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Effects Of Conceptual Instructional Strategy On Students' Achievement And Retention In Geometry In Delta State, Nigeria

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ABSTRACT

This study examined the effects of conceptual instructional strategy of teaching on students' achievement and retention in geometry in Delta State Nigeria. Four research questions and four hypotheses guided the study. The study adopted a quasi-experimental research design of non-equivalent research design of non-equivalent group. Intact classes were assigned to experimental group (conceptual instructional strategy) and control group (conventional teaching strategy) using multi stage sampling technique. The sample for this study is 217 SS 2 secondary school students from four public secondary schools. Data for this study was generated using Geometry Achievement Test (GAT) and reliability index of 0.87 was obtained using kuder-Richardson (K-R20). Mean and standard deviation were used to answer all research questions. Analysis of covariance (ANCOVA) was used to test the hypotheses at a 0.05 level of significance. Based on the data collected and analyzed the following were the findings: There was significant difference in mean academic achievement and knowledge retention of students taught geometry using the conceptual instructional and conventional teaching strategies. The study therefore recommended that; Mathematics teachers should be encouraged to use conceptual instructional strategy in teaching mathematics. Mathematics teacher's trainees should be trained on the use of conceptual instructional strategy which could improve achievement of secondary school students. Curriculum planners and science teachers should inco-oporate innovative activity based pedagogical strategies like conceptual instructional strategy in all teachers' education instructions. Professional bodies like the Mathematical Association of Nigeria (MAN) and Science Teachers Association of Nigeria (STAN) in collaboration with NERDC and federal ministry of education should organize seminars, workshops and symposia on the use of conceptual instructional strategy for science teachers. Efficacy of the use of conceptual instructional strategy in teaching of mathematics and other science subjects need to be explored.

Keywords: conceptual instructional strategy, mathematics, students

INTRODUCTION

Mathematics plays a significant role in national development and transformation of any society. Among other things, mathematics has helped in the realization of technological development and modern science. Different researchers in the field of mathematics have defined mathematics

from different perspectives. According to Ntibi and Neji (2018), mathematics is a language that uses carefully defined terms and concise symbolic representations which add precision to communication. Abdu-Raheem (2012) declared mathematics as the mother of all sciences, explaining that the diverse phenomena, both in physical, biological and economic situations can be communicated through the concepts of shape, quantity, size and order.

From the above definitions, it is clear that mathematics is vital to all sciences. It can further be deduced from these definitions that the ultimate objective of mathematics is to promote scientific and technological development of the nation. It is obvious that technological training is impossible without thorough knowledge of mathematics.

Sambo (2015) stated that geometry is an appropriate vehicle for proving the process of mathematical logic. He felt that students or learners who are good at geometry have potential abilities to solve many of the societal problems, whether social, economic, technological or otherwise. Schwartz (2014) noted that geometry is so often the school mathematics topic that people remember with unpleasantness and lack of comprehension. Even with the West African Examination Council Chief Examiners negative reports (2009, 2013, 2022) about poor mathematics performances, the National Centre for Education Statistics (2016) particularly mention geometry as worst hit when it comes to candidates performance. To arrest the above situation, Unodiaku (2018) appealed for alternative strategies of teaching geometry. This study is an answer to that appeal.

In recognition of the importance of mathematics and how to improve the quality of teaching and learning of the subject, the Mathematical Association of Nigeria (MAN) initiated mathematics improvement projects with the intention to improve on the learning of mathematics in the secondary schools. Hence, MAN emphasizes how to teach the subject matter of mathematics as well as, its presentation to the students to enhance students' performance. In the last few decades the Science Teachers Association of Nigeria (STAN) has made efforts at diagnosing the problems plaguing the teaching and learning of science, technology and mathematics in Nigeria. The results of these efforts revealed that these problems are caused by students, teachers, parents, environment/society, governments etc.

Bolaji et al (2015) saw that the conventional strategy of teaching is restricted to some degree and its classroom setting is teacher-centred. Olayinka (2015)'s research evidence specifically faulted strategies like conventional teaching strategies as the causes of these poor performances. This shows that mathematics pedagogy needs a boost in order to address the challenges of persistent poor performance as well as, improve quality and standard in mathematics instructions as most of the methodology used by mathematics teachers during instruction is teacher dominated discourse. This is because students are inhibited from sharing ideas with the teachers, instead they are expected to comply with commands or orders without questioning. The strategy is related to the lecture strategy of teaching which affords little or no interaction between the teacher and the students during classroom activities.

The usual teaching strategies used in mathematics delivery have been the most important factor of poor performance and poor knowledge retention (Chukwu, 2016). The less interactive, teacher-centred instructional technique presents some teaching and learning challenges, which heightens the inability of mathematics teachers to inculcate serious critical thinking ability on students whose poor attitude to learning, poor self-concept and poor academic achievement stems from their perception that mathematics lessons are difficult. The content and context of the mathematics syllabus places emphasis on guided discovery, conceptual thinking and problem-solving as strategies of teaching mathematics (Udoh, Ukpong & Akpan, 2012). The teaching of mathematics which is supposed to equip the students with the necessary in-depth knowledge of subject matter content, develop learners' interest and lead to discovering of new facts for survival is relegated to the background (Okoro, 2019).

Conceptual instructional strategy of teaching is a type of strategy where emphasis is placed on teaching the concepts in the subject to be taught using appropriate instructional strategies (Gobinath, 2017). This leads to increased conceptual understanding and transfer of correct formula and presentation. Conceptual instructional strategy promotes meaningful learning of concepts through elaborate links that ensure that concepts are explicitly understood and can then serve as anchor for further learning which can be applied to solve problems (Bergsten, et al 2017).

Achievement implies the accomplishment of a goal which is the acquisition of geometric knowledge and skills for the solution of life problem (Anyor, 2014). It is an observable and measurable behavior of a student in a particular situation. According to Tella (2023), academic achievement of a student is the ability of the student to study and remember facts and be able to communicate his knowledge orally or in writing form in whatever condition.

Retention is a strong component of achievement. It is a preservative factor of the mind. According to Ugwuanyi (2016), retention refer to the ability of the students to keep in memory what has been taught and assimilated.

Statement of the Problem

The achievement of students in Senior Secondary School Examinations (SSCE) conducted by West African Examination Council (WAEC) and National Examination Council (NECO) in mathematics in Nigeria has been very unsatisfactory. This state of affairs is undoubtedly not encouraging and constitutes a source of worry to major stakeholders in the education sector such as educationists, mathematics experts, teachers, parents and examination bodies. Many factors may be responsible for this poor achievement of students in WAEC and NECO in mathematics in Nigeria.

Research evidence like Imuno (2015) have implicated teachers' incompetence and use of unproductive teaching strategies in teaching mathematics. These go to show that teachers' pedagogy and instructional methodology may need a boost in order to face the challenges of persistence poor achievement and low knowledge retention in mathematics. In this regard, the need to examine some teaching strategies which could improve students' achievement and retention of knowledge in mathematics becomes inevitable. This instructional strategy appear consistence not only with the procedure for solving problems in mathematics, but also with the ability to elicits better explanation and make students to learn more as well as enhance their knowledge retention in mathematics . In view of this situation, conceptual instructional strategy may be considered useful in teaching mathematics so as to improve the students' achievement and knowledge retention in the subject.

Students have been found to always be avoiding geometry topics and those who attempt them, perform very poorly. The problem of this study posed as a question therefore is: What is the effects of conceptual instructional strategy on students' achievement and knowledge retention in geometry in senior secondary schools in Delta State.

Purpose of the Study

The aim of the study is to investigate the effects of conceptual instructional strategy on achievement and knowledge retention of Senior Secondary Schools students in Delta State in geometry. Specifically, the study seeks to determine:

1. The academic achievement of male and female senior secondary school students in geometry when taught using the conceptual instructional strategy and traditional teaching strategy.
2. The knowledge retention of senior secondary school students in geometry when taught using the conceptual instructional strategy and traditional teaching strategy.

Research Questions

The following research questions were raised to guide the study:

1. What is the difference in academic achievement of senior secondary school students in geometry when taught using conceptual instructional and traditional teaching strategies?

2. What is the difference in knowledge retention of senior secondary school students in geometry when taught using conceptual instructional and traditional teaching strategies?

Statement of the Hypotheses

The following null hypotheses were formulated to guide the study. These were also tested at 0.05 level of significance (P<.05).

1. There is no significant difference in senior secondary school students' academic achievement in geometry when taught using the conceptual instructional strategy and conventional teaching strategy.
2. There is no significant difference in knowledge retention of senior secondary school students taught geometry using the conceptual instructional strategy and conventional teaching strategy.

Literature Review

Conceptual Instructional Strategy

Conceptual instruction is an art of conveying concept. It is designed to present an idea (Cambridge Advanced Learners' Dictionary, 2020). Conceptual instruction is also known as category learning in which a human or machine learner is trained to classify object by being shown a set of example object along with their class labels. The learner will simplify what has been observed in an example. This simplified version of what has been learned will then be applied to future examples. Conceptual instructions range in simplicity and complexity because learning takes place over many areas (Asabe, 2014). Conceptual instruction assessment typically focused on a learners' ability to consider the nature of instances encountered based upon defining attribute belonging to the concept category (Baker et al, 2018). Conceptual instruction leads to increased conceptual understanding (Oginni, 2016). Concept formation or concept learning is referred to as the development of the ability to respond to common features or categories of objects or events. Concepts are mental categories or objects, events or ideas that have a common set of features (Howard-Jones & Martin, 2016).

Teaching students the basic concepts behind problems is more useful than teaching students procedures for solving the problems. These students gave better explanation and learn more (Webster, 2016).With conceptual instruction, teachers explain the basic concepts of problems underlying structure. That type of instruction enables students to solve problems without being taught specific procedures and also to understand more about how problems work. Conceptual instruction therefore is a type of instruction where emphasis is placed on teaching the major concepts in the subject to be taught (Jonah & Dogo, 2019).

Concepts are mental categories that help us classify objects, events, or ideas and each object, event, or idea has a set of common relevant features (Asabe, 2014). It is something that somebody has thought up or somebody might be able to imagine (Encarta Dictionary, 2019). It can also be seen as an idea of what something or someone is like, or basic understanding of a situation or principle. Views on how people acquire concepts are guided in large part by which theory of concept determination is believed, (Cambridge Advanced Learners' Dictionary, 2020).Research on concepts acquisition has revealed that children learn by active interaction, initially with concrete objects and later with abstract entities (Erifyli, & Geogios, 2020).

Academic Achievement

Achievement is used in synonymous with success. It is something that somebody has succeeded in doing usually with effort. It implies the act or process of finishing something successfully; success in the area of academic is what is referred to as academic achievement usually assessed with achievement test. Hence achievement refers to the degree of success reached or attained in some specific area (Enyi, 2014). In other words achievement is the extent of success attained by an individual. According to Eze (2019) achievement could be referred to as something very good or difficult which was carried out successfully. Ajah (2014) regarded achievement as a change in behaviour exhibited at the end of a given period of time or within a given range of

time. Achievement has also been described by Aniekwe (2016) as something which has been accomplished successfully especially by means of exertion, skills, practice or perseverance. Aniekwe (2016) sees achievement as a test for the measurement and accomplishment of skills in various field of academic study. Also describing achievement, Nwagu (2020) said it is a systematic and purposeful quantification of learning outcome.

Historical Trends in Mathematics Achievement

Despite efforts to improve mathematics instruction, student performance in mathematics examinations remains unsatisfactory (Wale, 2015). Recent years have seen dismal performance, with less than 40% of students achieving credit six and above in the West African Senior School Certificate Examination (Jonah & Dogo, 2019). Teaching problems, particularly the lecture strategy, are identified as major contributors to poor mathematics achievement in Nigerian secondary schools (Atnufu, 2014; Panya & Adiri, 2013). Bot and Davou (2016) highlight teaching approaches as a key obstacle to pupils' understanding of mathematical concepts. Other researchers, including Ndukwe (2018) and Izuegbunam et al. (2018), attribute poor performance in mathematics to teachers' methodologies. The effectiveness of teaching approaches significantly influences students' achievement levels, emphasizing the importance of teachers' instructional strategies.

Review of Empirical Studies

Conceptual Instructional Strategy and Student Academic Achievement in Mathematics

Asabe (2014) investigated the impact of conceptual instructional strategy on students' academic achievement in practical chemistry among secondary school students in Kaduna state, Nigeria. Using a sample of 100 students from two co-educational secondary schools, they employed a pre-test, post-test quasi-experimental control group design and analyzed the data using ANOVA and t-tests. Results showed that students taught with conceptual instructional strategies performed significantly better than those taught with lecture-based methods. No significant difference in achievement was found between male and female students. The study recommended the integration of conceptual instructional strategies at the senior secondary school level. It shares similarities with the present study in research design and variables but differs in location and data analysis methods.

Muhammad (2014) investigated the efficacy of conceptual instructional strategy of teaching practical chemistry within Zaria education zone of Kaduna state. The quasi experimental research design was adopted for the study. Two research questions were raised and two hypotheses formulated to guide the study. A sample of 220 students was selected from a population of 1,401 science students of senior secondary school two (SSS II). The instrument used for data collection chemistry achievement test (CAT). Findings from the study showed that academic achievement of students exposed to conceptual instructional strategy was significantly higher than their counterpart exposed to lecture strategy of instruction. With reference to gender, there was no significant difference of male and female students' academic achievement in the experimental group. Muhammad's work is similar to the present one in design. However, while his is on chemistry, the present one is on mathematics. While one was taken in the northern part of Nigeria, the other is at the southern part of Nigeria.

Conceptual Instructional Strategy and Students' Retention in Mathematics

Ezema et al. (2017) examined the impact of guided inquiry instructional strategy on Biology retention among secondary school students. They used a quasi-experimental design with 358 SSS II students in Plateau state. Findings showed that students taught with guided inquiry retained more concepts. The study recommended integrating this strategy into the curriculum. Similar to the present study, it used the same research design, one instrument, and ANCOVA for analysis, but differed in location and reliability measure.

Ajayi (2017) examined the impact of hands-on activities on senior secondary chemistry students' achievement and retention in stoichiometry in Zone C of Benue State. Using a quasi-experimental design, the study included 292 students from eight schools. Results showed that students taught with hands-on activities had higher achievement and retention scores compared to those taught using demonstration strategy. Gender did not significantly affect achievement. Recommendations included training Chemistry teachers in hands-on activities. Similar to the present study, it employed a quasi-experimental design and ANCOVA for data analysis, but differed in the study area.

Okwuoza et al. (2018) explored the effects of computer-assisted instruction (CAI) packages on senior secondary students' retention in latitudes and longitudes in Abuja, using a quasi-experimental design. The study included 178 SSSII students, and the Mathematics Retention Test (MRT) was used as the instrument, with a reliability of 0.86. Results indicated that CAI packages enhanced retention compared to conventional teaching strategies. Similar to the present study, it employed a quasi-experimental design and single instrument for data collection, but differed in location, reliability measure, and hypothesis testing method.

Iyekekpolor and Bernard (2021) examined the influence of exploratory talk on primary school pupils' retention of mathematics concepts using an ex-post facto design. The study included 90 pupils and 20 mathematics teachers selected through simple random sampling. Data analysis involved mean, standard deviation, and t-test. Findings suggested positive effects of exploratory talk on retention. Though similar to the present study in having retention as a dependent variable, it differed in location, grade level, research design, and sampling method.

RESEARCH METHODS

The research design employed was a quasi-experimental non-randomized pretest, post-test control group design, specifically utilizing a non-equivalent control group design. The study was conducted in Delta State, with a population of 39,904 SSS II students from which a sample of 333 students was selected using multi-stage cluster random sampling. The instrument for data collection was the Geometry Achievement Test (GAT), comprising 40 multiple-choice questions developed by the researcher from WAEC past question papers and geometry books. The instrument was validated for content and face validity by three experts, ensuring clarity, language suitability, content coverage, and relevance to the research questions. The instrument's reliability was established by administering the Geometry Achievement Test (GAT) to a trial group in a different school, yielding a coefficient index of 0.87. Data collection involved using the GAT by research assistants who were regular mathematics teachers. Three sets of scores were generated: pre-test, post-test, and postpost-test, to assess initial knowledge, achievement after treatment, and knowledge retention, respectively. Analysis was conducted using SPSS version 26, chosen for its efficiency and accuracy, with mean and standard deviation used to address research questions and Analysis of Covariance (ANCOVA) to test null hypotheses at a 0.05 significance level, considering possible initial group differences.

RESULTS AND DISCUSSION

Research Question One

What is the difference in academic achievement of senior secondary school students in geometry when taught using conceptual instructional and traditional teaching strategies?

Table 2: Mean Academic Achievement of Students in Geometry when taught using Conceptual Instructional and Traditional Teaching Strategies

Strategies		**PreGAT**	**PostGAT**	**Mean Gain**
Conceptual Instructional Strategy	Mean	7.52	15.84	8.32
	N	115	115	
	Std. Deviation	3.88	4.01	
Traditional Teaching Strategy	Mean	9.75	13.20	3.45
	N	102	102	
	Std. Deviation	3.17	6.74	
Mean difference				4.87

Table 2 shows the mean academic achievement of senior secondary students in geometry when taught using conceptual instructional and traditional teaching strategies. The table shows that 115 students were taught geometry using conceptual instructional teaching strategy and 102 students were taught geometry using traditional teaching strategy. The table reveals that the mean academic achievement of senior secondary students taught geometry using conceptual instructional teaching strategy is 7.52 with a standard deviation of 3.88 during pre-test and 15.84 with a standard deviation of 4.01 in posttest while the mean academic achievement of senior secondary students taught geometry using traditional teaching strategy is 9.75 with a standard deviation of 3.17 during pre-test and 13.20 with a standard deviation of 6.74 in posttest. The table further shows that the mean gain for conceptual instructional teaching strategy is 8.32 and traditional teaching strategy is 3.45. The difference in academic achievement of senior secondary students taught geometry using conceptual instructional and traditional teaching strategies is 4.87 in favour of students in conceptual instructional teaching strategy class.

Research Question Two

What is the difference in knowledge retention of senior secondary students in geometry when taught using conceptual instructional and traditional teaching strategies?

Table 3: Mean Retention of Students in Geometry when taught using Conceptual Instructional and Traditional Teaching Strategies

Strategies		**PreGAT**	**Retention**	**Mean Gain**
	Mean	7.52	10.66	3.14
Conceptual Instructional Strategy	N	115	115	
	Std. Deviation	3.88	3.74	
	Mean	9.75	9.81	0.06
Traditional Teaching Strategy	N	102	102	
	Std. Deviation	3.17	2.94	
Mean difference				4.87

Table 3 shows the mean knowledge retention of senior secondary students taught geometry using conceptual instructional and traditional teaching strategies. The table shows that 115 students were taught geometry using conceptual instructional teaching strategy and 102 students were taught geometry using traditional teaching strategy. The table reveals that the mean knowledge retention of senior secondary students taught geometry using conceptual instructional teaching strategy is 7.52 with a standard deviation of 3.88 during pre-test and 10.66 with a standard deviation of 3.74 in posttest while the mean knowledge retention of senior secondary students taught geometry using traditional teaching strategy is 9.75 with a standard deviation of 3.17 during pre-test and 9.81 with a standard deviation of 2.94 in posttest. The table further shows that the mean gain for conceptual instructional teaching strategy is 3.14 and traditional teaching strategy is 0.06. The difference in knowledge retention of senior secondary students taught geometry using conceptual instructional and traditional teaching strategies is 4.87 in favour of students in conceptual instructional teaching strategy class.

Hypotheses Testing

Hypothesis One

There is no significant difference in students' academic achievement in geometry when taught using the conceptual instructional strategy and conventional teaching strategy.

Table 6: ANCOVA of Academic Achievement in Geometry when taught using the Conceptual Instructional and Conventional Teaching Strategies

Dependent Variable: PostGAT

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	590.141[a]	2	295.070	10.280	.000	.088
Intercept	4546.222	1	4546.222	158.392	.000	.425
PreGAT	249.548	1	249.548	8.694	.004	.039
Strategy	**497.507**	**1**	**497.507**	**17.333**	**.000**	**.075**
Error	6142.302	214	28.702			
Total	53392.000	217				
Corrected Total	6732.442	216				

a. R Squared = .088 (Adjusted R Squared = .079)

Table 6shows that F (1, 214) = 17.333; p = 0.000< 0.05. Thus, the null hypothesis is rejected. This implies that there is significant difference in students' academic achievement in geometry when taught using the conceptual instructional strategy and conventional teaching strategy. Thus, empirical evidence reveals that there is significant difference in mean academic achievement of students taught geometry using the conceptual instructional strategy and conventional teaching strategy. The partial Eta square of 0.075obtain for the strategies means that 7.5 percent of the mean academic achievement of students in geometry can be accounted for by the strategies employed in the teaching of geometry.

Hypothesis Two

There is no significant difference in knowledge retention of students taught geometry using the conceptual instructional strategy and conventional teaching strategy.

Table 7: ANCOVA of Retention of Students taught Geometry using the Conceptual Instructional and Conventional Teaching Strategies

Dependent Variable: Retention

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	68.606[a]	2	34.303	3.006	.052	.027
Intercept	2767.388	1	2767.388	242.526	.000	.531
PreGAT	29.012	1	29.012	2.543	.112	.012
Strategy	**57.836**	**1**	**57.836**	**5.069**	**.025**	**.023**
Error	2441.892	214	11.411			
Total	25386.000	217				
Corrected Total	2510.498	216				

a. R Squared = .027 (Adjusted R Squared = .018)

Table 7shows that F (1, 214) = 5.069; p = 0.025< 0.05. Thus, the null hypothesis is rejected. This implies that there is significant difference in knowledge retention of students taught geometry using the conceptual instructional strategy and conventional teaching strategy. Thus, empirical evidence reveals that there is significant difference in mean knowledge retention of students taught geometry using the conceptual instructional strategy and conventional teaching strategy. The partial Eta square of 0.023obtain for the strategies means that 2.3 percent of the mean knowledge retention of students in geometry can be accounted for by the strategies employed in the teaching of geometry.

Summary of Findings

From the analysis of data collected for the study, the following summary of findings was made:

i. The mean academic achievement of senior secondary students taught geometry using conceptual instructional teaching strategy was higher than those taught using traditional teaching strategy. There was significant difference in mean academic achievement of students taught geometry using the conceptual instructional strategy and conventional teaching strategy.
ii. The mean knowledge retention of senior secondary students taught geometry using conceptual instructional teaching strategy was higher than those taught using traditional teaching strategy. There was significant difference in mean knowledge retention of students taught geometry using the conceptual instructional strategy and conventional teaching strategy.

DISCUSSION OF FINDINGS

The study investigated the impact of conceptual instructional strategies on geometry achievement and retention among Senior Secondary School students in Delta State, Nigeria, with gender as a moderator variable. The findings indicate that students taught geometry using conceptual instructional strategies outperformed those taught with traditional methods, suggesting that conceptual instruction is more effective for geometry teaching. This aligns with previous research by Abioye (2018) and Ntow and Hissan (2021), who found similar benefits of conceptual teaching strategies in geometry and circle theorems, respectively. Additionally, the results support Khalil's (2009) assertion that providing learners with the right concepts can enhance their performance in various academic tasks, such as writing persuasive essays.

The use of conceptual instructional strategy in the study facilitated the conveyance of geometry concepts and ideas, allowing students to understand the nature of geometry figures based on defining attributes. Consequently, students taught with conceptual instructional strategy exhibited higher knowledge retention compared to those taught using traditional methods. This finding is consistent with Omwirhiren and Ibrahim (2016), who observed significant differences in learning outcomes between students exposed to demonstration and lecture strategies in chemistry. Thus, the significant difference in knowledge retention between the two teaching approaches underscores the effectiveness of conceptual instructional strategy in geometry education.

Summary

This study examined the effects of conceptual instructional strategies of teaching on students' achievement and retention in geometry in Delta State, Nigeria. It also examines the interactive effect of gender on secondary school students' achievement in geometry. Four research questions and four hypotheses guided the study. The study adopted the quasi-experimental research design of pretest, posttest and post-post-test non- randomized control groups. Intact classes in the sampled schools of subjects were used. The descriptive statistics of mean and standard deviation was used to answer research questions and inferential statistics of analysis of covariance (ANCOVA) was used to test the null hypotheses 1-4.Based on the data collected and analyzed the following findings were made.

i. There was significant difference in mean academic achievement of students taught geometry using the conceptual instructional strategy and conventional teaching strategy.
ii. There was significant difference in mean knowledge retention of students taught geometry using the conceptual instructional strategy and conventional teaching strategy.

CONCLUSION

It is evident from the findings of this study that the use of and conceptual instructional strategies of teaching could provide a good way for secondary school students to learn mathematics. The two teaching strategies enhanced students' academic achievement and knowledge retention in mathematics.

The effect of this instructional strategy is not dependent on gender. Achievement in mathematics is function of strategy rather than gender as both sexes are capable of competing and participating in class room activities benefiting effectively when exposed to appropriate teaching and learning strategies.

If conceptual instructional strategy proposed in this study is adopted in teaching of mathematics and science subjects in general, it will improve the achievement of students in skills and development of the right attitude toward sciences and mathematics in particular. This will equip the students intellectually and lead to a remarkable breakthrough in sciences, technology, engineering and mathematics (STEM) in our country and globally

RECOMMENDATIONS

i. Mathematics teachers should be encouraged to use conceptual instructional strategies in teaching mathematics
ii. Mathematics teacher's trainees should be trained on the use of conceptual instructional strategies which could improve achievement of secondary school students
iii. Curriculum planners and science teachers should cooperate innovative activity based pedagogical strategy like conceptual instructional strategy in all teacher's education instructions
iv. Professional bodies like the Science Teachers Association of Nigeria (STAN) in collaboration with NERDC and federal ministry of education should organize seminars, workshops and symposia on the use of conceptual instructional strategy for science leaders.
v. Efficacy of the use of conceptual instructional strategy in teaching of mathematics and other science subjects need to be explored. Need for federal government bodies to sponsor further research in other areas

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