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EFFECT OF INTERACTIVE SIMULATION ON ATTITUDE AND ACADEMIC ACHIEVEMENT IN MATHEMATICS AMONG SECONDARY SCHOOL STUDENTS IN ADAMAWA STATE, NIGERIA

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ABSTRACT: This study investigated the effects of interactive simulation strategy on Senior Secondary school Students' attitude and achievement in mathematics. This study adopted a quasi-experimental non-equivalent pre-test post-test Design. Interactive classes were assigned to experimental and control groups. The study used a sample size of 135 Senior Secondary Students in Yola Education Zone of Adamawa State. The Instruments used were Mathematics Attitude Inventory Scale (MAIS) and Mathematics Achievement Test (MAT). The teaching strategies adopted for experimental group was interactive simulation strategy (ISS). Conventional strategy was used for the control group. The study used descriptive statistics of Mean and Standard Deviation in answering research questions and inferential statistics of Analysis of Covariance (ANCOVA) for testing hypotheses at 0.05 level of significance. The findings of the study revealed that ISS was effective on Senior Secondary Students' attitude and achievement in mathematics. Likewise, the use of ISS for teaching mathematics does not show any significant difference in attitude and achievement in mathematics amongst male and female students. Based on the findings of the study, it was recommended that the State Government through the State Ministry of Education should equip the Senior Secondary Schools in Adamawa State with computers to facilitate effective teaching-learning mathematics.

Keyword: Interactive simulation, students' attitude and Students achievement, Mathematics

INTRODUCTION

There is a rapid development in the world today and every nation strives to meet up with the requirements needed to align with the global trend. Nations do so through education. Education is the key to life. It plays a major role in the growth and progress of a society. Unarguably, education equips mankind with skills and knowledge to improve lives in the areas of agriculture, housing, communication

and medicine. No nation would have survived without education because it has been identified as a platform which provides knowledge and skills for protection and improvement of human race as a whole. The growth of every nation depends on education. Today, the benefit of education to a nation is overwhelming, that is why UNESCO recommended to all nations to allocate 26% of her budget to education. This is why United Kingdom lays much emphasis on education by budgeting heavily on her education after Pension and health care.

Achievement can be defined as the ability to perform a given task successfully at a given time (Oyesiku, 2016). United Nations Educational Scientific and Cultural Organization (UNESCO, 2015) defined achievement as completing of goals set by an individual, organisation or nations. Mathematics Chief Examiners' report on students' areas of deficiency in School Certificate Examinations showed that students least understood mathematics. Poor achievement in mathematics has been attributed to many factors such as poor teaching approach (WAEC, 2017), lack of confidence (Olaleye, 2016), poor learning environment, shallow knowledge of the subject matter and incorrect interpretations of ideas about mathematics from poor background at basic education level (Timayi, Ibrahim & Sirajo, 2016). In a heterogeneous class where students of different abilities are taught together, only a few with sharp imagery ability among the learners can obtain high scores in achievement tests. Nnamani and Oyibe (2016) viewed the ugly trend of high failure rate in mathematics as a national disaster. Ineffective teaching method which mostly described as teacher centred and didactic that forced learners to simply listen, copy notes, do class wo rk and assignments. This therefore, calls on mathematics educators to intensify efforts in the aspect of research in order to come up with effective teaching method(s) suitable for mathematics and enhanced learners commitment and achievement.

Gender differences in mathematics learning and achievement is still a current issue in mathematics education especially mathematics education research that are pedagogically inclined (Timayi et al., 2016). Also, Timayi et al. (2016), revealed that fear of failure negatively impact female achievement in mathematics. This fear of failure combined with competitive environment heightens students' perceptions of self-worth. With conventional strategy of teaching, the gap between high and low ability of the students is very wide. Besides, differences in achievement between high and low ability students exists. Thus, there is the need for more studies on instructional strategies that can enhance equal achievement among the gender in mathematics which necessitates this study.

Mathematics is a subject that has the most direct and dramatic impact on our lives, and a science that shapes the world we live in today and tomorrow (Misfeldt, 2015). The position of mathematics as one of the major subjects at the senior secondary school level cannot but be a major consideration for a developing society. Students' attitudes to mathematics correlate highly with their science achievement. Attitude is a way of feeling, thinking or behaving towards a particular thing (Muzzatti & Agnoli, 2009). Once the attitude of a student is known, suitable teaching strategy can be devised to meet the learning needs of the student. Attitude deals with interest, aspiration and behavior exhibited by students towards studying and learning any subject. Thus, positive attitude can influence students' choice of subject, particular activities or area in a given subject area. Attitude has both perceptual and affective components. A child may acquire certain attitudes about a particular subject through the parents, teacher and environment. Nnamani and Oyibe (2016) argued that attitudes can have recursive effect in such situation where individual attitude influence others in similar pattern. Thus, teachers' attitude can influence students' attitude and most specifically, attitude among peer group can lead to a specific attitudinal pattern among students. The perception by students of a subject can influence their attitude towards such a subject. Akinsola and Olowojiaye (2012), argued that

the poor attitude of most students towards mathematics is influenced by their wrong perception regarding the subject as a difficult one.

Iyekekpolor and Tsue Avar (2010) maintained that the use of poor approach by most mathematics teachers to teach leads to students' development of negative attitude toward mathematics. The attitude and interest of students towards mathematics in schools have been known to be poor and a hindrance to the learning of mathematics for a long time now.

Statement of the Problem

Indeed, poor achievement in mathematics at the senior secondary school level has been attributed to a number of factors such as teachers' teaching method and unfavourable attitude, teachers' inability to master the key areas of mathematics, gender difference, students' attitude towards mathematics and, non-use of instructional materials by teachers and students, as well as students' phobia in this area of mathematics. Efforts from various studies concerning ways of improving teaching techniques to enhance students' academic achievement have been relentlessly on going. However, the results from these studies have not yielded the desired solution. This has increased the need to adopt recommended ways of achieving sustained learning attitude and achievement in mathematics a branch of mathematics. However, these questions remain to be asked: would the introduction of new teaching strategies that are basically different from conventional strategy address the problem of low achievement in mathematics an aspect of mathematics? The problem of this study was, "How could the use of Interactive Simulation Strategy positively enhance students' attitude and improve their achievement in mathematics at Senior Secondary school classes?" This study therefore is an attempt to address the problem of students' failure in mathematics, especially the geometric aspect of it. This study was undertaken in order to see whether the use of interactive simulation strategy and power point as teaching strategies could improve

students' achievement and enhance learners' attitude in mathematics at Senior Secondary school level.

Aim and Objectives of the Study

The aim of this study is determine the effects of interactive simulation strategy on senior secondary students' attitude and achievement in mathematics in Adamawa state

The specific objectives includes:

1. Determine the effect of interactive simulation strategy (ISS) and Conventional Strategy (CS) on senior secondary school students' attitude towards mathematics
2. Investigate the effect of interactive simulation strategy and CS on senior secondary school students' achievement in mathematics
3. Determine the effect of interactive simulation strategy on male and female senior secondary school students' attitude towards mathematics.
4. Determine the effect of interactive simulation strategy on male and female senior secondary school students' achievement in mathematics.

Research Questions

The following research questions were raised for the study. They included:

1. How different are the mean attitude ratings of students taught mathematics using ISS and those taught using CS?
2. How different are the mean achievement scores of students taught mathematics using ISS and those taught using CS?
3. How different are the mean attitude ratings of male and female students taught mathematics using ISS?
4. How different are the mean achievement scores of male and female students taught mathematics using ISS?

Hypotheses

HO1: There is no significant difference in the mean attitude ratings of students taught mathematics using interactive simulation strategy and those taught using conventional strategy.

HO2: There is no significant difference in the mean achievement scores of students taught mathematics using interactive simulation strategy and those taught mathematics using conventional strategy.

HO3: There is no significant difference in the mean attitude ratings of male and female students taught mathematics using interactive simulation strategy.

HO4: There is no significant difference in the mean achievement scores of male and female students taught mathematics using interactive simulation strategy.

LITERATURE REVIEW

Teaching Method

Method can be regarded as a procedure or process for attaining a specific objective. According to Shofoyeke (2016) every discipline has its way or proper manner of doing things. In teaching profession, method can be regarded as an established approach chosen by a teacher to explain concept to the learners. The teaching method has to be a prescribed practice that aid systematic presentation of lesson to the learners to achieve the stated objective of lesson. Ganyaupfu (2013) expressed the view that teaching method irrespective of the type has to depict accuracy and efficiency of teachers as curriculum implementers as well as making students relevant in the classroom. The effectiveness of teaching method can be seen in its ability to allow ordered presentation of lesson in a sequence that can guide the learners to acquire the planned objective (Achor, Imoko, & Ajai, 2010). Thus, it can be submitted that teaching method is the general approach to conducting a lesson.

INTERACTIVE SIMULATION TEACHING STRATEGY

Interactive simulation teaching strategy is a simulation system which, are computer programs that are used for improving the teaching and learning processes in multiple domains. It is an educational simulation programme that place learners in the loop inside a computer to see and have real life experience. Achor et al. (2010) defines interactive simulations as interactive software programs in which individuals explore new situations and complex relationships of dynamic variables that model real life. Adeyemi and Ajibade (2011) defines interactive simulation as a program that embodies some model or an aspect of the world, allows the user to make inputs to the model, runs the model, and displays the results. Interactive computer simulation software enables users (teachers and students) make decisions and input these decisions into the computer. Hence, interactive simulation teaching strategy could be seen as a teaching strategy that allows both teachers and learners have real life teaching-learning experience by exploring new situation.

Students' Attitude

Usman (2018) defines attitude as personal view of something. That is an opinion or general feeling about something. Individual attitude can be an indicator for individual personal life and can serve as moderator for each aspect of a person's life. In education, one of the aspects that is mostly considered apart from cognitive performance for a student is attitudinal performance. Students' attitudes towards learning can greatly determine their ability and willingness to learn (Usman, 2018). If student's negative attitudes are not being properly addressed, such a student may not likely complete his/her education before being dropout. Changing students' negative attitudes towards learning is a process that involves determining the factors driving the attitude and using this information to bring about change. According to Razali, Talib, Manaf and Hassan (2018) students' attitudes on learning, good or bad, affect their outlook toward learning throughout life. Their attitude towards learning affected not only their amount of education but their desire for education.

According to Ahmad, Muhamad, Naji andAvi (2016) without positive attitudes and perceptions, students have little chance of learning proficiently, if at all. In most cases, every student can be categorized based on their attitudes and perceptions about learning climate and classroom tasks. Ahmad et al. (2016) argued further that students perception about school learning climate and classroom tasks affect their learning rate. Thus, an effective teacher is expected to be continually reinforcing students learning attitudes and perceptions in both these categories. Every professional teacher may need to internalize different techniques and strategies for enhancing students' attitudes and perceptions to such a degree that the techniques will be transparent and become part of the fabric of instruction used in the class which can be barely noticeable to the undiscerning eye.

Acceptance is another factor modifying students learning attitude. Intuitively, whenever students feel not being accepted by both the teachers and peers, the learning rate can be greatly inhibited. In most scenario, in elementary school when students did not feel accepted by the peers, or even at times in tertiary institution when students felt that a teacher did not like them in their class such student may finds it difficult to cope with their study. Perceived being an outcast within a classroom setting can probably distracted the student away from actual learning. Razali et al. (2018) confirm the importance of a sense of acceptance among students on their attitude toward learning. It was further illustrated that the students' perceptions about their acceptance by the teacher affect their overall attitude toward learning. Similarly, for decades other authors, (Muzzatti & Agnoli, 2009; Mohammed & Waheed, 2011; Ganley and Vasilyeva 2013) have been championed the importance of students' perceptions of their acceptance as attitudinal modifier on learning rate. Virtually all of the research and theories on learning attitude modifier indicate that teachers can help students to feel accepted in the classroom through seemingly trivial yet very important behaviours.

Academic Achievement

Academic achievement is generally a pedagogical terminology used while determining learner's success in formal education and which is measured through reports, examinations, researches and ratings with numerous factors (Usman, 2018). Essentially, the National Policy on Education (2014) has identified secondary school achievement according to school subjects which are classified as either core or elective subjects.

Academic achievement is the extent to which a student, teacher or institution has achieved their short or long-term educational goals and objectives. According Adaramola and Obomanu (2011), the academic achievement in schools are usually measured through Cumulative Grade Point Average (CGPA) as well as the completion of educational benchmarks such as secondary school diplomas and bachelor's degrees or any other higher educational attainment. Adaramola and Obomanu (2011) expressed further that academic achievement is commonly measured through examinations or continuous assessments. There is no general agreement on how it is best evaluated or which aspects are most important among procedural knowledge such as skills or declarative knowledge such as facts.

METHODOLOGY

The study employed quasi-experimental design of non-randomized pre-test- post-test control group type. The design was chosen because it was not possible to have complete randomization of subjects. Therefore, intact classes were used so as not to disrupt the already existing settings in the schools. The study was carried out in Mubi Education Zone of Adamawa State. However, the study purposively sampled 135 SS II students made up of 76 boys and 59 girls from total 421 students in four selected senior secondary schools. The study used pre-planned research instruments Mathematics Achievement Test (MAT) and Mathematics Attitude Inventory Scale (MAIS). The experimental group were taught mathematics with purposively designed Interactive simulation

strategy while Control Group were taught using conventional method. The two groups were tested earlier before study (pre-test) and were retested after received mathematics lesson (post-test). The results obtained from testes were anaysled using, percentages, frequency table and Analysis of covariance (ANCOVA).

RESULTS

Research Question 1: How different is the mean attitude ratings of students taught mathematics using Interactive Simulation Strategy (ISS) and those taught using conventional strategy (CS)?

Table 1 Mean Attitude Ratings of Students taught mathematics using Interactive Simulation Strategy and those taught using Conventional Strategy

Method of instruction	n	Pre-Test Mean	Std. dev	Post-Test Mean	Std. dev	Mean Difference
ISS	56	3.08	0.34	4.14	0.19	1.06
CS	79	3.06	0.3	3.64	0.41	0.58

Table 1 revealed the results on the differences in the mean attitude ratings of students taught mathematics using interactive simulation strategy and those taught using conventional strategy. The results indicated 3.08 and 4.14 as mean ratings for students' attitude to mathematics before and after being taught using interactive simulation strategy respectively. This gave a mean gain of 1.06. In the category of students taught mathematics using conventional strategy, 3.06 and 3.64 values were recorded as students' attitude ratings toward mathematics before and after the lesson which gave a mean gain of 0.58. Thus, it showed that students taught mathematics using interactive simulation strategy have better average attitude score toward mathematics than their counterparts taught mathematics using conventional strategy.

Research Questions 2: How different are the mean achievement scores of students taught mathematics using Interactive Simulation Strategy and those taught using Conventional Strategy?

Table 2: Mean Achievement Scores of Students taught mathematics using Interactive Simulation Strategy and those taught using Conventional Strategy

Method of instruction	n	Pre-Test Mean	Pre-Test Std. dev	Post-Test Mean	Post-Test Std. dev	Mean Difference
Interactive Simulation Strategy	56	15.96	4.38	32.89	3.63	16.93
Conventional Strategy	79	12.78	4.33	15.66	0.1	2.88

Table 2 revealed the mean achievement scores in mathematics for students taught mathematics using interactive simulation strategy and those taught with conventional strategy. In the category of students taught with interactive simulation strategy, the table revealed the average scores of 15.96 and 32.89 for Pre-MAT and Post-MAT values respectively; which yielded 16.93 mean gain score. Also, in the category of students taught mathematics using conventional strategy, the table revealed 12.78 and 15.66 for Pre-MAT and Post-MAT values respectively. This yielded 2.87 as mean gain. The mean gain difference of 14.05 in favour of students exposed to ISS revealed that students taught mathematics using ISS have better average score value than those taught using CS.

Research Question 3: How different is the mean attitude rating of male and female students taught mathematics using Interactive Simulation Strategy?

Table 3: Mean Attitude Ratings of Male and Female Students taught mathematics using Interactive Simulation Strategy

Method of instruction	n	Pre-Test Mean	Pre-Test Std. dev	Post-Test Mean	Post-Test Std. dev	Mean Difference
Male	27	3.09	0.31	4	0.19	0.91
Female	29	3.08	0.37	4.28	0.2	1.2

The results on Table 3 revealed the mean attitude ratings of male and female students taught mathematics using interactive simulation strategy. The results revealed 3.09 and 4.00 for Pre-MAIS and Post-MAIS mean ratings respectively for male students, this yielded 0.91 as

the mean attitude gain. Whereas, in the category of female students, the results revealed mean attitude ratings of 3.08 and 4.28 for Pre-MAIS and Post-MAIS respectively; which yielded a mean attitude gain of 1.20 for the female counterpart. However, these results did not show much gaps between male and female mean gain difference in attitude (-0.29).

Research Question 4: How different are the mean achievement scores of male and female students' taught mathematics using Interactive Simulation Strategy?

Table 4: Mean Achievement Scores of Male and Female Students Taught Mathematics using Interactive Simulation Strategy

		Pre-Test		Post-Test		Mean
Method of instruction	N	Mean	Std. dev	Mean	Std. dev	Difference
Male	27	16.48	4.58	32.96	4.04	16.48
Female	29	15.48	4.21	32.83	3.25	17.35

The results in Table 4 revealed the mean achievement scores of male and female students taught using interactive simulation strategy. The results revealed 16.48 and 32.96 for Pre-MAT and Post-MAT mean scores respectively for male students, this yielded 16.48 mean gain for male students. Also, in the category of female students, the results indicated the mean achievement scores of 15.48 and 32.83 for Pre-MAT and Post- MAT scores respectively, and this gave a mean gain of 17.35 for female students. Comparing the mean gain differences for both the male and female students, the results showed a close performance for both male and female students.

Research Hypothesis

Ho1: There is no significant difference in mean attitude ratings of students taught mathematics using interactive simulation strategy and those taught using conventional strategy.

Table 5: Analysis of Covariance on the Mean Attitude Ratings of Students taught mathematics using Interactive Simulation Strategy and those taught using Conventional Strategy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2.00[a]	2	.49	4.53	.00	.12
Intercept	10.71	1	10.71	98.28	.00	.43
Pre-MAIS	1.19	1	1.19	10.95	.00	.08
ISS and CS	.58	1	.58	5.28	.02	.04
Error	14.17	130	.11			
Total	1861.63	135				
Corrected Total	16.14	134				

Dependent Variable: Post-MAIS, a. R Squared = .12 (Adjusted R Squared = .10)

The results in Table 5 it was revealed that F (1, 130) = 5.28 at P =0.02, Since P=0.02 < 0.05. The null hypothesis of no significant difference is therefore rejected. Also, Table 11 revealed the interaction effects of ISS on attitude was significantly different. This is given by F-value of 5.28 and a corresponding P-value of 0.02 which was less than the value of 0.05 level of significance. That is, there is a significant difference between ISS and CS. The Eta-square (0.04) was reported. This indicated that about 4% of attitude's improvement noticed at Post-MAIS (dependent variable) is contributed by independent variable ISS.

Ho2: There is no significant difference in mean achievement score of students taught mathematics using interactive simulation strategy and those taught using conventional strategy.

Table 6: Analysis of Covariance on the Mean Achievement Scores of Students taught mathematics using Interactive Simulation Strategy and those taught using Conventional Strategy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	11460.70[a]	2	2865.17	50.41	.00	.61
Intercept	1751.02	1	1751.02	30.81	.00	.19
Pre-MAT	1647.84	1	1647.84	28.99	.00	.18
ISS and CS	6239.33	1	6239.33	109.78	.00	.46
Error	7388.30	130	56.83			

Total	89073.00	135
Corrected Total	18848.99	134

Dependent Variable: Post-MAT; R Squared = .61 (Adjusted R Squared = .60)

The results in Table 6 revealed that F (1, 130) = 109.78 at P =0.00. Since P=0.00 < 0.05, the null hypothesis of no significant difference is therefore rejected. That is, there is a significant difference in the mean achievement scores of students taught using ISS and those taught using Conventional Strategy. More so, the Eta-square (0.46) was reported which indicated that about 46% of achievement improvement noticed at Post-MAT (dependent variable) is contributed by independent variable Interactive Simulation Strategy (ISS).

Ho3: There is no significant difference in mean attitude ratings of male and female students taught mathematics using interactive simulation strategy.

Table 7 Analysis of Covariance on the Mean Attitude Ratings of Male and Female Students Taught Mathematics using Interactive Simulation Strategy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.03[a]	2	.02	.42	.66	.02
Intercept	10.08	1	10.08	264.87	.00	.83
Pre-MAIS	.02	1	.03	.40	.53	.01
Gender	.02	1	.02	.41	.52	.01
Error	2.02	53	.04			
Total	803.15	56				
Corrected Total	2.05	55				

Dependent variable: Post-MAIS; R-Squared = .02; (Adjusted R Squared = -.02)

The results on Table 7 revealed that F (1, 53) = 0.41 at P =5.23. Since P=0.52 > 0.05, the null hypothesis of no significant difference is

therefore not rejected. This implies that there is no significant difference in the mean attitude ratings of male and female students taught mathematics using interactive simulation strategy package. More so, the eta-square value (0.01) expressed that only 1% difference in the mean attitude ratings is notice in male students towards mathematics compare to their female counterpart in the same ISS teaching strategy.

Ho4: There is no significant difference in mean achievement scores for male and female students taught mathematics using interactive simulation strategy.

Table 8: Analysis of Covariance on the Mean Achievement Scores of Male and Female Students taught mathematics using Interactive Simulation Strategy.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	306.01[a]	2	153.01	19.52	.00	.42
Intercept	2228.07	1	2228.07	284.31	.00	.84
Pre-MAT	305.75	1	305.75	39.02	.00	.42
Gender	2.28	1	2.28	.29	.59	.01
Error	415.35	53	7.84			
Total	61310.00	56				
Corrected Total	721.36	55				

Dependent Variable: Post-MAT; R Squared = .42 (Adjusted R Squared = .40)

In Table 8 one-way ANCOVA results on the effect of ISS on achievement scores for students in mathematics with respect to their gender is presented. The table revealed that F (1, 53) = 0.29 at P =0.59. Since P=0.59 > 0.05, the null hypothesis of no significant difference is therefore not rejected. This implies that there is no significant difference in the mean achievement scores of male and female students taught mathematics using interactive simulation strategy package. More so, the eta-square value (0.01) expressed that only 01% difference in the male students' mean achievement scores in

mathematics was observed comparison to their female counterpart under same ISS teaching strategy.

DISCUSSION

The use of interactive simulation strategy for teaching of mathematics significantly enhanced positive attitude among students toward mathematics than those students taught mathematics using conventional strategy. This finding may not be unconnected with the combined effects of the features of interactive simulation strategy that offers user-friendly environment which motivates the users to put in more efforts. This finding is in agreement with the findings made in the earlier research work carried out by Misfeldt (2015) that games were more motivating than 'pencil and paper. The use of interactive simulation strategy for teaching mathematics in Senior Secondary Schools has positive effect on students' achievement more than the achievement of those taught using conventional strategy. This finding agreed with the finding made from the study conducted by Seay and Jouhingen (2013), who found that students that were exposed to interactive simulation strategy and other ICT gadgets have tendency to respond to mathematical task than those trained in conventional strategy classes. This finding of stylish learning as a result of understanding rules before playing games was also reported in the study conducted by McGrath (2010) that the students that were made to play educative games were unaware of knowledge benefits they acquired, until when they were made to face the reality test in mathematical or other educative challenges task. In this study, clear rules and principles used in the study were made clear from on set in order not to leave students in ambiguity while playing the games. Any games that simulated the students' thinking should be taken as one that leads to skill acquisition for life usage.

There is no significant difference in the attitude of male and female students taught mathematics using interactive simulation strategy. This implies that using interactive simulation strategy for teaching of mathematics has similar low effect attitude of both male and female

students towards mathematics. This result showed that male and female gain similar positive attitude toward mathematics after being taught by interactive simulation strategy. This finding concurs with the finding made by Sierra- Fernandez and Perales- Palacios (2013) that computer games override some ugly situations such as overcrowded classes where female students will be at a disadvantage, poor teaching methods from inexperienced teachers and other teacher attitudes that deny particular gender (mostly female) the opportunity to catch up with others in the class. However, the finding of this study disagree with the earlier findings made by Timayi et al. (2015) which indicated significant differences in gender attitude ratings amongst students taught with interactive simulation strategy in favour of male against female students. The Timayi et al.'s study attributed the poor female students' attitude in computer simulated class to phobia and lack of self-courage. In all, the current study reaffirmed that the variable gender as a strong factor, does not create biased influence on the attitude of students toward mathematics as a result of using interactive simulation strategy.

The use of interactive simulation strategy for teaching mathematics in secondary schools does not significantly enhance achievement of male students than the achievement of their female counterpart. Non-gender biased effectiveness of the interactive simulation strategy as revealed by the findings of this study agreed with the earlier finding made by Ganley and Vasilyeva (2013). Ganley and Vasilyeva had found that education is not meant for a particular gender and thus difficulty to find why particular gender will presume to be performing woefully if allowed equal learning opportunity and subjected to the same leaning conditions. This finding was also in accordance with the finding made by Seay and Jouhingen (2013) that the issues with female students' performance in schools subject could not be directly attributed to gender, but to the dissimilarities that educators put in place in curriculum implementation which tends to favour male students more than female students. In a nutshell, using interactive simulation strategy that gives both gender of students

equal opportunities and guides may be an awaited answer for creating breakthrough learning model that is not gender-biased.

CONCLUSION

The focus of this study was set to determine the effect of using interactive simulation strategy (ISS) on Senior Secondary Schools students' attitude and achievement in mathematics. This study has established the importance of employing new teaching strategies to get the best out of students in terms of their attitude and achievement in mathematics aspect of mathematics. It has been identified from the findings of this study that through the use of interactive simulation strategy (ISS) for teaching mathematics at Senior Secondary classes, the attitudes of students towards mathematics was not only enhanced but it also improved their achievement in mathematics lesson significantly. The findings from this study also identified the consistency of interactive simulation strategy (ISS) as an effective teaching strategy for plane mathematics irrespective of the gender of students. The use of interactive simulation strategy on the scene of teaching and learning activities may be one of the ways to correct earlier insinuation that female students are unconvincingly fit into mathematics classes. Thus, with interactive simulation strategy which, allow students to study at their respective paces, there are equal chances for both male and female students to benefit from mathematics instruction and increase their interest in mathematics. The consistency demonstrated in the study by interactive simulation strategy has proved the efficiency of interactive simulation strategy as one of the effective strategies of teaching mathematics to both male and female students in senior secondary schools level in the study area.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

1. Government through the State Ministry of Education should encourage the use of interactive simulation strategy in the State

for the teaching of mathematics in senior secondary schools students in the state.

2. There should be seminars and workshops for teachers to encourage the adoption of interactive simulation strategy for their Mathematics class.
3. In the situations where quantity of interactive simulation strategy facilities are not sufficient for students use, teachers should ensure that all students irrespective of their gender have even equal access to enhance the achievement among students.

REFERENCES

Achor, E.E., Imoko, B.I. & Ajai, J.T. (2010). Sex differential in students' achievement and interest in Geometry using Games and simulations technique. *Necatibey Faculty of Education, Electronic Journal of Science and Mathematics Education*, 4(1), 1-10

Adaramola, M. O., & Obomanu, B.J. (2011). Factors related to under achievement in science, technology and mathematics education (STME) in secondary schools in Rivers State, Nigeria. *World Journal of Education,* 1(1), 102-109.

Adeyemi, B. A. & Ajibade, Y. A. (2011). The comparative effects of simulation games and brainstorming instructional strategies on Junior Secondary School students' achievement in Social Studies in Nigeria, *African Research Review: An International Multi-Disciplinary Journal,* 5(20),64-80,

Ahmad, B., Muhamad, H., Naji, K., &Avi, H. (2016). The effectiveness of teachers' use of demonstrations for enhancing students' understanding of and attitudes to learning the oxidation-reduction concept. *Journal of Mathematics Science and Technology Education 2(03):23 – 45.*

Akinsola, M. K. & Olowojiaye, F. B. (2012). Effect behavioural objectives based (BOBIS) and study questions based (SQBIS) instructional strategies on students' attitude in senior secondary school subject in Lagos State. *International Electronic Journal of Mathematics Education,* 3(1), 60-70.

Ganley, C. M., & Vasilyeva, M. (2013). Sex differences in the relation between math performance, spatial skills, and attitudes. *Behavioral and Brain Sciences*, 19, 229-284.

Ganyaupfu, M. E. (2013). Teaching methods ad students' academic performance. *South Africa: International Journal of Humanities and Social Science Invention*, 2(9) 29-35. Retrieved from http://www.ijhssi.org

Iyekekpolor, S. A. & Tsue Avar, E. (2010). Effect of computer assisted instruction on students' academic performance in Mathematics. *Journal of Research in Curriculum and Teaching*, 3 (1), 211 – 216

McGrath, C. (2010). Supporting early mathematical development. Practical approaches to play-based learning. New York: Routledge.

Misfeldt, M. (2015). Scenario Based Education as a Framework for Understanding Students Engagement and Learning in a Project Management Simulation Game. *Electronic Journal of E-Learning*, 13(3), 181-191.

Mohammed, L. & Waheed, H. (2011). Secondary Students' Attitude towards Mathematics in a selected School of Maldives. *International Journal of Humanities and social science* 1(15), 277-281.

Muzzatti, B., & Agnoli, F. (2009). Gender and mathematics: Attitudes and stereotype threat susceptibility in Italian children. *Developmental Psychology*, 43,747-759.

Nnamani, S. C. & Oyibe, O. A. (2016). Effects of individualized instructional method on secondary school students' achievement in social studies. *British Journal of Education, 4(3), 110 – 120*

Olaleye, F.O. (2016). Teachers' characteristics as predictor of academic performance of students in secondary school in Osun State – Nigeria. *Global Journal of Human Social Science,* 2(2)49-76

Oyesiku, K. (2016). Relationship between self-esteem and academic achievement amongst Pre-University students in the South

Western, Nigeria. *International Journal of Educational Management,* 20(6), 466-479.

Razali, F., Talib, O., Manaf, U. K. A., & Hassan, S. A. (2018). Students Attitude towards Science, Technology, Engineering and Mathematics in Developing Career Aspiration. *International Journal of Academic Research in Business and Social Sciences*, 8(5), 962–976.

Seay, D, T. & Jouhingen, W.V. (2013). What do we know about computer Simulations? *Kaleidoscope Network of Excellence for technology Enhanced Learning* retrieved on13/12/2013, from; http://kaleicdoscope.gw.utwente.ml/SIG-ILI. Kenmisnet/ICT of school publishers.

Shofoyeke, A.D. (2016). The Impact of Teaching Methods on Pre-Primary School Pupils' Learning Achievement in Protection Issues in Selected Nursery and Primary Schools in Ondo West Local Government. *Journal of Elementary Education,* 25(2): 45-60.

Sierra- Fernandez, J. L., & Perales- Palacios, F. J. (2013). The effect of instruction with computer simulation as a research tool on open- ended problem- solving in a Spanish classroom of 16-year- olds. *Journal of Computers in Mathematics and Science Teaching*, 22, 119- 140.

Timayi, J. M., Ibrahim, M.O. & Sirajo, A.M. (2016). Gender differentials in students' interest and achievement in Geometry using JIGSAW IV cooperative learning strategy (J4CLS). *ABACUS: The Journal of Mathematical Association of Nigeria.* 41(1), 147-157.

Usman, E.O. (2018). *Effects of computer simulated games and power point on senior secondary students' attitude and achievement in Geometry in Adamawa State*. Unpublished PHD Thesis Benue State University, Makurdi.