EFFECT OF PEER ASSESSMENT STRATEGY WITH FEEDBACK AND REMEDIATION ON STUDENTS WITH SPECIAL NEEDS' INTEREST IN GEOMETRY IN BENUE STATE

[1]Sharon M. Abaver, [2]Jerry E. Omenka and [3]Zephaniah N. Iyornum

[1&2] Department of Science and Mathematics Education, Benue State University, Makurdi, Nigeria.
[3]Department of Mathematics Education, Joseph Saawuan Tarka University, Makurdi Nigeria.

sharonjude85@gmail.com, ejerryomenka@gmail.com and iyornumzephaniah@gmail.com

Abstract

This study investigated the effect of peer assessment strategy with feedback and remediation on students with special needs interest in Geometry in Benue State. Two research questions and two null hypotheses guided the study. Quasi-experimental non-randomized pre-test, post-test control group design was adopted. The population consisted of 84 upper basic three students with special needs from the 6 special secondary schools in Benue State. Two schools were selected using simple random hat and draw sampling technique without replacement. From the two schools, a sample size of 48 Upper basic three students from two intact classes was used as experimental and control group each. One instruments was used for data collection, the Students' Interest in Geometry Inventory (SIGI), which yielded a reliability coefficient of 0.77 using Cronbach Alpha. Mean and standard deviations were used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the null hypothesis at 0.05 level of significance. Findings revealed that there is a significant effect of peer assessment strategy with feedback and remediation, (F (1, 47) =21.235; p = 0.000<.05) compared to conventional assessment strategy on mean interest ratings of students with special needs in Geometry, while there is no significant difference in the mean interest ratings between male and female students with special needs when peer assessment strategy with feedback and remediation strategy was used in geometry (F (1, 29) =.823; p = .372 >.05). The study recommended among others that Mathematics teachers should use Peer Assessment Strategy (PAS) to enhance students with special needs' interest in Mathematics concepts such as geometry. Ministry of Education at both federal and state level should encourage the use of Peer Assessment Strategy among Mathematics teachers who teach special needs students by funding workshops, seminars and conferences.

Key Words: Peer assessment strategy, Special needs, Geometry, Feedback, Remediation and Interest.

Introduction

Mathematics is a subject that is made up of concepts, laws, theorems, principles, values and numbers which empowers an individual to develop critical, analytical and creative thinking skills in problem solving. Shimizu and Vithal (2023) posits that Mathematics specifications provide students with access to

important mathematical ideas to develop mathematical knowledge and problem solving skills.

Students with special needs are students with disabilities. They include students who are blind or visually-impaired children, the deaf or hearing-impaired children. The physically disabled students with limb issues, the lame or crippled. Aligba and Nyihemba (2022) opined that special needs education is a customized educational programme, designed to meet the unique needs of persons with special needs that the general education programme cannot cater for. Special education schools are schools where such students could be educated, using the same Mathematics curriculum with the normal schools which include Mathematical concepts such as geometry, and also participate in the same external examinations in which students without special needs do engage in.

The results of students' in both internal and external examinations in Mathematics could be interpreted as students' not having interest in learning Mathematics concepts. Students' interest towards learning Mathematics and their implications for Mathematics instruction have long been a common concern among Mathematics educators (Oluyemo, Musbahu, Kukwil, Anikweze & Shaluko, 2020). Interest towards geometry could be considered an important factor influencing participation and success in the learning of Mathematics. There is need for innovative strategies that can boost the interest of students with special needs to learn geometry. Observations and reports from examining bodies such as West African Examination Council (WAEC) and Basic Education Certification Examination (BECE) revealed that a high percentage of secondary school students continue to perform poorly in Mathematics examinations (Darragh, 2018). From the West African Examination council, Chief Examiner's report for 2022 (WAEC, 2022) result obtained showed that geometry is a commonly difficulty learning theme of secondary school Mathematics curriculum. Students' interest, which reflects in their performance, could be affected by many factors such as the teacher factor which could be seen in his inability to teach effectively, also by learner factors such as; students' phobia for Mathematics. With these current problems facing the assessment of students at all levels all over Nigeria and Benue State in particular, there is need to consider how PAS with feedback and remediation could be used to boost students' interest in geometry, especially, at the secondary school level among students' with special needs.

There are various strategies that can be employed in teaching, learning and assessing of Mathematics outcomes especially in geometry, such as hands-on strategies, activity based strategies, think-pair share strategy, peer assessment strategy and cooperative instructional strategies. Peer Assessment Strategy with feedback and remediation could enhance inclusivity and active participation of all students including students with special needs in learning geometry. The students assess their mates using a well-constructed assessment format given to them by the Mathematics teacher during classwork. In PAS with feedback and remediation, the results are given to the students' and they are also given solutions to areas of difficulty and error by the teacher and the students correct each other as they interact with their peers.

Concepts such as geometry in Mathematics could be learned using peer assessment strategy with feedback and remediation. Many students' find solving problems in geometry difficult. According to (Biber, 2013) in (Juman, Mathavan, Ambegedara & Udagedara, 2022) geometry is a branch of Mathematics concerned with point, straight line, plane figures, space, spatial figures and the relations between them. . Many students' find solving algebraic word problems difficult. The steps in word problems could be taught using strategies that could boost students' interest in learning such as PAS. Interest is a feeling that accompanies a sense of excitement. Interest in learning is the ability of the student to show concern when studying and engagement in learning. Interest is the willingness to learn. Interest in Mathematics concepts such as geometry can be influenced and maintained by activities and students' interaction in the class by use of student-centered teaching, learning and assessment strategies. According to Asmira, Rusli and Sabri (2021) interest and learning has a strong connection, and learning interest changes within specific, learning environment. Azmidar, Darhim and Dahlam (2017) opined that students with Mathematics learning interest will give more attention to the learning process, Mathematics materials, tasks, assignments and will tend to have curiosity towards the Mathematics learning content.

Anigbo (2016) on factors affecting students' interest in Mathematics in secondary schools in Enugu State revealed significant influence on students' interest to learn Mathematics. The issue of students' interest in Mathematics is very important, as revealed also in Aligba and Abaver (2022) on the effect of portfolio-based learning strategy on secondary school students' interest in set theory in Benue State, Nigeria. Their findings showed mean difference of 0.57 in favor of experimental group, suggesting that students in the experimental group have improved their interest towards set theory after PBL strategy was used. The findings also suggested that both male and female students at 0.15 equally improved upon their interest in set theory, and there was no significant difference between the male and female interest ratings.

Even though researches by Anigbo (2016), Aligba and Abaver (2022) investigated on ways of improving students' interest in Mathematics, they reported mixed finding. None of the studies considered assessment strategies like peer assessment strategy even though there are indications that peer assessment strategy could enhance students' interest in Mathematics concepts such as geometry.

Gender deals with the characteristics of women, men, girls and boys that are socially constructed. Mathematics and its concepts has for years been considered as a male subject because it is technical, logical, critical, creative and analytical in nature and deals with reasoning. According to Kimmo (2022) there is a relationship between male and female students' interest in Mathematics, the females' interest was higher than the males due to higher peer influence among the females. This review could be of great relevance to this study since using PAS with feedback and remediation in teaching students with special needs could help the students interact. It could be used as a classroom assessment to help engage students, clarify roles, promote

learning, provide feedback and remediation, and diversify the scope of evaluation. The failure in solving word problems could be caused by lack of emphasis by teachers on understanding the language of Mathematics used in the sentences (Adu, Assuah, & Asiedu-Addo, 2015). The use of PAS with feedback and remediation in geometry could boost students with special needs interest to learn from their peers. PAS is commonly used as a strategy for students to assess their fellow students' work, particularly valuable in team-based learning.

According to Oluyemo, Musbahu, Kukwil, Anikweze and Shaluko (2020) on the influence on gender differences in Mathematics interest and achievement of junior secondary school students in Niger State, the findings revealed that male students excelled in Mathematics more than their female counterparts. According to Ajai, and Imoko (2015) gender differences in Mathematics achievement and ability has remained a source of concern as scientists seek to address the under-representation of women at the highest levels of Mathematics, physical sciences and engineering. Literature reviews have showed that male students outperform the females in Mathematics during the elementary school years with some exceptions. Female students excel in computational fluency, while male performed better on more cognitively demanding tasks such as problem-solving (Ajai & Imoko, 2015). In a world where Mathematics knowledge is preferred to male than it is to female students, it becomes more difficult for the disabled female child to be accorded the right to proper formal education especially relating to learning mathematical concepts such as geometry. The use of PAS with feedback and remediation could increases the interest of female students in geometry. Omenka and Kurumeh (2013) investigated on gender and location as correlates of achievement in number and numeration using ethno Mathematics approach in the junior secondary schools in Benue State, Nigeria. The findings of the study showed that there exists significant effect of gender on students' achievement in Number and Numeration when taught Ethno Mathematics approach. Furthermore, Allahnana, Akande, Vintseh, Usman, and Monica (2018) researched on assessment of gender and interest in Mathematics achievement in Keffi Local Government Area of Nasarawa State, Nigeria. The study findings revealed that male students have interest in Mathematics more than their female counterparts. This is in contradiction to Ibrahim (2022) research on the effects of peer assessment strategy on students' academic achievement in Mathematics in senior secondary schools in Nasarawa Local Government Area of Kano State Nigeria. His findings revealed that PAS has significant effect on the academic achievement of students in Mathematics but has no significance difference in the mean achievement scores of male and female students exposed to PAS in Mathematics. Against the backdrop of the controversial nature of these findings and paucity of research on students with special needs education in geometry in Benue State, this study ascertained the effect of peer assessment strategy with feedback and remediation on the performance and interest of students with special needs in geometry in Benue State.

Statement of the Problem

Students with special needs could have lack of interest in learning Mathematics concepts. Students with special needs have physical disabilities which could affect their interest in learning geometry in the classroom. It is obvious that literature accessed by the researcher on peer assessment strategy, on the interest of students with special needs in Mathematics concepts are scarce, especially in Benue State, Nigeria. There are few studies on the use of peer assessment strategy of students without special needs in Benue State. Due to paucity of research on students with special needs education in Mathematics, this present study investigated the effect of peer assessment strategy with feedback and remediation, on students with special needs interest in geometry in Benue State.

Purpose of Study

The purpose of the study was to investigate the effect of peer assessment strategy with feedback and remediation on the performance and interest of students with special needs in geometry in Benue State. Specifically, the study;

1. ascertained the effect of peer assessment strategy with feedback and remediation on students with special needs interest in geometry in Benue State.
2. investigated the effect of peer assessment strategy with feedback and remediation between male and female students with special needs interest in geometry in Benue State.

Research Questions

The following research questions guided the study

1. What is the difference between the mean interest ratings of students with special needs taught using peer assessment strategy with feedback and remediation and those taught using conventional assessment strategy in geometry?
2. What is the difference between the mean interest ratings in geometry between male and female students with special needs when peer assessment strategy with feedback and remediation is used?

Hypotheses

The following hypotheses were tested at 0.05 level of significance in the study

H_{O1}: There is no significant difference between the mean interest ratings of students with special needs taught using peer assessment strategy with feedback and remediation and those taught using conventional assessment strategy in geometry.

H_{O2}: There is no significant difference between the mean interest ratings in geometry between male and female students with special needs when taught using peer assessment strategy with feedback and remediation.

Methodology

The research adopted a quasi-experimental design specifically the non-randomized pre-test, post-test control group type. This design was used because it is not possible to have complete randomization of the subject as this may disrupt school organization. Thus intact classes were used. Emaikwu (2015) stated that intact classes should be used only where it is

impossible to allocate subjects to experimental and control groups randomly. The reason for using this design is therefore justified.

The total number of students in upper basic three in the six special needs schools in Benue State was 272. The population of the study was 84 students with special needs from the 6 special needs secondary schools in Benue State. Two special schools were selected using simple random hat and draw sampling technique without replacement. From the two special schools selected, one of the schools was assigned the experimental group and the other was assigned the control group using simple random hat and draw sampling technique. A sample size of 48 students from two intact classes was used from the population of 84 upper basic three students with special needs. From the West African Examination council, Chief Examiner's report for 2022 (WAEC, 2022) result obtained showed that geometry is a commonly difficulty learning theme of secondary school Mathematics curriculum. The experimental group was taught geometric concepts of plane shapes and angles, and assessed using peer assessment strategy with feedback and remediation, the students were taught and given feedback in form of notes being returned and remediation was given in areas of their weaknesses. While the control group was taught geometric concepts of plane shapes and angles and assessed using the conventional assessment strategy, which is a teacher – centered assessment approach, here they were assessed without being allowed to interact with each other and access feedback and remediation.

One instrument was used for the study. The Students' Interest in Geometry Inventory (SIGI), a four point-likert like scale questionnaire with 20 items was developed by the researchers. The instrument was validated by three experts, two from the department of science and Mathematics Education, Benue State University Makurdi, and one educator from one of the special needs schools. The reliability coefficient value of SIGI was 0.77 Cronbach Alpha.

The study lasted for a period of four weeks, and at the beginning of the study, SIMI was administered as pre-test while at the end of the fourth week, SIGI was administered again as post-test. Means and standard deviations were used to answer the research questions while the hypotheses were tested at 0.05 level of significance using Analysis of covariance (ANCOVA). The choice of ANCOVA was informed by the fact that the study employed quasi-experimental design, which involves using students in intact classes (Emaikwu, 2015).

Results

Research Question One

What is the difference between the mean interest ratings of students with special needs taught using peer assessment strategy with feedback and remediation and those taught using conventional assessment strategy in geometry?

Table 1: Mean and Standard Deviation of Interest Ratings of Students with Special Needs in Geometry in Upper Basic III

Assessment Technique		Pre-SIGI	Post-SIGI	Mean Gain
Peer Assessment Strategy with Feedback and Remediation	N	30	30	
	Mean	2.93	3.22	0.29
	Std. Deviation	0.35	0.30	
Conventional Assessment Strategy	N	18	18	
	Mean	2.64	2.70	0.06
	Std. Deviation	0.37	0.33	
Mean Difference		0.29	0.52	0.23

Data in Table 2 indicated that students taught using PAS with feedback and remediation and CAS had mean interest ratings of 2.93 and 2.64 with standard deviation of 0.35 and 0.37 in the pre-SIMI respectively and mean interest ratings of 3.22 and 2.70 with standard deviation of 0.30 and 0.33 in the post-SIGI respectively. The mean difference of 0.52 is in favor of PAS with feedback and remediation and this indicates that students taught using PAS with feedback and remediation gained higher interest in learning geometry compared to those taught using CAS.

Research Question Two

What is the difference between the mean interest ratings in geometry between male and female students with special needs when peer assessment strategy with feedback and remediation is used?

Table 2: Mean and Standard Deviation of the Interest Ratings of Male and Female Students with Special Needs in Geometry in Upper Basic III

Student's Gender		Pre-SIGI	Post-SIGI	Mean Gain
Female	N	16	16	
	Mean	2.96	3.27	0.31
	Std. Deviation	0.35	0.30	
Male	N	14	14	
	Mean	2.90	3.17	0.27
	Std. Deviation	0.36	0.29	
Mean Difference		0.06	0.10	0.04

Data in Table 4 reveals that the female students taught using PAS with feedback and remediation, had mean interest ratings of 2.96 with standard deviation of .35, while male students had mean interest ratings of 2.90 with standard deviation of .36 in the pre-SIGI respectively. Also the post-SIGI mean scores for female students was 3.27 with standard deviation of .30, while the mean interest ratings for the male students was 3.17 and the

standard deviation of .29. The mean difference of 0.10 favors female students compared to their male counterpart, when PAS with feedback and remediation is used.

Hypothesis One

There is no significant difference between the mean interest ratings of students with special needs taught using peer assessment strategy with feedback and remediation and those taught using conventional assessment strategy in geometry.

Table 3: ANCOVA of the Effect of Peer Assessment Strategy on Mean Interest Ratings in Geometry of Students with Special Needs in in Upper Basic III

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	4.989[a]	2	2.495	44.849	.000
Intercept	1.313	1	1.313	23.611	.000
Pre-interest	1.965	1	1.965	35.327	.000
Assessment	**1.181**	**1**	**1.181**	**21.235**	**.000**
Error	2.503	45	.056		
Total	447.857	48			
Corrected Total	7.492	47			

a. R Squared = .666 (Adjusted R Squared = .651)

Results data summary in table 6 reveals that F (1, 47) =21.235; p = 0.000<.05. This signifies that the probability level is less than the specified alpha-level of .05. Consequently, the null hypothesis is rejected. This means that there is a significant effect of peer assessment strategy with feedback and remediation, compared to conventional assessment strategy on mean interest ratings of students with special needs in geometry.

Hypothesis Two

There is no significant difference between the mean interest ratings in geometry between male and female students with special needs when peer assessment strategy with feedback and remediation is used.

Table 4: ANCOVA of Interest Ratings in Geometry of Male and Female Students with Special Needs in Upper Basic III

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1.669[a]	2	.835	25.105	.000
Intercept	.601	1	.601	18.078	.000
Pre-interest	1.592	1	1.592	47.883	.000
Gender	**.027**	**1**	**.027**	**.823**	**.372**
Error	.898	27	.033		
Total	314.263	30			
Corrected Total	2.567	29			

a. R Squared = .650 (Adjusted R Squared = -.624)

Results data summary in table 8 indicated that F (1, 29) =.823; p = .372 >.05. This indicates that the probability level is greater than the specified alpha-level of .05. Consequently, the null hypothesis is not rejected. This implies there is no significant difference in the mean interest ratings between male and female students with special needs when peer assessment strategy with feedback and remediation strategy is used in geometry.

Discussions

The study investigated the effect of peer assessment strategy with feedback and remediation on students with special needs' interest in geometry in Benue State. Findings from the present study reveals that there is a significant effect of peer assessment strategy with feedback and remediation, compared to conventional assessment strategy on mean interest ratings in Mathematics of students with special needs. This finding agrees with Anigbo (2016) findings which revealed that instructional strategy had significant influence on students' interest in learning Mathematics. The issue of students with special needs interest' in Mathematics concepts such as geometry is very important, as revealed also in Aligba and Abaver (2022) that students in the experimental group had improved their interest towards set theory after PBL strategy was used. The findings agree with the present findings, which indicates that students taught using PAS with feedback and remediation gained higher interest in learning geometry compared to those taught using CAS.

It was also found that there is no significant difference in the mean interest ratings in geometry between male and female students with special needs when peer assessment strategy with feedback and remediation strategy was used in geometry. The following studies contradict the findings of the present study. This finding disagrees with Oluyemo, Musbahu, Kukwil, Anikweze and Shaluko (2020) findings, which revealed that male students' exceled in Mathematics more than their female counterparts, which differs from the present findings which indicated that female students had higher interest compared to their male counterpart, when PAS with feedback and remediation is used.

Also, Kimmo (2020) researched findings revealed that female students have interest in Mathematics more than their male counterparts, this also differs from the present study's findings that female students. Findings from the present study which indicates that there is no significant difference in the mean interest ratings between male and female students with special needs when peer assessment strategy with feedback and remediation strategy is used in geometry is in line with the findings of Ibrahim (2022) which revealed that there exists no significant difference in the mean achievement scores of male and female students exposed to peer assessment strategy in Mathematics**.**

These findings indicate that PAS is effective in motivating students with special needs interest in geometry. Similarly, as observed in the result of the study, there is no significant difference in the interest ratings between male and female students with special needs when peer assessment strategy with feedback and remediation strategy is used in geometry.

Conclusion of Findings

The findings have shown that Peer Assessment Strategy (PAS) with feedback and remediation provides a way out in boosting students with special needs' interest when taught geometry The findings also indicate that PAS is an effective in reducing the gender gap in learning Mathematics concepts especially geometry. Hence its adoption will be appropriate for the teaching, learning and assessing of Mathematics concepts and also in the enhancing of students with special needs' interest in learning geometry for better performance.

Recommendations

Based on the findings of the present study, the following recommendations were made

I. Mathematics teachers should use Peer Assessment Strategy (PAS) to enhance students with special needs' interest in geometry.
II. Ministry of Education at both federal and state level should encourage the use of Peer Assessment Strategy among Mathematics teachers who teach special needs students by funding workshops, seminars and conferences.
III. Mathematics teachers should use Peer Assessment Strategy (PAS) to enhance parity in interest of special needs students in geometry in terms of gender.

References

Adu, E., Assuah, C. K., & Asiedu-Addo, S.K (2015). Student's errors in solving linear equation word problems: Case study of a Ghanaian senior high school. *African Journal of Educational Studies in Mathematics and Science,* 11. 17-30.

Ajai, & Imoko, B. I. (2015). Gender difference in Mathematics and retention scores: A case of problem-based learning method. *International Journal of Research in Education and Science (IJRES),* 1(1), 45-50.

Aligba, S.O. & Abaver, S. M. (2022). Effect of portfolio-based learning strategy on secondary school students' interest in set theory in Benue State, Nigeria. *Lafia Journal of Education, 3(1),* 259-268.

Aligba, S.O. & Nyihemba (2022). Achieving inclusiveness in mathematics curriculum implementation in Nigeria. *ICSHER Journal, 5(2), June, 2022.*

Anigbo, L.C. (2016). Factors affecting students interest in Mathematics in secondary schools in Enugu State. *International Journal of Education, 2(*1), 22-28.

Asmira, A., Rusli & Sabri. (2021). Improving students' interest and achievement in Mathematics learning through problem-based learning model. *Advances in Social Science, Education and Humanities Research,* 611, 303-307.

Azmidar, A., Darhim, D & Dahlam, J. A. (2017). Enhancing students' interest through Mathematics learning. *Journal of Physics Conference Series* 895, 1-6.

Darragh, L. (2018). Loving and loathing: portrayals of school Mathematics in young adult fiction. *Journal of Research in Mathematics Education,* 49(2), 178-209.

Emaikwu, S. O., 2015. *Fundamentals of research methods and statistics.* Makurdi: Selfters Academic Press Limited.

Ibrahim, B. M. (2022). Effects of peer assessment strategy on students' academic achievement in Mathematics in senior secondary schools of Nasarawa Local Government Area, Kano State, Nigeria. *International Journal of Research in Education and Sustainable Development.* 2(10). 15-25.

Juman, Z. A. M., Mathavan, M., Ambegedara A. S. & Udagedara, I. G. K. (2022). Difficulties in Learning geometry component in Mathematics and active-based learning methods to overcome the difficulties. *International Journal of Education*, 10(2), 41-58.

Kimmo, E. (2020). Gender differences in the interest in Mathematics schoolwork across 50 countries. *Frontier in Psychology*, 11, 1-8

Omenka, J. E. & Kurumeh, M. (2013). Gender and location as correlates of achievement in number and numeration using ethno Mathematics approach in the junior secondary schools in Benue State. *Greener Journal of Educational Research, 3*(4), 184-190.

Oluyemo, A. A., Musbahu, Kukwil, I. J., Anikweze, C.M & Shaluko, Y. D. (2020). Gender differences in Mathematics interest and achievement of junior secondary school students in Niger State, Nigeria. *International Journal of Research and Innovation in Social Studies (IJRISS)*, 4 (10), 359-366.

Shimizu, Y., & Vithal, R. (2023). *School Mathematics curriculum reform*: Widespread practice but under research in Mathematics education. New ICMI Study Series (NISS). Springer.

WAEC (2022). Chief examiners report. Retrieved May 20, 2023. From http://www.weac.org.