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Effects of Algebra Tiles Teaching Approach on Students Achievement in Quadratic Equation in FCT Abuja, Nigeria

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ABSTRACT

This study investigated the effect of Algebra Tiles Teaching Approach on students' achievement in quadratic equation in the Federal Capital Territory, Abuja. Two research questions and two null hypotheses guided the study. The study adopted a quasi-experimental research design (intact class, pre-test, post-test control group design). A sample size of 122 Senior Secondary School students made up of 64 SS 2A students drawn from Government Secondary School Gwagwalada; and 58 SS 2A students, drawn from Government Secondary School, Kwali. "Quadratic Equation Achievement Test (QEAT)" containing 20 Multiple Choice Test items was developed to elicit data for the study. Mean scores and standard deviation were used to answer the research questions; while t-test was used to test the null hypotheses. The findings of the study revealed that students taught quadratic equation using Algebra Tiles Teaching Approach had higher mean achievement scores than their counterparts taught using conventional teaching method. Also, the study found that there is a significant difference between the mean achievement scores of male and female students taught quadratic equation using Algebra Tiles Teaching Approach. The study concluded that Algebra Tiles Teaching Approach had significant effect on students' achievement in quadratic equation in public senior secondary schools in FCT, Nigeria. It was recommended that mathematics teachers should create more time for extension classes in preparation for internal and external examinations. As this will enhance students' academic achievements.

KEYWORDS

Effect, Algebra Tiles, Achievement, Quadratic Equation.



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Introduction

The pivotal role of education in every country is determined by the country's political, social and economic goals. Education is considered as an instrument for the integration of individuals within the society; for the attaining of national goals and achieving high levels of progress, promotion of unity, self-actualization, political stability, social evolution, economic welfare, scientific development, cultural consciousness, and technological progress (Hanushek&Wobmam, 2007 cited in Nonyelum, Ogugua&Abah, 2022).

In Nigeria, Education is a major means of achieving the aforementioned goals as enunciated in the National Policy on Education (which equally acknowledges "education as an instrument per excellence" (FRN, 2014). Education is therefore the key to becoming a self-sustaining country, and the guide towards a knowledge-based society. Any nation that neglects the education of her citizens is toying with the lives of the people and among the country of nations. As expected, Mathematics being an integral part of the educational process must be studied as a fundamental component of the development of a country.

It is in line with the above objectives that today's mathematics curriculum tries to prepare students for their future roles in the society. It is aimed at equipping them with essential mathematical knowledge and skills, such as skills of reasoning, problem solving, communication, and most importantly, the ability and motivation to continue learning on their own (Anyor&Abah, 2014).

The inclusion of mathematics as a core subject in the secondary school curriculum in Nigeria is due to the key role mathematics play in the achievement of the objectives of secondary school education. These roles as provided in the National Policy on Education (FRN, 2014) include promoting science and technology, provision of trained manpower in the applied sciences, technology and commerce, and the acquisition of appropriate skills, abilities and competence both mental and physical as equipment for the individual to live on and contribute to the development of his society (FRN, 2014). Thus, the mathematics curriculum is intended to provide students with knowledge and skills that are essential in the changing technological world (Ngussa and Mbuti, 2017).

Mathematics is the study of quantity, structure, space and change. It is a science that draws necessary conclusions and is considered as a means of sharpening the individual minds, shaping the reasoning ability and developing the personality (Usman, 2002 cited in Odo, 2016). Mathematics is a science of magnitude and number that is very useful virtually in all subject areas. This is because all fields of studies are dependent on it for problem solving and prediction of outcomes (Anigbo, 2016). Akinoso (2011) as cited in Anigbo (2016) viewed mathematics as the basic for science and technology and the tool for achieving scientific and technological development.

Mathematics is an important discipline which any nation aspiring to develop in science and technology cannot afford to ignore. Mathematics is a cognitive subject and one of the five compulsory core crosscutting subjects in the senior secondary school Curriculum in Nigeria (FRN, 2008; Ethe, 2012). Anigbo (2016) further stated that competency in mathematics learning is vital to any individual and nation in domestic and business deals, scientific discoveries, technological breakthrough, problem-solving and decision making in different situations in life. This is because mathematics skills are essential in understanding other disciplines including engineering, sciences, social sciences and even the arts (Patena&Dinglasan, 2013; Phonapichat, Wongwanich&Sujiva, 2014). Thus, it is the backbone of science and technology. In justifying the importance of mathematics, Amidu, Salifu and Nyarko (2020) opined that mathematics serves as the foundation for all technological advancement. Since the study of mathematics enhances one's understanding of the world through the use of symbols and abstract representation of phenomena.

In view of the above, the Federal Republic of Nigeria (FRN, 2014:14) has outlined the objectives of Senior Secondary School mathematics to include:

- i. laying a solid foundation for the concept of numeracy and scientific thinking;
- ii. developing in the student, the ability to adapt to his/her changing environment;
- iii. giving the students opportunity for developing manipulative skills that will enable him to function effectively in the society within his capacity and
- iv. preparing the student for higher education (FRN, 2014:14);

However for the above objectives of senior secondary school mathematics to be achieved, there is a need for contemporary teaching approaches for teaching and learning of Algebraic concept such as quadratic equation.

The implementation of the Senior Secondary Education (SSE) curriculum structure in September, 2011 reflects the role of Mathematics in the cognitive development of students. In field of education, mathematics plays a very important role in life in the future, because mathematics teaches students to think scientifically and foster abilities from what they know before (Priatna&Yuhardi, 2019). According to the Nigerian Educational Research and Development Council (NERDC) (2008), mathematics is made one of the five compulsory core cross-cutting subjects that all students in senior secondary school stage must offer in their field of studies. This is because apart from the fact that success in the subject enhances the quality of certificate, the trend has shown that in order to secure admission into most lucrative/prestigious programmes at higher levels of education, a credit pass in mathematics is an imperative (Abe &Gbenro, 2014).

Despite the importance accorded mathematics in the educational system in Nigeria, the Nigerian secondary school students' poor achievement in WASSCE mathematics examinations over a decade cast doubts on the country's hope of the attainment of science and technological development. The West African Examination Council (WAEC) result statistics from 2012 to 2022 revealed that only 53.23% of the students who sat for the WASSCE passed Mathematics; while 46.77% of the students failed the subject. The implication of these SSCE results is the need for improvement in the teaching of mathematical concepts and secondary school students' academic achievement in mathematics; which is key to enhancing the quality of secondary education to achieve its stated objectives as enuciated in the National Policy on Education (FRN, 2014).

Research evidence has shown that the standard of mathematics teaching in Nigeria is low and identified teaching problems as one of the root causes of poor achievement in mathematics (Makinde& Yusuf, 2019; Nonyelum, Ogugua&Abah, 2022). This claim is further supported by WAEC Chief Examiners' Reports (2012–2016) in May/June Senior School Certificate Examination (SSCE) in which they attributed students' poor achievements in mathematics to ineffective teaching and stated that the overall performance of the candidates was generally poor and below average.

The poor performance of students in mathematics despite its importance was also attributed to poor teaching approach (FRN, 2014; WAEC, 2016). Musbahu, Oluyemo, Amos and Alhassan (2021) noted that despite being an important subject, mathematics has suffered a lot of neglect and hatred which has resulted in poor performance, giving rise to poor quality students. Studies have attributed students' poor academic achievement in mathematics to factors such as students' negative attitude to mathematics, inadequate motivation from teacher, inadequate supply of instructional material, lack of qualified teachers, use of teacher centered instructional strategies, non-challant attitude to the use of available ICT resources for teaching of mathematics (Olafare, Akinoso, Omotunde&Eguatu, 2016; Musbahu et al, 2021; Ekwue&Umukoro, 2011).

In an attempt to enhance pedagogy and help the society produce more people who can think creatively in quantitative and qualitative terms, the search for more appropriate approaches to the teaching and learning of mathematics in general and quadratic equation in particular becomes necessary. This is because from the researchers' experiences as educators, students find it difficult to understand the conventional approaches involved in solving quadratic equations. The WAEC Chief Examiners' Reports (2012–2022) also explained that many candidates missed full marks because of

arithmetic errors committed in factorization and solutions of quadratic functions. These errors are traceable to the level of understanding of algebraic concepts by the students, and the problems of the students with mathematics, especially as algebraic concepts have to do with the abstract nature of the concept and inability of the teachers of Mathematics to use concrete objects to represent algebraic concepts.

Algebra is one of the most critical classes a mathematics student takes. Unfortunately this area of mathematics is where most students lose interest in mathematics because the concepts become too abstract. Algebra is a topic that cuts across the mathematics curriculum because of its importance because of the use of alphabets to express the terms use to present it. In Algebra, it is necessary to think not only few numbers, but sets of numbers (Amidu, Salifu&Nyarko, 2020). For this reason, Algebra seems more abstract than arithmetic (Palabiyik&Akkus, 2011 cited in Amidu et al, 2020).

Algebra Tiles are mathematical manipulative that allows you to better understand ways of Algebraic thinking and the concepts of Algebra. It allows both Algebraic and geometric approach to Algebraic concepts. They give you other ways to solve Algebraic problems other than just abstract manipulation. Algebra Tiles are made up of rectangles and large squares and small squares (Salifu, 2022). It can be defined as Algebra Tiles Teaching Approach is therefore defined as the application of geometric discovery in the instructional strategy of teaching quadratic equation concepts. This instructional approach is assumed to be capable of resolving the cognitive conflict introduced in the minds of the learners when the algebraic concepts are taught in abstract manner. The use of Algebra Tiles Teaching approach by mathematics teachers has become imperative due to its suitability as a contemporary approach for teachers to effectively teach all aspects of Algebra and in specific terms quadratic equations.

Variables in algebra are letters of alphabet that are used to represent numbers or quantities that can vary or be varied while integers are positive, zero and negative whole numbers. Algebra tiles, therefore, are manipulative pieces with which one can represent algebraic expressions and perform polynomial operations. Each tile represents a specific monomial as will be represented in lesson plans based on Algebra Tiles Teaching Approach. Algebra Tiles provide a useful way to introduce operations in algebraic concepts to students of all ages (Caylan&Haser, 2021).

Quadratic equation is a polynomial equation in which the highest power of x is exactly 2. In other words, it is a polynomial equation of degree 2 (Mckeague, 2014). Quadratic equation is an aspect of algebraic concepts and deals with unknown quantity (that is, variable), therefore, there is need to use an active participation approach which will increase students' zeal to learn it, have interest and equally achieve better. One of such ways that may make the students to have interest in quadratic equation and get higher achievement is by using Algebra Tiles Teaching Approach.

The researchers observed in some public senior secondary schools in the study area that the conventional methods adopted by teachers of mathematics in teaching quadratic equation which is a subset of Algebra seem to be inefficient in enhancing the achievement levels of secondary school students. Thus, considering the fact that mathematics is a core subject at secondary school level of education and satisfactory academic outcomes in mathematics is critical to the educational development of students and actualization of secondary education goals, investigating the effect of Algebra Tiles Teaching Approach on students' achievement in quadratic equation which is a mathematics concept that is ever present in mathematical assessment in either internal and external examinations becomes imperative.

As a solution to this problem, therefore, Mckeague (2014) suggested that students should be encouraged to solve quadratic equations using either completing the square or factorization approaches because they are more involving, and give deeper understanding of the concept. Algebra Tiles Teaching Approach in solving quadratic equations is concerned mainly with completing the

square or factorization approaches to solve quadratic equations, and according to Protters and Morrey (2019), it empowers students of all learning styles to understand mathematical concepts better. This calls for the need to promote activity-types of teaching and learning. Hence, the need for Algebra Tiles Teaching Approach to enable students acquire mathematical skills. It is also envisaged that this approach will enhance students' achievements, whose purpose according to Akiniyi (2017) is to find out the stand of a student at a given moment. It also helps teachers predict the degree of learning outcome (Agu& Samuel, 2018) and determine the efficacy and efficiency of a given instruction.

Research Questions

The following research questions guided the study.

1. What is the difference in the mean achievement scores of students taught quadratic equation using Algebra Tiles Teaching Approach and their counterparts taught using the conventional teaching method?
2. What is the difference in the mean achievement scores of male and female students taught quadratic equation using Algebra Tiles Teaching Approach?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

Ho₁ There is no significant difference in the mean achievement scores of students taught quadratic equation using Algebra Tiles Teaching Approach and their counterparts taught using the conventional teaching method.

Ho₂ There is no significant difference in the mean achievement scores of male and female students taught quadratic equation using Algebra Tiles Teaching Approach.

A number of research studies have been carried out in Nigeria on students' achievement in general mathematics. The study of Makinde (2019) found out that flipped classroom strategy improved positively the performance of students in secondary school mathematics classroom. Also, Akaazu et al (2017) found that concrete manipulative approach improved the performance of students taught Geometry concepts in Mathematics.

The study of Bot (2018) on SSII students' understanding and achievement in word problem solving in linear inequalities in mathematics found out that the treatment group achieved significantly better than the control group with mean achievement scores of 48.75 and 39.65 respectively.

Gender Factors in Mathematics Education

Gender is a construct that is culturally defined as the distinguishing roles, behaviour, mental, economic and political characteristics of the male and the female as prescribed by the society (Owoyemi&Olusanya, 2014). Several studies have been carried out to ascertain the effect of gender as a factor in student's interest, achievement and retention in mathematics.

The study of Jiang (2021) investigated gender differences in mathematics academic performance of high school students in Western China. The study found that female students' mathematics academic performance was significant better than male students; in sets, complex numbers, plane vectors, statistics, trigonometric functions, analytic geometry and functional knowledge modules. The study observed there were no significant differences between male students and female students in common logic, inequalities, algorithms, probability, sequence, solid geometry and derivative knowledge modules. In terms of basic skills, mathematical operations and data analysis, female students were significantly better than male students; and there were no significant

differences between male students and female students in mathematical abstraction, logical reasoning and initiative imagination.

The study of Ajai and Imoko (2015) examined gender differences in mathematics achievement and retention by using Problem – Based Learning (PBL). The study revealed that male and female students taught Algebra using PBL did not significantly differ in achievement and retention scores, thereby revealing that male and female students are capable of competing and collaborating in mathematics.

In their study, Allahnana et al (2018) assessed gender and interest in mathematics achievement in Keffi Local Government area of Nasarawa State, Nigeria. The study found that male students excel in mathematics achievement more than their female counterpart; and male students have interest in mathematics than female students. In other words, the study found that there is significant relationship between male and female achievement and interest in mathematics.

The study of Mwalya (2013) investigated gender differences in mathematics performance at secondary school level in Kamdara, Sub-County, Murang'a County, Kenya. The findings showed that male students outperform female students in mathematics. The study also found that though female students trail male students by performance in mathematics, some female students also outperform some male learners in the subject.

The study of Okpe et al (2022) investigated gender differences in mathematics achievement and retention among secondary school students in Nsukka Education Zone, Enugu State. The findings show that male students had high achievement in mathematics than their female counterparts. Male students also had higher mathematics retention abilities than female students as this also manifested in their higher achievement in mathematics than female senior secondary school students.

The study of Onwuka (2016) which examined gender gap in mathematics through the use of mathematics game found out that there was no significant difference in the performance of male and female pupils. Although in pre-test males performed slightly higher; while in the post test, females performed better, the differences were not significant.

The study of Awing and Ismail (2017) investigated gender differences in mathematics learning in Malaysia. The secondary focused on gender differences in terms of the average overall mathematics scores as well as average achievement in each of the five content areas of mathematics namely; fractions and number bases; measurement; data representation, analysis and probability; geometry and algebra. The result from the study showed that girls had significantly higher scores in the overall average mathematics achievement as well as in three areas of mathematics content namely: number, algebra and data. Based on the various findings discussed above, the researcher in this study investigated to see whether there will be significant difference in the performance of male and female students in quadratic equation using Algebra Tiles Approach.

METHODOLOGY

Research Design

The research design adopted in the study was the quasi-experimental research design (intact class, pre-test, post-test control group design). This design is appropriate for the study as it enabled the researcher to assign the study respondents (SS2 students) to experimental and control groups respectively.

Furthermore, the quasi-experimental group design enabled the researcher to repeat the post-test after sometime following the completion of the treatment. This allowed the researcher to establish whether there is retention effect of the treatment.

Population

The population of the study was made up of 17,913 senior secondary two (SS2) students consisting of 9,377 boys and 8,536 girls in the 62 public senior secondary schools in FCT, Nigeria (Source: FCT Education Secretariat, 2020).

Sample Size and Sampling Procedure

The sample size for the study comprised of 122 SS2A students made up of 64 SS2A students drawn from Government Secondary School Gwagwalada; and 58 SS2A students drawn from Government secondary school Kwali respectively. In both schools, the researcher purposively sampled SS2A students. This was because they are relatively science based students. The SS2A students of GSS Gwagwalada served as experimental group in the study (students taught Quadratic equation using Algebra Tiles Approach); while SS2A students of GSS Kwali served as control group in the study (students taught Quadratic equation using Conventional Method of Teaching).

Furthermore, considering the adoption of intact classes of SS2A students for the study; the sampling procedure for the study was the homogeneous purposive sampling technique. A purposive sample is a non-probability sample that is selected based on characteristics of a population and the objective of the study (Crossman, 2020). This technique was considered as being suitable as it enabled the researcher to identify respondents that possess the characteristics required for their involvement in the study. That is because Quadratic Equation is in their syllabus.

Instrumentation

The research instrument for the study was the “Quadratic Equation Achievement Test (QEAT)”. The QEAT is made up of five sections (A-E) and contained 20 multiple choice test items with options A-D. Section A covered six test items on “Factorization of Quadratic Equations”; Section B contained four test items on “Expansion of quadratic equations”; section C covered four test items on “completing the square of Quadratic Equations”; Section D contained three test items on “solutions of Quadratic Equations by factorization”; while section E covered three test items on “solutions of quadratic equations by completing the square”.

Validity and Reliability of the Instrument

The research instruments were validated by a team of three (3) experts in the Department of Science and Environmental Education, Faculty of Education, University of Abuja. Also, three (3) experienced Mathematics teachers in FCT were involved in the validation exercise. The validation of the research instruments focused on their construct and face validity. The validators scrutinized the test items of the instruments on achievement and made suggestions for modifications in the instrument.

The reliability of the research instruments was determined through a pilot test conducted in two public senior secondary schools in FCT, Nigeria, that were within the study population but excluded from the main study. The pilot test involved 30 SS2 students. Test-retest and Kuder-Richardson 20 approach (K-R20) were used to compute the reliability indexes of the QEAT and QERT instruments. Using the K-R20 approach, the reliability index of 0.65 was obtained for the QEAT. Thus, the instrument was considered by the researcher as being reliable and suitable for the study; having met the 0.60 benchmark for postgraduate research and thesis as stipulated by Salem (2023).

Method of Data Analysis

The data analysis for the study was carried out using descriptive and inferential statistical tools. The research questions were answered using mean scores and standard deviation in order to ascertain the mean gain and mean difference after pre-test and post-test were administered on the experimental and control groups. The test of hypothesis was carried out using the independent t-test statistic at 0.05 level of significance.

DATA ANALYSIS AND RESULTS

Research Question One

What is the difference in the mean achievement scores of students taught quadratic equation using Algebra Tiles Teaching Approach and their counterparts taught using the conventional teaching method?

Table 2

Analysis of the Difference in the Mean Achievement Scores of Students Taught Quadratic Equation using Algebra Tiles Teaching Approach and their Counterparts Taught using the Conventional Teaching Method

Groups	N	Mean Scores		Standard Deviation		Mean Gain
		Pre-test	Post-test	Pre-test	Post-test	
Experimental	64	9.44	12.80	2.650	2.396	3.36
Control	58	8.05	9.49	2.970	2.680	1.44
Mean Difference		1.39	3.31			1.92
Total	122					

Table 2 shows the mean achievement scores of the students in the experimental and control groups. The mean achievement scores of students taught quadratic equation using Algebra Tiles Teaching Approach were 9.44 and 12.80 in pre-test and post-test respectively, with standard deviation of 2.65 in pre-test, and 2.396 in post-test. For the students taught quadratic equation using conventional method, their mean achievement scores were 8.05 and 9.49; with standard deviation of 2.97 and 2.68 in pre-test and post-test respectively. The mean differences were 1.39 and 3.31 for pre-test and post-test respectively, while the overall mean differences between the groups was 1.92. This implies that students taught quadratic equation using Algebra Tiles Teaching Approach had higher mean achievement scores than their counterparts taught using the conventional teaching method.

Research Question Two

What is the difference in the mean achievement scores of male and female students taught quadratic equation using Algebra Tiles Teaching Approach?

Table 3

Analysis of the Difference in the Mean Achievement Scores of Male and Female Students taught Quadratic Equation using Algebra Tiles Teaching Approach

Group	Gender	N	Mean Scores		Standard Deviation		Mean Gain
			Pre-test	Post-test	Pre-test	Post-test	
Experimental	Male	34	9.53	13.38	1.822	1.435	3.85
	Female	30	9.36	10.93	1.984	2.293	1.57
Mean Difference			0.17	2.45			2.28
Total		64					

Table 3 shows the mean achievement scores of male and female students taught quadratic equation using Algebra Tiles Teaching Approach. The mean achievement scores of male and female students were 9.53 and 9.36 in the pre-test with standard deviation of 1.822 and 1.984 respectively. In the post-test results, the mean achievement scores of male and female students were 13.38 and 10.93 with standard deviation of 1.435 and 2.293 respectively. The mean differences were 0.17 and 2.45 for pre-test and post-test respectively; while the overall mean difference between male and female students was 2.28. This implies that male students had a higher mean achievement score than their female counterparts after being taught quadratic equation using Algebra Tiles Teaching Approach.

Ho₁ There is no significant difference in the mean achievement scores of students taught quadratic equation using Algebra Tiles Teaching Approach and their counterparts taught using the conventional teaching method.

Table 4

t-test Analysis of Significant Difference in the Mean Achievement Scores of Students taught Quadratic Equation using Algebra Tiles Teaching Approach and their Counterparts taught using the Conventional Teaching Method

		t-test for Equality of means							
	Group	N	Mean	td. Deviation	t	df	Sig.	Decision	
Mean	Experimental	64	12.80	2.396	7.163	120	.034	Accepted	
Achievement Scores	Control	58	9.49	2.680					

* $p < .05$ = Significant Difference between Groups

The result of the test of hypothesis in Table 4 shows that $t = 7.163$, $df = 120$, $p = .034$, indicating that the probability value (p) is less than the alpha level of 0.05. Thus, the null hypothesis is rejected, which implies that there is significant difference between the mean achievement scores of students taught quadratic equation using Algebra Tiles Teaching Approach and their counterparts taught using the conventional teaching method in favour of experimental group. In essence, the use of ATTA improves the achievement of students in Algebra Quadratic equation.

Ho₂ There is no significant difference in the mean achievement scores of male and female students taught quadratic equation using Algebra Tiles Teaching Approach.

Table 5

t-test Analysis of Significant difference in the Mean Achievement Scores of Male and Female taught Quadratic Equation using Algebra Tiles Teaching Approach

Gender	N	Mean	td. Deviation	t	df	Sig.	Decision
Male	34	13.38	1.435	3.771	62	.016	Accepted
Female	30	10.93	2.293				

* $p < .05$ = Significant Difference based on Gender

The result of the test of hypothesis in Table 5 shows that $t = 3.771$, $df = 62$, $p = .016$, indicating that the probability value (p) is less than the alpha level of 0.05. Thus, the null hypothesis is rejected, which implies that there is significant difference between the mean achievement scores of male and female students taught quadratic equation using Algebra Tiles Teaching Approach. Thus, male students outperformed their female counterparts after being taught quadratic equation using ATTA.

Discussion of Findings

The findings of the study revealed that students taught quadratic equation using Algebra Tiles Teaching Approach had higher mean achievement scores than their counterparts taught using the conventional method. The descriptive analysis results showed that the post-test mean achievement score of the experimental group was 12.80; while the post-test mean achievement score of the control group was 9.49. The findings from the corresponding null hypothesis revealed that there is significant difference in the mean achievement scores of students taught quadratic equation using Algebra Tiles Teaching Approach and their counterparts taught using the conventional teaching method. This finding is in agreement with the studies of Makinde (2019), Akaazu et al (2017), Bot (2018) which found that student exposed to treatment in the experimental group performed better than students taught Mathematics concept using conventional teaching method. The finding is also in agreement with the studies of Caylan (2018) whose study found that experimental group students taught using Algebra Tiles Teaching Approach performed better than control group students taught using conventional teaching approach. The study of Castro (2017) however found that there were no significant differences in the Mathematical achievement of the experimental group and control group after exposure to Algebra Tiles Teaching Approach.

The findings of the study showed that male students had higher mean achievement score than their female counterparts after being taught quadratic equation using Algebra Tiles Teaching Approach. The descriptive analysis results showed that the mean achievement scores of male and female students taught quadratic equation using Algebra Tiles Teaching Approach were 13.38 and 10.93 respectively. The findings from the corresponding null hypothesis revealed that there is significant difference in the mean achievement scores of male and female students taught quadratic equation using Algebra Tiles Teaching Approach. This finding contradicts the findings of Larbi and Okyere (2014) who found that there was no significant difference between male and female students Mathematical achievement after being taught using Algebra tiles manipulative.

Recommendations

The following recommendations were made:

1. In enhancing the achievement of students, mathematics educators should create more time for extension classes in preparation for internal and external examinations.
2. The coverage of the secondary school mathematics concepts should be emphasized by teachers in order to enable students have broader understanding that facilitates higher levels of academic achievement.
3. The establishment and equipping of mathematics laboratories where students can engaged in practical instructional work should be prioritized by school authorities in collaboration with mathematic educators.

Conclusion

The study found that students taught quadratic equation using Algebra Tiles Teaching Approach had higher mean achievement scores than their counterparts taught using the conventional teaching method. Also, the study found that male students had a higher mean achievement score than their female counterparts after being taught quadratic equation using Algebra Tiles Teaching Approach. In conclusion, it was established that Algebra Tiles Teaching Approach had significant effect on students' achievement in quadratic equation in public senior secondary schools in FCT, Nigeria.

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