Effect of Assessment Supported Instructional Model on Secondary School Students' Interest in Mathematics in Onitsha Education Zone

Iliemenam, Jude, Chukwunonso[1] & Okigbo, Ebele Chinelo[2]
[1,2]Department of Science Education, Nnamdi Azikiwe University, Awka
cinajoyd@gmail.com

DOI: 10.56201/ijee.v9.no5.2023.pg1.10

ABSTRACT
The study investigated the effect of Assessment supported instructional model (ASIM) on students' interest in mathematics in Onitsha Education zone of Anambra state. Two questions guided the study while three hypotheses were tested. Quasi-experimental research design was adopted for the study. The population was made up of 6,257 senior secondary two student (SS2) offering mathematics. Purposive and random sampling techniques were used to draw a sample of 130 SS2 students offering mathematics from 19 co-educational schools in the Zone. Students' Mathematics Interest Rating Scale (SMIRS) was used to collect data for the study. The instruments was validated by three experts and the reliability coefficient of 0.81 was obtained for SMIRS using Cronbach Alpha. Data were collected by administering the instruments as pretest and posttest. Mean and standard deviation were used to answer the research questions while Analysis of Covariance was used to test the null hypotheses at 0.05 alpha level. Findings of the study showed that assessment supported instructional model (ASIM) significantly improved students' interest in mathematics more than Conventional System of Instruction (CSI). Also, ASIM enhanced interest of students in Mathematics equally irrespective of gender. Based on the findings, it recommended that ASIM should be used in teaching and learning of mathematics in secondary school by mathematics teachers.

KEYWORD: *Assessment-supported, instruction, interest, mathematics*

Introduction

Nigerian government is very much aware of the importance of education in general and science education in particular for her technological advancement. Thus the government stipulates a ratio of 60 : 40 in favour of science and technology related courses in the conventional universities, 80 : 20 in universities of technology and 70: 30 in polytechnics. Nowadays, countries all over the world, especially the developing ones like Nigeria, are striving hard to develop technologically and scientifically since the world is turning scientific and all proper functioning of lives depend greatly on science.

According to University of California (2013), science is a process of discovery that allows us to link isolated facts into coherent and comprehensive understandings of the natural world. It is a branch of knowledge or study which deals with body of facts or truth systematically arranged and showing the operation of general laws. Science is systematic knowledge of the physical or material world gained through observation and experimentation. Without the applications of science, it would have been difficult for man to explore the other planets of the universe. Science comprises the basic disciplines such as physics, chemistry, integrated science, Mathematics and biology.

Mathematics is a core and compulsory subject taught at primary, secondary and higher education levels in Nigeria. Mathematics as a subject affects all aspects of human life at different levels. Studies have suggested that, Mathematics is a science of magnitude and number that is very useful virtually in all subject areas (Ayebalea, Habaasab and Tweheyo, 2020). Besides, according to the Nigeria Educational Research and Development Council, (NERDC, 2018), Mathematics as one of the science subjects remains one of the most difficult subjects in the school curriculum

Studies such as Avong (2013), Sa'ad and Rabiu (2014) have also revealed that the performance of Nigerian students in Ordinary level Mathematics was generally and consistently fluctuating over the years. This poor performance of the students' are witnessed in both internal and external examination with progressive decline of the students' performance as the year goes by. The analysis of West Africa Examination Council passed result in Nigeria also showed that, in 2015, 616,370 students out of 1,593,442 students representing 58.68% of the students who sat Senior Secondary Certificate Examination passed Mathematics at credit level and above, in 2016, 878,040 out of 1,552,758 students representing 51.97% who sat for the examination passed Mathematics, in 2017, 923,486 out of 1,559,162 students representing 48.22% passed Mathematics at credit level and above. However, in 2018 as compared to 2017 and 2020 as compared to 2019, there was a sharp decrease in the number of students that passed Mathematics at credit level which was reviewed as 49.98 and 39.98% respectively. There was in 2021 a good number of students who passed the subject at credit level and above.

Though Mathematics occupies a critical position in Nigeria education system, it has been observed by researchers that most people find it difficult to pass the subject. Many reasons have been attributed to the causes of poor academic performance in Mathematics amongst the causes of poor academic performance in Mathematics includes attitudes of the learners towards the subject, lack of teaching experiences, economic conditions, lack of appropriate teaching methods and low motivation of teachers and attitudes (Makondo and Makondo 2020). Certain conventional teaching methods mostly used in teaching Mathematics makes student passive rather than active in the classroom. It takes active learners' to master learning process, discover learning needs and challenges, and pattern a way to solve their learning problems and need thereby leading to meaningful learning.

Mastery of Mathematics concepts might not be fully achieved without the use of a good instructional model. A teaching model that will make the students active in the classroom and contribute effectively to their learning goal will make Mathematics learning experience more interesting and result oriented. Recent research (Makondo and Makondo, 2020) has indicated that an individual ability to learn and interact might increase when suitable conditions are met, that are appropriate for the individual in terms of pace of comprehension and power of understanding.

However, effective teaching, according to Enu, Agyman and Nkum (2015) has three components; preparation, execution and assessment. Preparation phase is the planning stage at which instructional objectives and suitable instructional materials are selected. The planned lesson is actually delivered using relevant instructional strategies at the execution stage. At the assessment stage, the teacher determines the achievement of intended objectives. It can be deduced from the foregoing discussion that effective teaching/instruction is inseparable from assessment. This is because there is no effective teaching without assessment just like there will be no assessment without teaching taking place.

In view of the foregoing, an urgent need to find ways for improving the teaching and learning of Mathematics is very necessary. Efforts could be geared towards evolving new strategies and total transformation of the Mathematics education programmes. Such efforts

should include among others the integration of assessment and instructional strategies as integral part of teaching and learning of Mathematics. Such integration involves the use of Assessment-Supported Instructional Model (ASIM).

The Assessment – Supported Instructional Model (ASIM) is a model designed with the primary objective of using the students' assessment result to improve instructions (Allahnana et *al.*, 2018).The intention is to ensure that students' level of understanding at any point in the teaching/learning process is adequately ascertained so as to apply appropriate instructional method that will enhance learning outcome. ASIM is a system of instruction which is a total deviation from the conventional system of instruction. The conventional system of instruction is known as teacher – centered instruction. This is because it makes the teacher to; (a) act as essential link between a student and what is to be learned, (b) select what a student should learn and (c) select the method(s) by regarding students in a class as more or less uniform groups of learners.

The ASIM consists of the following steps; (i) Pre-teaching preparation; (ii) real teaching of the topic/units,(iii) administration of formative assessment; (iv) marking, scoring and analyzing the scores, (v) using the result to determine the instructional objectives; (vi) review of instructional strategies, if ineffective: record scores in formative assessment sheet if effective; proceed to other topic segments (if any) if none; (vii) administration of test for topic assessment, marking, scoring and analyzing the scores; use the result to determine the strength of the instruction; (viii) completely review of instructional strategies and ask the students if ineffective; record scores in a continuous assessment sheet if effective. The inference therefore is that presently Mathematics teachers in the secondary school system do conduct assessment after Mathematics instruction terminally for the purpose of selection, promotion and certification of learners (Makondo and Makondo, 2020). It is therefore, paramount that Mathematics teachers should adopt new strategies which integrate assessment and instruction for Mathematics lessons. As it will enable the students assess themselves to find out their learning difficulties and device appropriate approach towards solving, their learning problems. This method when used in teaching Mathematics may arouse and sustain interest in learning mathematics.

Academic interest is the psychological disposition of students which defines their propensity to either commit themselves to learning or abscond to learning activities. Academic interest according to Chukwuagu (2016) is a psychological construct that defines individual's degree of responsiveness to a given activity, events, object or person. This deals with how often or willing one is to perform a given activity, engage with an object or person for maximum output. For Hilgard in Ali (2015) academic interest is a persisting tendency to pay attention and enjoy some activity or content. By implication it is a factor of emotion that makes the students ready and prepared to learn. Academic interest gives the student the propensity to continue in a task till success is achieved. It is the force which enhances learning and sustains effectiveness.

In teaching and learning especially Mathematics, the factors that enhances the interest of the learner involve the teaching method, the teacher and how often learning activities can be relevant to real life experiences. When the teaching method used by the teacher elicits and sustains the students' interest, it will improve their commitment in learning activities which could improve their achievement and make them life-long learners of the subject. Thus, this study set out to use ASIM for Mathematics instruction so as to observe its effect on Mathematics achievement and interest of secondary school students. More so it is important to note that academic activities in today's classroom involves male and female students who have varied interest abilities and different level of anxiety which has the ability to affect their

performance. Mathematics is one of the secondary school subjects that is associated with so many phobia, and acclaimed to be gender sensitive.

Ezeh (2013) sees gender as any physical and behavioural difference between males and females which are social culturally biased. Gender as it were is the state of being a male or female as defined by the society in which one lives. Before now, science was preserved for the males with little participation of female students. This is due to the fact that girls did not embrace formal education and specifically science education early enough as to their male counterparts (Chukwuagu, 2016). Okeke and Okigbo (2021) earlier observed that women and girls grapple with a lot of discrimination and difficulties in science learning. Abdu-Raheem (2017) also argued that the differential treatment given to boys and girls by teachers and the society dangerously hampered the educational progress, self-esteem, and career choices of girls.

Gender of the students plays significant role in the achievement in Mathematics. Many researchers have considered the role of gender and its significant impart in the interest of students in Mathematics. Females express less interest in Mathematics than their male peers probably because fewer females pursue careers in Science Technology Engineering and Mathematics (STEM) fields. Njoku and Okigbo (2021) in their study found no significant influence of gender on students' interest in mathematics while Obi (2022) found out that gender had a significant influence on the interest of male and female students in mathematics. With this in mind, there is every tendency that interest of male and female students in Mathematics might differ. It becomes important that this study should examine the effect of ASIM on the interest of male and female students in Mathematics.

Purpose of the Study

The purpose of this study was to determine the effect of assessment supported instructional model (ASIM) on students' interest in Mathematics in Onitsha Education Zone. Specifically, the study determined the:

1) Difference between the mean interest rating scores of students taught Mathematics using ASIM and that of those taught using CSI
2) Difference between the mean interest rating scores of male and female students taught Mathematics using ASIM and those taught using CSI.
3) Interaction effect of treatment (ASIM and CSI) and gender on students' interest in Mathematics.

Research Questions

The following research questions guided the study:

1) What is the difference between the mean interest rating scores of students taught Mathematics using ASIM and that of those taught using CSI?
2) What is the difference between the mean interest rating scores of male and female students taught Mathematics using ASIM those taught using CSI?

Hypotheses

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

1) There is no significant difference between the mean interest rating scores of students taught Mathematics using ASIM and those taught using CSI.
2) There is no significant difference between the mean interest rating scores of male and female students taught Mathematics using ASIM and those taught using CSI.
3) There is no interaction effect of gender and treatment(ASIM and CSI) on students' interest rating scores in Mathematics

Method

The design of the study is quasi – experimental. This study was carried out in Onitsha Education Zone. The population consists of all students offering Mathematics in senior

secondary school year two (SS2) in the 32 secondary schools in Onitsha Education Zone of Anambra State. The total population of SS2 students in the zone is 6,257. The sample is made up of 130 SS2 Mathematics students drawn from two out of the 21 co-educational Secondary Schools in Onitsha Education Zone of Anambra State. Multistage sampling procedure involving different techniques at each stage was used to draw the sample size. First, the schools were retained in their category and purposive sampling technique was used to sample two co-educational senior schools in the Zone. Only co-educational schools were chosen because the researcher intends to observe male and female students under the same teacher in the same school environment. Simple random sampling was used to allocate the schools to experimental and control group schools. Simple random sampling technique (balloting without replacement) was used to sample two schools (two stream of an intact class of SS2 students in each school) were assigned to experimental group and two schools (two stream of an intact class of SS2 in each school) were assigned to control group. The experimental group school has 65 students (32 males and 33 females) while the control group school has 65 students (30 males and 35 females).

The SMIRS instrument was used to collect data on students' interest in Mathematics. The researcher developed the instrument from measure of interest in literature and other such interest instruments used for data collection. The instrument is made up of two sections A and B. Section A of the instrument is designed to collect bio data of the respondents. These information include sex, name of school and class. The section B contains 40 items which was targeted at gathering information based on the interest of the students in Mathematics, how often they wanted to participate in Mathematics activities and relate Mathematics to real world away from classroom experience, their propensity to take a career in Mathematics and so on. The instrument (SMIRS) is structured on a 4-point scale with response options of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). SMIRS has both positive and negative statements. SMIRS was validated by three experts in Nnamdi Azikiwe University, Awka.

In order to ensure that the SMIRS was reliable, the instruments was administered to 20 students in an intact class in Community Secondary School Ozubulu in Nnewi Education zone who are not part of the study, for the purpose of pilot testing of the instrument. The data collected from the students were analyzed to establish the reliability index. Cronbach alpha was used to analyze the data collected. Cronbach alpha was used because the SMIRS was not dichotomously scored; it has multiple ratings without wrong or right answers. A reliability coefficient of 0.81 was obtained for SMIRS.

The research work was carried out within a period of six weeks. This period was used for pretest, treatment and posttest. Mathematics teachers of the various schools sampled were used as research assistants. They taught the students using Assessment Supported Instruction for experimental group. In order to effectively follow the rules of this research work, the teachers were instructed on what ASIM is and how to use it in the classroom. The lesson plan prepared for this study on ASIM was given to the teachers to enable them to master the guidelines of ASIM before they can apply it in the classroom. Teachers in the schools used as control group taught using conventional instruction model and made use of a lesson plan prepared by the researcher.

Pretesting: The first week of the treatment was for school visiting and it involved seeking for permission from school authority to carry out the research work. The researcher also used this week to familiarize with the teachers who also serve as the research assistants. The teachers were given the instrument to administer to the students as pretest. The score of the students was collected and documented before the teaching proceeded without any form of feedback.

Teaching of students: After the training, the research assistants commenced the teaching of the students with the lesson plans developed for this study both for ASIM and for CSI. This teaching lasted for four weeks using the school timetable for Mathematics periods. There are two double periods and one single period of Mathematics per week. These periods were utilized by the research assistants. During the teaching, teachers in the experimental group are expected to adhere to the ASIM which was supervised by the researcher from time to time. The treatment procedure in ASIM and CIS is described as follows:

ASIM:

The students in the ASIM group were taught by first revising the last topic taught. Thereafter, the teacher introduced the concept and taught the students the concept using examples to solve related problems. After teaching the concept and solving examples, the teacher gave the students assessment questions to solve. The students' attempt and solutions to the problems given are marked and weaknesses and strength of the students as to how much the concept has been learnt was noted. The teacher used these scores and indicators of areas of weakness and strength of learning in the assessment to further teach the concept paying more emphases to the areas of weakness noted. At the end of the instruction, the teacher gave the students evaluation questions to solve as further assessment in preparation for the next class.

CIS:

In the CIS class, the same instructional content was taught. However, no in-class assessment was given to determine students' weaknesses and strength in learning the concepts. Students were given opportunity to ask questions for clarification. The lesson in totality was as directed by the teacher and instructions flew from the teachers to students who were the recipients.

Post testing: at the end of the fifth week, the teachers having covered all the topics as contained in the lesson plan given to them, gave posttest to the students in the sixth week. Post testing of the students was done using SMIRS. The students were administered the posttest by the research assistants both in control and experimental groups.

The research questions were answered using mean scores. The hypotheses were tested at 0.05 level of significance using analysis of covariance (ANCOVA). ANCOVA was used to take care of the initial group difference that existed due to non-randomization of the students. For the research questions, a wider difference in mean gain will be taken as effectiveness while close difference in mean gain will be taken as not effective. For the hypotheses, if probability value (P-value) is less than or equals the significant value of 0.05, the null hypothesis is rejected but if it is greater than 0.05 the hypothesis is not rejected.

Results

Research question 1: What is the difference between the mean interest rating scores of students taught Mathematics using ASIM and that of those taught using CSI?

Table 1: Difference between Mean Interest Score of Students taught Mathematics using ASIM and CSI

Groups	N	Pretest $\bar{x}$	Pretest SD	Posttest $\bar{x}$	Posttest SD	Mean Gain
ASIM	65	76.00	17.43	101.97	22.75	25.97
CSI	65	68.86	15.03	84.86	15.83	16.00
Mean Diff.		7.14		17.11		9.97

Table 1 is an indication of the various means and standard deviations of students taught mathematics using ASIM and CSI. From the result of the data in table 3, students taught with ASIM has mean interest rating score of 76.00 in pre-interest and 101.97 in their post-interest mean score. A mean gain of 25.97 was obtained. For those students taught mathematics with CSI, they had pre-interest rating mean score of 68.86 and post-interest rating mean score of

84.86. A mean difference of 9.97 from the table showed that students taught with ASIM had higher mean interest scores than students taught with CSI. Students taught using ASIM also had a less homogeneous score in the posttest (22.75) than those taught using CSI (15.83).

Research question 2: What is the difference between the mean interest rating scores of male and female students taught Mathematics using ASIM those taught using CSI?

Table 2: Difference between Mean Interest Score of Male and Female Students taught Mathematics using ASIM and CSI

Groups	Gender	N	Pretest $\bar{x}$	Pretest SD	Posttest $\bar{x}$	Posttest SD	Mean Gain
ASIM	Male	32	75.47	14.86	105.53	25.37	30.06
	Female	33	68.86	15.03	84.86	15.83	16.00
Mean Diff.			6.61		20.67		14.06
CSI	Male	30	69.23	13.41	85.67	11.99	16.44
	Female	35	68.54	16.48	83.43	18.63	14.89
Mean Diff.			0.69		2.24		1.55

Table 2 is the mean standard deviation, mean gain and mean difference of male and female students on their interest rating taught mathematics using ASIM and CSI. From the table there is a mean pre-interest score of 75.47 and post-interest mean interest rating of 105.53 male students taught mathematics using ASIM. For the female students taught using ASIM a mean interest rating score of 68.86 and 84.86 were obtained for pre-interest and post-interest respectively. With a mean interest gain of 14.06 showed that male students taught with ASIM had higher mean gain score than their female counterparts. For male and female students taught with CSI, male students had mean pre-interest score of 69.23 while their female counterparts had mean pre-interest rating score of 68.54. Also male students taught with CSI had post-interest mean rating scores of 85.67 while their female counterparts had post-interest mean rating scores of 83.43. A mean gain score of 16.44 was obtained for male students and 14.89 for female students. A mean gain score of 1.44 was obtained in favor of male students taught using CSI.

Hypothesis 1: There is no significant difference between the mean interest rating scores of students taught Mathematics using ASIM and those taught using CSI.

Table 3: Analysis of Covariance on Difference between the Mean Interest Rating Scores of Students taught mathematics using ASIM and CSI

Source	SS	df	MS	F	Sig	Decision
Corrected Model	32418.888[a]	4	8104.722	37.931	.000	
Intercept	7733.233	1	7733.233	36.192	.000	
Pretest	21576.368	1	21576.368	100.979	.000	
Method	4307.614	1	4307.614	20.160	.000	Sig.
Gender	736.900	1	736.900	3.449	.066	Not Sig.
Method * Gender	307.566	1	307.566	1.439	.233	Not Sig.
Error	26709.081	125	213.673			
Total	1188712.000	130				
Corrected Total	59127.969	129				

Table 3 show the main effect of teaching methods on the interest of students in mathematics. Table 6 shows that there is a difference between the mean interest rating scores of students taught mathematics using ASIM and CSI, $F(1,125) = 20.160$, $P = 0.000 < 0.05$. The null hypothesis was therefore rejected meaning that there is a significant difference in the mean interest rating scores of students taught mathematics using ASIM and those taught using CSI in favour of those taught using ASIM.

Hypothesis 2: There is no significant difference between the mean interest rating scores of male and female students taught Mathematics using ASIM and those taught using CSI.
Data relating to hypotheses 2 is contained in Table 3.

Table 3 also shows that there is no significant difference between the mean interest rating scores of male and female students taught mathematics using ASIM and CSI, F(1,125) = 3.449, P = 0.66 > 0.05. The null hypothesis was therefore not rejected meaning that there is no significant difference in the mean interest rating scores of male and female students taught mathematics using ASIM and CSI.

Hypothesis 3: There is no interaction effect of gender and treatment on students' interest rating scores in Mathematics
Data relating to hypothesis 3 is contained in Table 4
Table 6 further shows that there is no significant interaction effect of teaching methods (ASIM and CSI) and gender on the interest ratings of the students in mathematics, F(1, 125) = 1.439, P = 0.233 > 0.05. The null hypothesis was therefore not rejected meaning that there is no interaction effect of gender and treatment (ASIM and CSI) on students' interest rating scores in Mathematics.

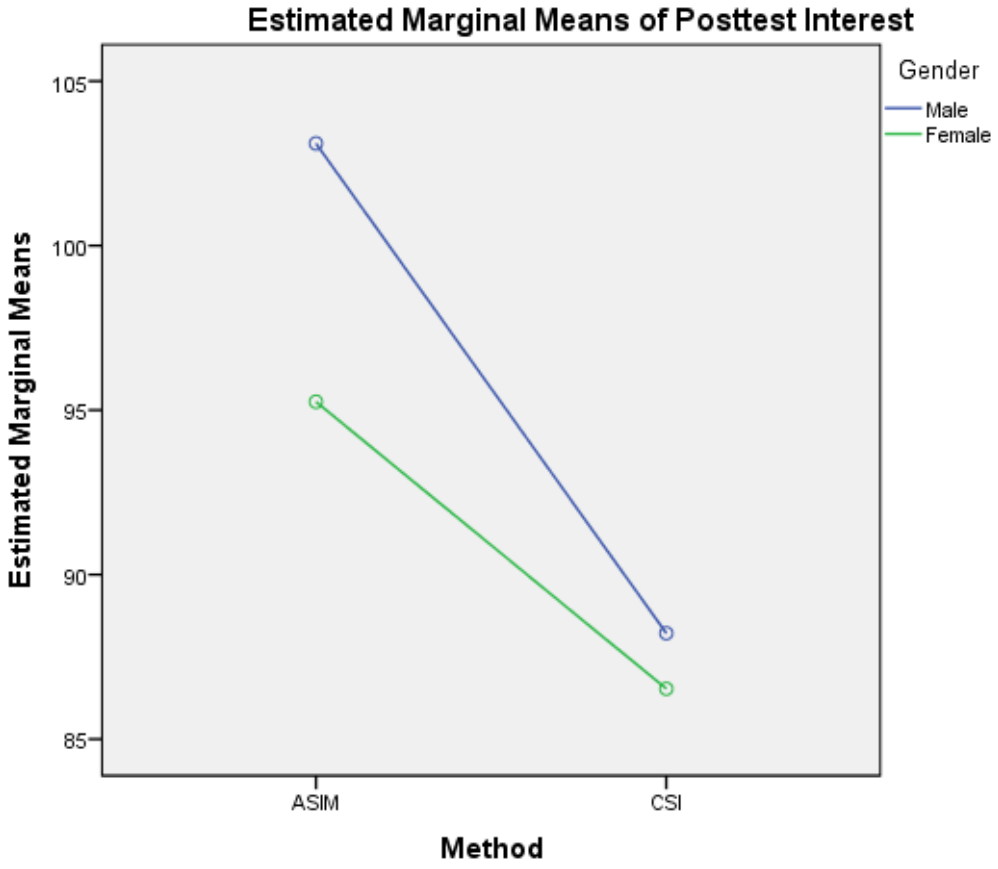

Figure 1: Plot of Interaction Effect of Gender and Methods on Students' Interest in Mathematics

Discussion

This study examined the interest of students in mathematics when taught using ASIM and CSI. The findings of the study showed that students who were taught using ASIM had mean interest rating score that is higher than those taught using CSI. The mean gain was in favour of students who were taught using ASIM. Also there was a significant difference in

the mean interest rating scores of students taught using ASIM when compared with that of students taught using CSI. By implication students who are taught with ASIM showed more interest in mathematics, because there were appropriate feedback and assessment on every level the teaching process giving them room sufficiently to express their learning difficulties which was resolved immediately before they moved to the next phase of learning. This helped to elicit and sustain their interest in the learning process throughout the teaching and learning period. Tembe, Anyagh and Abakpa (2020) found out this a significant relationship between method of teaching and academic achievement of the students in mathematics. Therefore interest of the students is affected by the method used in the class by teachers to deliver mathematics instruction to the students. the implication therefore, is that as the method of teaching becomes favorable to the students the will tend to be more interested in what the teacher is teaching which will in turn affect their achievement positively. Also the work of Essien, Akpan and Obot (2015) showed that there is a significant relationship between students' interest and achievement. Mohamed and Charles, (2017) in the study reported that there was a significant difference in interest and academic achievement of secondary school students.

Female student taught with ASIM showed slightly higher mean gain score than their male counterparts also male students taught using CSI showed higher interest mean score than their female counterparts. There was no significant difference in the mean interest rating of male and female students taught mathematics. Therefore male students as well as their female counterparts were interested in mathematics when taught with ASIM and CSI.

Conclusion

From the finding of the study and discussion made, it can be concluded that ASIM has effect on the interest of students more than CSI in mathematics. It can be concluded that ASIM positively affected the interest of students in mathematics.

Recommendations

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

1. Teachers of mathematics should adopt ASIM in teaching mathematics as this will help increase the interest and achievement of the students in the subject.
2. Teachers of mathematics should train, encourage and motivate students on how ASIM strategies in learning mathematics so as to improve achievement.
3. Government and other stakeholders in education should sensitize mathematics teachers on the efficacy of ASIM through conferences, seminars and workshops.

References

Abdu-Raheem, B. O. (2017). The Influence of gender on secondary school students' academic performance in South-West, Nigeria. *Journal of Social Sciences, 31*(1), 93-98. DOI: *10.1080/09718923.2012.11893018*

Allahnana, K. M.; Akande, M. T.; Vintseh, I. M. U.; Alaku, E. A. and Alaku, M. E. (2018). Assessment of gender and interest in mathematics achievement in keffi local government area of Nasarawa State, Nigeria. *International Journal of Operational Research in Management, Social Sciences and Education, 4*(1), 127-140.

Avong, H. N. (2013). Poor performance in mathematics among senior secondary school students in Kaduna state: What's to blame? *Journal of Research in National Development*, *11*(2), 319-324.

Ayebalea, L., Habaasab, G. and Tweheyo, S (2020). Factors affecting students' achievement in mathematics in secondary schools in developing countries: A rapid systematic review. *Statistical Journal of the IAOS,* 36, 73–76. DOI 10.3233/SJI-200713

Chukwuagu, K. (2016). *Effect of instructional scaffolding on academic achievement and interest of students' in chemistry in senior secondary schools in mabitoli l.g.a.* Imo State. Retrieved from http//:google.com.doi.ajndunog.2987484.pdf on 12/12/2022

Enu, J., Agyman, O. K., and Nkum, D. (2015). factors influencing students' Mathematics performance in some selected colleges of education in Ghana. *International Journal of Education Learning and Development*, 6(3), 68-74.

Ezeh, A. (2013). Is gender a factor in mathematics performance among Nigerian pre-service teachers? *Sex Role*, 51 (11 and 12), 749-754.

Makondo, V. and Makondo, D. (2020). Causes of poor academic performance in mathematics at ordinary level: A case of Mavuzani high school, Zimbabwe. *International Journal of Humanities and Social Science Invention*, 9(6),10-18. DOI: 10.35629/7722-0906011018.

Muhammad K., (2017). Gender Difference in Math anxiety and mathematics performance of secondary schools students in Bauchi State Nigeria. *International Journal of Education and Evaluation,* 3(11), 26-31.

Njoku, C. and Okigbo, E.C. (2021). Effect of GeoTAN instructional software package on secondary school students' interest in geometry. *African Journal of Science, Technology and Mathematics Education (AJSTME), 6*(1), 185-194.

Obi, C.A. (2022). Effects of gender on assessment supported instructional model (ASIM) on students' achievement and interest in secondary school mathematics in Delta central senatorial district. *IOSR Journal of Research and Method in Education (IOSR-JRME), 12*(3), 63-71.

Okeke, J.C. and Okigbo, E.C (2021) Effect of generative learning model on secondary school students' achievement and retention in algebra. *South Eastern Journal of Research and Sustainable Development*, 4(2), 32-45.

Sa'ad, T. and Rabiu, U. (2014). The causes of poor performance in english language among senior secondary school students in Dutse Metropolis of Jigawa State, Nigeria. *IOSR Journal of Research and Method in Education (IOSRJRME), 4*(5), 41-47. DOI:10.9790/7388-04564147