometry, while integrating it with prior knowledge, in parallel to the students' level of mental development.
Teaching geometry is a difficult task for teachers. The difficulties require excellent teachers with adequate training and abilities so that they can carry out the task of mediation between material and learner. To help students overcome learning difficulties in geometry teachers should proceed to contextual problems, making the students active, with the teacher acting as a facilitator, with students freely spending their time, sharing their ideas and teachers helping students compare ideas and making decisions about which idea is deemed better for them. Fitting into this description is the conceptual teaching and learning strategy.

The Contextual Teaching (CT) Strategy aims to provide students with knowledge that can be flexibly applied (transferred) from one problem to another and from one context to another. In other words CT approach has the principle of bring them from their world to our world, then; take them from our world back to their world so that students really get to know not only the value but also they appreciate it and most importantly they are able to actualize or practice it (Rustana, 2012).In contextual teaching method students are given opportunity to construct relationships within the context of things that are more relevant and meaningful to them. Hence, contextual learning is often hypothesized as an effective teaching method in improving students' potential and thus makes them to be more interested in science learning. At execution, emphasis is given to the cognitive, affective and psychomotor elements and strengthened with authentic assessment. Students also are educated towards the overall development of their character. As declared by Arnold and Ketter (2011), contextual teaching is a learning philosophy that emphasizes students' interest and experiences. It provides the means for reaching learning goals that requires higher order thinking skills. Apparently, contextual teaching is viewed as an approach of learning that cannot be separated from behaviorism and constructivism theories. It is indeed a conception that enables teachers relates subject matter content to real world situation and its application to students' lives as family members, citizens and workers and engaging them in the hard work that learning requires (Pate, 2016).

A few studies, however, explored contextual teaching strategy from different dimensions as it concerns teachers. Olorukooba (2002) studied the effects of contextual teaching method of

instruction and traditional method of instruction on academic achievement of students and their retention of chemistry concept and the attitude of male and female students in Akure metropolis. The findings showed that the experimental group performed significantly better in the achievement test than the control group. Based on the findings, the use of contextual instructional strategy was recommended in the teaching of chemistry.
Mardianto and Eka (2016) investigated the effects of contextual teaching and learning and conventional method on mathematics thinking ability of Islamic senior high school students 1 in Medan Indonesia. The aim of this study was to find out the difference in mathematics thinking ability of students' taught Geometry using Contextual Teaching and Learning and those taught with Conventional Method. The results indicated that there was a difference in students 'mathematics thinking ability as students taught with Contextual Teaching and Learning Model got higher thinking ability than those taught with Conventional Model on the Geometry material.

Suryawati and Osman (2018) investigated contextual learning: innovative approach towards the development of students' scientific attitude and natural science performance. The study was specifically designed to measure the effectiveness of Contextual Teaching and Learning (CTL) on students' scientific attitude and achievement in Natural Science among junior school students in Pekanbaru, Indonesia. The findings revealed that significant difference existed across experimental groups in terms of students' achievement. However, there was no significant difference in terms of scientific attitude. These findings contribute significant implications for the enhancement of scientific thinking skills among various students' capabilities and different categories of school. Contextual teaching strategy is found appropriate in achieving the above dimensions in heterogeneous schools.

According to Okeke (2017), gender refers to the social or cultural construct, characteristics, behaviors and role which society ascribes to males and females. Gender is a social or cultural determinant that varies from place to place or culture to culture. In recent times gender related issues in science education has continued to receive serious attention judging by the quanta of studies done to that effect. For example Babajide (2010) opined that science subjects are given masculine outlook by educational practitioners. In addition to this, the studies by Ogunleye (2012) show that science achievement depends on gender. But, Nwosu (2011) found that students' acquisition of science process skills are not gender specific. Also, influence of gender on students' conceptual change has been equally investigated. The interaction effect between gender and teaching method has received research attention in recent times in science education. Baser (2016) found that gender significantly interacts with an instructional treatment. Therefore, this study is designed to examine the effect of contextual teaching strategy on geometry achievement of secondary school students in Katsina metropolis.

Statement of the Problem

There are many methods, techniques and strategies for impacting knowledge to students but there is no denying the fact that not all the methods of teaching adequately promote students' understanding. In spite of the support system given to the education of secondary school students by the government, majority of the students either do not or partially achieve their aims of secondary school education. In Nigeria, students' poor performance has been

attributed to poor teaching methods as well as poor and non-supportive learning environment. Due to individual differences, teachers owe it as a duty to employ varieties of techniques in teaching and learning in order to offset the problem of boredom and abstractness and more importantly enhance understanding of what is taught. Unfortunately, some teachers do not want any change in their mode of delivery. They stick to the lecture method and most of the times give explanations that are too complicated for the students to relate to life experiences.

Learning will be more meaningful and interesting to students if teachers can present problems in contextual and realistic settings, in such a way that the problems are already known or close to the daily experiences of students. Contextual issues can be used as the starting point of learning mathematics in helping students develop their reasoning ability to learn mathematical concepts and can also be used as a source of mathematical applications. Therefore, it is scholarly motivating and demanding that an assessment of the effect of contextual teaching strategy in geometry achievement be carried.

Purpose of the Study

The objectives of the study are to determine:

1. Find out if there is any difference between geometry achievement of junior secondary school students taught with contextual teaching strategy and those taught with conventional teaching method.
2. Find out if there is any difference between the achievement of male and female junior students taught geometry with contextual teaching strategy.

Research Questions

The following research questions were framed to guide the study:

1 What is the difference between geometry achievement of junior secondary school students taught with contextual teaching strategy and those taught with conventional teaching method?

2 What is the difference between the geometry achievement of male and female junior students taught with contextual teaching strategy?

Hypotheses

The following Hypotheses were formulated to be tested at 0.05 significant level:

Ho_1: There is no significant difference between geometry achievement of junior secondary school students taught with contextual teaching strategy and those taught with conventional teaching method.

Ho_2: There is no significant difference between the achievement of male and female junior students taught geometry with contextual teaching strategy.

Delimitation of the Study

This study aims at finding out the effect of contextual teaching strategy on the Geometry achievement and retention of secondary school students in Katsina metropolis of Katsina state. The study involved JS II students in the Katsina metropolis. The reason for choosing this

level of students is that they are a more stable class in addition to being reasonably exposed to mathematics concepts in the junior secondary school syllabus. They are not also yet very close to writing their external examination. Just the content of the JSII Geometry was used for this study.

Significance of the Study

This study would be of great benefit to a number of education stakeholders as well as the society at large. The **government** through this work would be able to realize the factors affecting the teaching and learning of mathematics for educational development and control within the country. To the policy makers, educational administrators, it will give or provide for them a guide line for formulating policies that are related to the teaching and learning of mathematics and other subjects in secondary schools. The **education authority** will also be helped by this work to package a highly students motivating curriculum for learning and teaching of mathematic as a subject in secondary schools. To the school management, it would provide necessary information for the teaching and control of mathematics classes while the teachers would be enlightened on the role to play in motivating students' interest in the learning of mathematics.

Parents as well will have a lot to learn on the role to play in order to ensure good mathematic achievement of the students. Curriculum designers could use the findings of the study as a basis for the design of teaching in secondary schools. This study shall also act as a source of strength to the educational change agents who may wish to raise eye brows against the status quo of the teaching pursuits. Furthermore, the study shall provide a guide on which these change agents would base their arguments to clamor for a positive educational change. Finally, to **students**, the research work will also be useful for academic purpose in the sense that it is an addition to knowledge on past academic works of other researchers on the subject of mathematics and will serve as a reference point for subsequent researchers.

Research Design

The quasi-experimental nonequivalent control group design is adopted for this study. This method uses pretest, treatment and posttest. The rationale for using this method rests on the fact that students in the class are to be taught with either contextual method or the conventional method. There will be no randomization of the students for the treatment. In addition, quasi-experimental design offers less difficult control compared to other experimental designs. The design is shown thus;

$O_1 \quad X_1 \quad O_2$
$O_3 \quad -O_4$

Experimental Group: Pre-testing- Contextual teaching method - Post test
Control Group: Pre-testing - Conventional method - Posttest.

Population of the Study

The target population of the study consisted of all JSII students in Private Secondary Schools in Katsina metropolis of Katsina state. The total population is 4,766 (Department of Quality Assurance Katsina, Zonal Educational Office, 2020).

Sample Size and Sampling Procedures

The total number of Secondary Schools in Katsina Metropolis is forty (40) of which twenty five (25) are public schools and fifteen (15) are private schools. Simple random sampling tech nique was used to select two private schools for this study. The schools sampled for the stu dy are: Saldefi International School Katsina and Mariamoh Ajiri International School Katsina. The two schools have two arms of JSII each and simple random sampling technique was used to randomly assigned to either experimental or control group. The experimental group comprised 43 male and 35 female students and the control group comprised 35 male and 31 female students, making a total of 144 students. Intact class of JSII was used in each of the two schools to avoid distortion in their normal school schedules and classroom settings.

Instrumentation

The instrument for the study was the Geometry Achievement Test (GAT), which consists of 20 multiple-choice objective questions with four options (A-D).It was developed by the researcher drawn from the topics Geometry in the JSII syllabus which were taught during the study. The GAT was used for both pre-testing and post testing of students'.

Validity and Reliability of the Instrument

The Geometry Achievement Test (GAT) was content validated with the use of a Table of Specification in constructing the test items. Also, it was face-validated by the three other experts in mathematics department of Federal College of Education Katsina. The experts' suggestions and advice were used to modify the test items. The Kuder-Richardson (KR-21) formula was used to ascertain the internal consistency or reliability of the GAT. The value of (r) was found to be 0.75. This made it reliable. The decision to use KR-21 for testing the reliability of GAT was borne out of the fact that the items were not of equal difficulty level and one single test score was used for the reliability.

Data Collection Procedures

The researcher carries out the teaching for the two groups together with their respective mathematics teacher as research assistants. The students in JSII of the selected schools were subjected to pretest to ascertain their corresponding entry behaviors. For the period of the study, the teachers meticulously used the lesson plans prepared by the researcher for both experimental and control groups to cover the Geometry contents. The post-test (that is, the second version of the GAT) was administered when lesson with the two groups was covered. The GAT was scored over 100 percent in both versions.

Methods of Data Analysis

The data collected was analyzed using mean and standard deviation to answer the research questions while t-test was used to test for all the hypotheses at 0.05 level of significance.

Data Analysis and Results

Answer to Research Questions

The answers to questions that sought to establish the possible differences in achievement among the various groups are hereby presented using frequencies, mean and standard deviation.

Research Question One: What is the difference between geometry achievement of secondary school students taught with contextual teaching strategy and those taught with conventional teaching method?

Table 1: Descriptive Statistics Showing Experimental Group (Contextual Teaching Strategy) and Control Group Achievement in the Post test

Groups	N	$\bar{X}$	SD
Experimental	78	69.87	8.95
Control	66	59.77	5.72
Mean Difference		10.1	

Results in Table 1 indicate that students in the experimental group had a mean score of 69.87 with a standard deviation of 8.95 while those in the control group had mean score of 59.77 with a standard deviation of 5.72. In other words the students in the experimental group (contextual teaching strategy) had a higher mean score of 10.1 more than their counterparts in the control group.

Research Question Two: What is the difference between the geometry achievement of male and female students taught with contextual teaching strategy?

Table 2: Descriptive Statistics Showing Effect of Contextual Teaching Strategy on Gender Achievement in the Post test Scores.

Groups	N	$\bar{X}$	SD
Male	43	68.58	7.40
Female	35	71.46	10.44
Mean Difference		2.88	

Results in Table 2 indicate that male students had a mean score of 68.58 with a standard deviation of 7.40 while the female students had a mean score of 71.46 with a standa rd deviation of 10.44. In other words, the female students had a higher mean score of 2.88 than their male counterparts when exposed to mathematics with contextual teaching strategy.

Test of Hypotheses

Hypotheses One: There is no significant difference between geometry achievement of secondary school students taught with contextual teaching strategy and those taught with conventional teaching method.

Table 3: **Two-tailed t-Test Result in Respect of Mean Achievement Score between the Experimental Group (Exposed to Contextual Teaching Strategy) and the ControlGroup(Conventional)**

Groups	N	$\bar{X}$	SD	df	t_{value}	Std Error	Sig.@0.05	Decision
Experimental	78	69.87	8.95	142	7.90	1.278	0.000	Rejected
Control	66	58.77	5.72					

Table 3 shows that there was a significant difference between the mean achievement scores of students' exposed to contextual teaching strategy and those in the control group as t=7.90, df=142,P<0.05. This hypothesis was therefore rejected. There is significant difference between the geometry achievement of secondary school students taught with contextual teaching strategy and those taught with conventional teaching method.

Ho_2: There is no significant difference between the achievement of male and female junior students taught geometry with contextual teaching strategy.

Table 4: Two-tailed t-Test Result in Respect of Mean Achievement Scores between Male and Female Students' Taught Geometry with Contextual Teaching Strategy.

Groups	N	$\bar{X}$	SD	df	t_{value}	Std Error	Sig.@0.05	Decision
Male	43	68.58	7.40	76	1.421	2.024	0.160	Accepted
Female	35	71.46	10.44					

Table 4 shows that there was no significant difference between the mean achievement scores of male and female students' taught geometry with contextual teaching strategy as t=1.421,df= 76, P> 0.05. This hypothesis was therefore retained. In other words, male and female students did not differ significantly in their mean achievement score as a result of exposure to geometry with contextual teaching strategy

Summary of Findings

The findings of this study were as follows:

- There is significance difference between the mean achievement scores of junior students taught geometry with contextual teaching strategy and those taught with conventional method.
- There is no significant difference between the mean achievement score of male and female junior students taught geometry with contextual teaching strategy

Discussion of Findings

The main purpose of the study was to examine the effects of contextual teaching strategy on the geometry achievement of secondary school students in Katsina metropolis. Two research questions and two hypotheses were raised. The data presented in Table 1 provides answer to research question one; findings revealed that the experimental group (contextual teaching strategy) had a mean score of 69.87 with a standard deviation of 8.95while those in the control group had a mean score of 59.77 with a standard deviation of 5.72. This indicates that students in the experimental group had a higher mean score than

their counterparts in the control group. The result of t-test as reported in Table 3 showed that there was a statistically significant difference between mean achievements of students exposed to geometry through contextual teaching strategy than those exposed to conventional method. The success of the experimental group is due to the fact that the contextual teaching strategy provides the students with concrete experience which they need in order to develop their intellect and how to effectively relate what they have studied to real life situation. These finding confirms that of Olorukooba (2002) that there was significant difference between the achievements of students taught with contextual mode of instruction and those thought with traditional method (conventional). It's also in line with Mardianto and Eka (2016) the study indicated that that there was a difference in students 'mathematics thinking ability as students taught with Contextual Teaching and Learning Model got higher thinking ability than those taught with Conventional Model on the Geometry material.

The data presented in Table 2 provides answer to research question two; finding revealed that in experimental group male students had a mean score of 68.58with a standard deviation of 7.40 while the female students had a mean score of 71.46 with a standard deviation of 10.44. In other words, the female students had a higher mean score than their male counterparts. The result of t-test as reported in Table 4 revealed that there was no statistically significant difference in the mean achievement scores of male and female students exposed to geometry with contextual teaching strategy. On the achievement between male and female students, the results showed that female students achieved higher than their male counterparts. The higher achievement of the female could be due to the fact that they can easily relate what they have learnt to real life than their male counterpart. This result concurred with the findings of Suryawati and Osman (2018) Contextual teaching strategy is found appropriate in achieving the good results in heterogeneous schools. These findings contribute significant implications for the enhancement of scientific thinking skills among various students' capabilities and different categories of school.

Conclusion

From the findings of the study, the following conclusion could be drawn: Contextual teaching strategy was found to make students explore a wider variety of ideas needed to boost students' learning outcomes. It provides students with knowledge that can be flexibly applied (transferred) from one problem to another and from one context to another. In other words the approach has the principle of bring them from their world to our world, then; take them from our world back to their world so that students really get to know not only the value but also they appreciate it and most importantly they are able to actualize or practice it. It enhances understanding of content, creative and critical thinking, expression of ideas and information connection of an individual to real life.

The students do not seem to have a banal view of intelligence as regards to gender, in achievement when taught geometry with contextual teaching strategy does not discriminate on academic achievement and retention of students based on their gender and that is, it has effect on both male and female students. In other words, it was found contextual teaching strategy is gender-friendly if adequately utilized.

Recommendations

Based on the findings of this study, the following recommendations are made.

1. Mathematics teachers should be encouraged to use contextual teaching strategy to teach mathematics.
2. For students to achieve maximally in geometry, conventional method should not be used to teach mathematics to students in junior secondary school education.
3. Teachers in training should be equipped with knowledge vast enough to implement contextual teaching strategy in teaching mathematics.

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Male Pre-Test and Post-Test Raw Score for Experimental Group (Contextual teaching strategy)

S/N	Pre-test scores	Post-test scores
1.	30	70
2.	20	75
3.	28	65
4.	15	75
5.	15	65
6.	25	70
7.	20	78
8.	25	85
9.	10	75
10.	15	68
11.	25	63
12.	20	70
13.	20	75
14.	30	73
15.	18	60
16.	18	73
17.	20	75
18.	15	78
19.	20	55
20.	20	75
21.	25	78
22.	10	65
23.	18	78
24.	25	65
25.	20	70
26.	15	70
27.	10	85
28.	10	65
29	15	60
30	18	65
31.	20	68
32.	13	65
33.	20	63

34.	13	65
35.	10	58
36.	13	58
37.	13	60
38.	15	58
39.	18	60
40.	20	70
41.	18	60
42.	20	65
43.	15	75

Female Pre-Test and Post-Test Raw Score for Experimental Group (Contextual teaching strategy)

S/N	Pre-test scores	Post-test scores
1	20	65
2	13	65
3	20	78
4	13	75
5	10	60
6	13	60
7	13	65
8	15	70
9	18	85
10	20	70
11	18	58
12	25	55
13	25	58
14	20	60
15	20	58
16	10	60
17	15	85
18	10	78
19	20	88
20	20	73
21.	13	70
22.	20	75
23.	13	93
24.	10	68
25.	13	93
26.	13	68
27.	15	73
28.	18	63
29.	20	85
30.	13	78

31.	13	83
32.	10	80
33.	10	70
34.	25	68
35.	20	68

Male Pre-Test and Post-Test Raw Score for Control Group (Conventional)

S/N	Pre-test scores	Post-test scores
1.	15	60
2.	20	55
3.	20	63
4.	10	60
5.	15	65
6.	20	65
7.	18	50
8.	20	65
9.	10	55
10.	18	58
11.	18	63
12.	20	60
13.	15	55
14.	20	53
15.	20	50
16.	15	63
17.	10	65
18.	13	58
19.	13	58
20.	20	70
21.	25	60
22.	13	65
23.	10	58
24.	15	65
25.	10	50
26.	18	55
27.	18	65
28.	13	45
29	13	58
30	10	60
31.	20	48
32.	18	60
33.	10	65
34.	20	63
35.	20	50

Female Pre-Test and Post-Test Raw Score for Control Group (Conventional)

S/N	Pre-test scores	Post-test scores
1.	18	65
2.	13	55
3.	20	60
4.	13	65
5.	15	60
6.	15	62
7.	18	63
8.	20	58
9.	10	58
10.	15	60
11.	18	58
12.	20	60
13.	15	60
14.	15	63
15.	20	60
16.	20	75
17.	10	58
18.	15	60
19.	20	60
20.	20	78
21.	20	60
22.	20	63
23.	20	55
24.	25	60
25.	20	50
26.	20	55
27.	20	65
28.	25	60
29	20	60
30	20	58
31.	25	63