Ethnomathematics and Students' Interest, Attitude and Academic Performance in Mathematics in Mkpat Enin Local Government Area, Akwa Ibom State, Nigeria

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ABSTRACT

This study investigated on ethnomathematics and students' interest, attitude and academic performance in mathematics in Mkpat Enin Local Government Area, Akwa Ibom State. Three research questions and three hypotheses guided the study. Quasi-experimental research design, specifically, pre-test posttest non-equivalent group was adopted for the study. The population of the study consisted of all government coeducational Senior Secondary School class two (SS2) students of 2024 academic session. A sample of 198 SS 2 students drawn from intact classes in four randomly selected secondary schools was used for the study. Mathematics Interest Scale (MIS), Mathematics Attitude Questionnaire (MAQ) and Mathematics Performance Test were used as instruments for data collection. The instruments were subjected to face and content validity. The reliability of the instruments was established using Cronbach Alpha and Kuder Richardson KR-20 with a reliability coefficient of 0.74, 0.81 and 0.76 respectively. Independent t-test was used to test the hypotheses. Results revealed that there was a significant difference in the mean interest, attitude scores and academic performance of students in mathematics exposed to ethnomathematics incorporated instruction and expository teaching method in favor of those that were exposed to ethnomathematics incorporated instruction. The researchers recommended that Mathematics teachers should recognize and realize the special role of ethnomathematics in mathematical instruction to students.

Keywords: Ethnomathematics, Interest, Attitude, Academic Performance, Mathematics

INTRODUCTION

Mathematics remains the foundation of scientific and technological knowledge that is vital in the socio-economic development of any nation (Anaduaka, Olaoye & Sunday, 2018). Because of this, Mathematics is made a compulsory subject at both primary and secondary levels in Nigeria (Federal Ministry of Education, FME 2014). It is one of the core subjects that is taken very serious in the school system irrespective of country or level of education. It has been described as a model of thinking (Iji 2008), which encourages learner to observe, reflect and reason logically about a problem and in communicating ideas, making it the central intellectual discipline. The literal meaning of mathematics is "things which can be counted" therefore one can think that counting has vital role in our daily life. Imagine that there were no mathematics at all, how would it be possible for one to count members of the family number of students in the class, days in a week or in a month or years? On a basic level, one need to be able to count, add, subtract, multiply, and divide. At a psychological level, exposure to mathematics helps in developing an analytic mind and assists in better organization of ideas and accurate expression of thought (Abasi, 2018a; 2018b). Ado and Abasi (2021) posited that Mathematics encourages the habit of self-reliance among learners, assisting them to think and solve problems themselves. In mathematics, learners are challenged to make discoveries, leading them to analyze and interpret their experiences and make generalizations which they can subsequently apply in new situations. Mathematics equally exposes learners to different ways of solving the same problem (Ado & Abasi, 2021). It therefore means that Mathematics can be applied in every facets of life even in the small-scale business

enterprises which is the life wire of every economic sector.

Mathematics has, all through the years been an important subject both in the role it plays in everyday activities and in its usefulness to other sciences (Daso, 2019). According to Malik and Salman (2018), Mathematics is a concenter subject which serves as a foundation for students' level of thinking, skill development and problem solving. Any nation that must develop their manpower scientifically and technological-wise must have a strong mathematical foundation at the basic school level. They further opined that Mathematics is a unifying subject that prepares pupils for a useful and meaningful living, and that Mathematics is the language and key to everyday activities of mankind in science and technology.

Mathematics is a very useful subject for most vocations and higher specialized courses of learning (Abasi & Ado, 2021). At the secondary and university levels, most of the physical and social sciences require the applications of Mathematics. No other subject can be a substitute for mathematics (Abasi & Ado, 2021). It is in recognition of the importance of Mathematics that prompted the Federal Government of Nigeria to make Mathematics a compulsory subject from the primary school through to the end of the senior secondary school education. It is in light of this that, all over the globe, much effort and time are put in action by mathematics educators and practitioners for the teaching and learning of mathematics to be enhanced (Ado & Abasi, 2014).

Despite the highly decorated and recognized importance of Mathematics and the fact that it is the prerequisite for most of the subjects, students still suffer psychological distress in areas of interest and attitude towards mathematics as reported in schools, colleges, and universities in developed and developing countries alike (Edoho & Abasi, 2019; Abasi & George, 2025; Babayemi, Akpan, & Abasi, 2022). Mathematics continues to be one of the most challenging subjects in schools as perceived by students (Akhter & Akhter, 2018). There is a general impression that its very nature complicates as such student develop phobia in Mathematics that lead to negative attitude and lack of interest towards the subject. Students' dwindling achievement in Mathematics in public examinations is so worrisome and this has led many researchers into investigating factors that could be responsible for this.

Abasi and George (2025) reported that students' interest and their overall attitude towards mathematics is not impressive and this has recorded inconsistencies in students' performance in the subject. Students are weak in understanding mathematical concepts, performing logical argument in operations and solving multi-step problems. The overall effects of this weakness are as a results of students' negative attitude and lack of interest towards mathematics (Edoho & Abasi, 2019). This ugly trend of students' poor performance in Mathematics has become a national disaster.

According to Abasi (2018b), this deplorable state of mathematics education is attributed to a number of factors ranging from teacher's incompetency on the subject matter, learners' attitude, perception and interest, instructional strategies and materials as well as availability and utilization of mathematics laboratory kits. For a successful mathematics instruction to take place, it is pertinent that every mathematics teacher should engage the students actively with concrete materials to aid the teaching and learning process (Abasi, 2018a). This is because in our schools, Mathematics is one of the most poorly taught, widely hated and abysmally understood subjects. Students develop a high degree of phobia which has degenerated to negative attitude and low interest towards mathematics and even other mathematics related activities and subjects (Abasi & George, 2025). Students with an interest in a subject like Mathematics are likely to be more motivated to manage their own learning and develop the requisite skills to become effective learners of that subject (Anaeche & Ezeamaenyi, 2019). Hence, interest in Mathematics is relevant when considering the development of effective learning strategies for Mathematics.

Interest, defined as the level of engagement, curiosity, and enjoyment students experience when interacting with mathematical concepts, has been recognized as a critical component of academic achievement and motivation in various educational contexts (Ryan, Fitzmaurice & O'Donoghue, 2022). Research suggests that students who are genuinely interested in Mathematics are more likely to exude positive attitude towards the subject, invest time and effort in learning, exhibit higher levels of persistence when faced with challenging problems, and demonstrate better academic performance compared to their less interested peers (Adigun, 2018). Conversely, students who lack interest in Mathematics may experience difficulties in understanding

concepts, lack motivation to engage with the subject matter, exhibit sloppy attitudes and ultimately underperform academically (Yeh, Cheng, Chen, Liao & Chan, 2019). Understanding the relationship between interest, attitude and academic performance in Mathematics is crucial for educators, policymakers, and stakeholders involved in shaping educational practices and curriculum development. By identifying factors that influence students' interest in Mathematics and exploring how it correlates with their academic achievement, educators can design more effective teaching strategies, interventions, and support mechanisms to enhance students' learning experiences, thereby igniting positive attitude to learning and improving performance in Mathematics (Abid & Noori, 2023).

On the other hand, students' attitude towards Mathematics refers to their feelings, beliefs, and behaviors towards the subject of Mathematics. This can include factors such as their motivation to learn Mathematics, their confidence in their ability to succeed in Mathematics, and their overall enjoyment of the subject (Sunghwan & Taekwon, 2021). Attitude is a relatively stable psychological tendency toward a particular idea, object, or entity with a certain degree of positivity or negativity (Clore & Schnall, 2015). Therefore, students' attitude toward Mathematics can be defined as their comprehensive evaluation of Mathematics. The attitude of students toward Mathematics has been the subject of a great deal of attention from educators (Chen *et al.*, 2018). Many researchers submit that students with a positive attitude toward Mathematics tend to enjoy the subject, understand its value, and have confidence in it; thus, they are likely to prioritize the study of Mathematics (Kiwanuka, Van Damme, Van den Noortgate, & Reynolds, 2020), which could lead to high performance in the same, and vice versa.

With the realization of the indispensability of Mathematics to the survival of human race, Mathematics educators have been concerned with ways in which students learn Mathematics (Abasi & Umoinyang, 2020); Ado, Abasi and Nwankwo (2017) and other prominent stakeholders, like Mathematical Association of Nigeria (MAN) and Science Teachers Association of Nigeria (STAN) have in recent times been beaming their search light on innovative pedagogies that could meet with the psychological needs of the students and also enhance the effectiveness of teaching and learning mathematics. As asserted by Abasi (2024), an instructional situation whereby the student is featured as the active participant while the teacher assumes the roles of a facilitator, mediator and assessor of learning have been found to be superior in developing students' abilities in applying concepts to personal growth, developing positive attitudes, fostering interest and motivation, and encouraging appropriate cognitive skills. Accordingly, Abasi, Okri and Arikpo (2022) asserted that the teaching and learning of mathematics requires an intensive application of manipulative resources that would appeal to all the senses of perception to improve the effectiveness of instruction as well as learning. Ethnomathematics clearly fit into these recommendations.

Ethnomathematics is an approach to curriculum adaptation in Mathematics, which builds on the student's previous knowledge, background of the learner, the role of his environment in terms of content and methods and his past and present experiences of his immediate environment (D'Ambrosio, 2015). Abonyi (2015) sees ethnomathematics as the science of numbers and its manipulations that are embedded in the people's culture. He further said that these manifest in cultural artifact's such as mats, clay pots, clay bed, houses (round and rectangular), decorations, baskets, local drums and fish traps. Hence, for this study, ethnomathematics has been defined as the culturally influenced mathematical approach, which makes the learning of Mathematics very meaningful. It is the Mathematics used by a defined, peculiar or specified cultural group in the course of dealing with environmental problems and activities (Kurumeh, 2016). For mathematical instruction to attract the attention of the learners, there is need for Mathematics teaching that has the learner's cultural background, that which will bridge the gap between the indigenous Mathematics and Eurocentric Mathematics (present classroom Mathematics) (Enukoha, 2018).

Since ethnomathematics is considered as a systematic, captivating and consistent tool or way of giving mathematics instruction in schools, it is therefore pertinent to consider those ethnomathematics concepts that will foster the teaching and learning of mathematics. When talking about ethnomathematics, one should consider those indigenious activities that are perculiar within the learners' culture and could be introduced in the classroom for the teaching and learning of mathematics as the basis to successful incorporation of ethnomathematics concepts in the mathematics classroom. Such ethnomathematical concepts are: the cock-

crows and shadow as a concept of time keeping, fingers-legs counting ryhmes as a concept of counting numbers, tallies and notches as a concept of keeping values and records, market days counting as a concept of number base system. This concepts could be used to facilitate the teaching and learning of mathematics. It is on this note that this study is carried out to determine whether incorporating ethnomathematics in teaching and learning will improve the interest, attitude and academic performance of students in Mathematics among senior secondary school students in Mkpat Enin Local Government Area of Akwa Ibom State.

Statement of the Problem

Students, parents, educators, government and the society at large are worried over the inconsistencies in the performance of students in mathematics. Available literatures showed that this condition is deplorably high as students struggled to acquire admission into tertiary institution due to poor mathematics results in SSCE. Available literatures also showed that this problem is as a result of non-utilization of appropriate teaching approaches in the subject. Due to inappropriate pedagogies in the teaching and learning of mathematics, students develop low interest and negative attitude towards the subject thereby having difficulty in understanding, comprehending, assimilating and remembering the concepts of mathematics taught to them in the classroom. They neither understood the basic computation, logic, fundamental principles nor the mathematic facts. This is because the examples that are presented to them by the mathematics teacher are abstract, alien Eurocentric and impracticable to them. They tend to believe on the primitive slogan that says that says; “mathematics make people to go mad”. The effect of this mathematophobia syndrome is what result in students’ loss of interest and generative negative attitude towards the subject which has resulted to persistent inconsistencies in performance of students in mathematics in Nigeria at large.

This trend is worrisome to the researcher, because one wonders why all the method used so far are not capable of reversing this ugly trend. It is however noted that the use of ethnomathematics as an instructional approach has not been widely tried out in Nigeria. There is therefore a need to bring in a method, which does not require foreign or alien instructional approach to arouse and sustain the learner’s interest and help them achieve a better result. Therefore, this present research wonders whether the use of ethnomathematics, which is student and activity-centered, will improve student’s interest, attitude and academic performance in Mathematics in Mkpat Enin Local Government Area of Akwa Ibom State.

Purpose of the Study

The main purpose of this study is to investigate the effect of ethnomathematics incorporated instruction on students’ interest, attitude and academic performance in Mathematics in Mkpat Enin Local Government Area of Akwa Ibom State, Nigeria. In specific terms, the study sought to:

1. Ascertain the difference in the mean interest scores of students’ in Mathematics exposed to ethnomathematics incorporated instruction and expository teaching.
2. Examine the difference in the mean attitude scores of students’ in Mathematics exposed to ethnomathematics incorporated instruction and expository teaching.
3. Determine the difference in mean performance scores of students’ in Mathematics exposed to ethnomathematics incorporated instruction and expository teaching.

Research Questions

The following research questions were formulated to guide the study.

1. What is the difference in the mean interest scores of students’ in Mathematics exposed to ethnomathematics incorporated instruction and expository teaching?
2. What is the difference in the mean attitude scores of students’ in Mathematics exposed to ethnomathematics incorporated instruction and expository teaching?
3. What difference exists in the mean performance scores of students’ in Mathematics exposed to ethnomathematics incorporated instruction and expository teaching?

Hypotheses

The following hypotheses were formulated for the study.

1. There is no significant difference in the mean interest scores of students' in Mathematics exposed to ethnomathematics incorporated instruction and expository teaching.
2. There is no significant difference in the mean attitude scores of students' in Mathematics exposed to ethnomathematics incorporated instruction and expository teaching.
3. There is no significant difference in the mean performance scores of students' in Mathematics exposed to ethnomathematics incorporated instruction and expository teaching.

METHODS

Quasi-experimental research design, specifically, pre-test posttest non-equivalent group was adopted for the study. The population of the study comprised all Senior Secondary two (SS2) students in the 16 public secondary schools in Mkpat Enin Local Government Area with a total enrolment of 2,125 SS2 students in 2023/2024 session (Local Education Committee, 2024). The sample size consisted 198 SS 2 students from four intact classes in four schools. This sample was arrived at by selecting 4 government owned secondary schools in the area of study using simple random sampling. Simple random sampling involving hat and draw method was used to select the sample. With simple random sampling technique each school was assigned to experimental group (ethnomathematics incorporated instruction) and control group (expository method) respectively. The instruments used for data collection were "Mathematics Interest Scale (MIS)", "Mathematics Attitude Questionnaire (MAQ)" and "Mathematics Performance Test (MPT)". The MIS and MAQ are well-structured questionnaires with 10 items each, arranged in a 4-point likert scale of Strongly Agreed (SA), Agreed (A), Disagreed (D) and Strongly Disagreed (SD). The MPT instrument consists of 20 multiple choice questions with four options lettered A-D on the concept of mensuration drawn from the SS 2 Mathematics scheme of work. The MIS, MAQ and MPT were administered to students in both experimental and control groups to assess their interest, attitude and academic performance before and after treatment. The instruments were content and face validated by two experts in measurement and evaluation. Upon validation of the instrument a trial test was conducted with an intact class of 20 SS 2 students outside the area of the study to establish the reliability of the instrument. A reliability coefficient of 0.74, 0.81 and 0.76 were obtained for the MIS, MAQ and MPT instruments respectively using Cronbach Alpha and Kuder Richardson KR-20 reliability estimate which showed a high reliability for the instruments.

The researcher had series of sessions with the teachers to educate them on the essence of the study and how to achieve an unbiased and better result. The MIS, MAQ and MPT were administered to the students as pretest before the instructional process commenced and collected on the spot by the class teachers and handed over to the researcher. In each of the sampled schools, the students were taught the concept of mensuration by the researcher using ethnomathematics and expository method as instructional approaches for the experimental and control groups respectively (see appendix for sampled lesson plan). After the instructional process, the instruments were administered to the students again as posttest and collected back immediately by the teacher and were instantly handed over to the researcher. Data collected were used in answering the research questions using mean and standard deviation while hypotheses were tested at 0.05 level of significance using independent t-test statistics.

RESULTS

The results of findings are presented by answering the research questions using descriptive statistics of mean and standard deviation and testing the null hypotheses at 0.05 level of significance using independent t—test statistics.

Research question one: What is the difference in the mean interest scores of students' in Mathematics exposed to ethnomathematics incorporated instruction and expository teaching?

Table 1:Mean and standard deviation of mathematics students' interest scores

Instructional approach	N	Interest scores		Mean difference
		Mean	SD	
Ethnomathematics incorporated instruction	97	38.64	2.54	
				11.74
Expository	101	26.90	2.21	

Table 1 revealed that the mean difference between the mean interest scores of students in mathematics exposed to ethnomathematics incorporated instruction and expository teaching method is 11.74 with the interest mean scores of 38.64 for those exposed to ethnomathematics incorporated instruction and 26.90 for those taught using expository teaching method. Hence, there is a mean difference between the mean interest scores of students' in mathematics when exposed to ethnomathematics incorporated instruction and expository teaching method in favor of those that were exposed to ethnomathematics incorporated instruction having the highest interest mean scores.

Research question two: What is the difference in the mean attitude scores of students in Mathematics exposed to ethnomathematics incorporated instruction and expository teaching?

Table 2:Mean and standard deviation of mathematics students' attitude scores

Instructional approach	N	Attitude scores		Mean difference
		Mean	SD	
Ethnomathematics incorporated instruction	97	37.10	3.94	
				11.45
Expository	101	25.65	3.23	

Table 2 revealed that the mean difference between the mean attitude scores of students in mathematics exposed to ethnomathematics incorporated instruction and expository teaching method is 11.45 with the attitude mean scores of 37.10 for those exposed to ethnomathematics incorporated instruction and 25.65 for those taught using expository teaching method. Hence, there is a mean difference between the mean attitude scores of students' in mathematics when exposed to ethnomathematics incorporated instruction and expository teaching method in favor of those that were exposed to ethnomathematics incorporated instruction having the highest attitude mean scores.

Research question three: What difference exists in the mean performance scores of students' in Mathematics exposed to ethnomathematics incorporated instruction and expository teaching?

Table 3:Mean and standard deviation of mathematics students' performance scores

Instructional approach	N	Performance scores		Mean difference
		Mean	SD	
Ethnomathematics incorporated instruction	97	17.41	1.44	
				5.43
Expository	101	11.98	1.39	

Table 3 revealed that the mean difference between the mean performance scores of students in mathematics exposed to ethnomathematics incorporated instruction and expository teaching method is 5.43 with the

performance mean scores of 17.41 for those exposed to ethnomathematics incorporated instruction and 11.98 for those taught using expository teaching method. Hence, there is a mean difference between the mean scores of students' performance in mathematics when exposed to the exposed to ethnomathematics incorporated instruction and expository teaching method in favor of those that were exposed to expository teaching method having the highest performance mean scores.

Hypothesis one: There is no significant difference in the mean interest scores of students in Mathematics exposed to ethnomathematics incorporated instruction and expository teaching.

Table 4: Independent t-test result on students' interest in Mathematics based on treatments (N = 198)

Instructional approach	N	Mean	SD	df	t-cal.	P
Ethnomathematics incorporated instruction	97	38.64	2.54			
				196	22.25*	.000
Expository	101	26.90	2.21			

*Significant at P>0.05 level of significance

As shown in Table 4, the analysis of the interest scores of the two groups of students in mathematics exposed to ethnomathematics incorporated instruction and expository teaching method is significant (t-cal = 22.25; df = 196) at 0.05 level of significance, indicating a statistical significance difference between the mean interest scores of the two groups. Therefore, the null hypothesis is rejected. This implies that there is a significant difference in the mean interest scores of students in mathematics exposed to ethnomathematics incorporated instruction and expository teaching method. Thus, the use of ethnomathematics incorporated instruction has been found to be more effective in boosting students' interest towards mathematics more than the use of expository teaching method.

Hypothesis two: There is no significant difference in the mean attitude scores of students' in Mathematics exposed to ethnomathematics incorporated instruction and expository teaching.

Table 5:Independent t-test result on students' attitude in Mathematics based on treatments (N = 198)

Instructional approach	N	Mean	SD	df	t-cal.	P
Ethnomathematics incorporated instruction	97	37.10	3.94			
				196	16.19*	.000
Expository	101	25.65	3.23			

*Significant @ 0.05 level of significance

As shown in Table 5, the analysis of the attitude scores of the two groups of students in mathematics exposed to ethnomathematics incorporated instruction and expository teaching method is significant (t-cal = 16.19; df = 196) at 0.05 level of significance, indicating a statistical significance difference between the mean interest scores of the two groups. Therefore, the null hypothesis is rejected. This implies that there is a significant difference in the mean attitude scores of students in mathematics exposed to ethnomathematics incorporated instruction and expository teaching method. Thus, the use of ethnomathematics incorporated instruction has been found to be more effective in driving students' attitude positively towards mathematics more than the use of expository teaching method.

Hypothesis three: There is no significant difference in the mean performance scores of students in Mathematics exposed to ethnomathematics incorporated instruction and expository teaching.

Table 6:Independent t-test result on students' academic performance in Mathematics based on treatments (N = 198)

Teaching methods	N	Mean	SD	df	t-cal.	P
Ethnomathematics incorporated instruction	97	17.41	1.44			
				95	18.89*	.000
Expository	101	11.98	1.39			

*Significant at @ 0.05 level of significance

As shown in Table 6, the analysis of the performance scores of the two groups of students in mathematics exposed to ethnomathematics incorporated instruction and expository teaching method is significant (t-cal = 18.89; df = 196) at 0.05 level of significance, indicating a statistical significance difference between the mean performance scores of the two groups. Therefore, the null hypothesis is rejected. This implies that there is a significant difference in the mean performance scores of students in mathematics exposed to ethnomathematics incorporated instruction and expository teaching method. Thus, the use of ethnomathematics incorporated instruction has been found to be more effective in enhancing students' performance in mathematics more than the use of expository teaching method.

DISCUSSION OF FINDINGS

Findings from the testing of hypothesis one as shown in table 3 revealed that there is a significant difference in the mean interest scores of students in mathematics exposed to ethnomathematics incorporated instruction and expository teaching method. The results of findings revealed that ethnomathematics incorporated instruction was found to be more effective in boosting students' interest towards mathematics than expository teaching method. The better facilitating effect of ethnomathematics incorporated instruction as experience in this study could be attributed to the facts that students in ethnomathematics classroom explore examples of mathematical concepts and ideas that are rooted in the common plays, games and activities that take place in their various homes in solving mathematical problems in schools. The practical knowledge and relationship in which they have between the mathematical practices in schools and that which they practice at home through games, rhymes, puzzles, exercise and so on aided them in solving mathematical problems at ease more than other students who only depend on the conventional formulae and system taught in school. This of course boosted their morale towards the learning of mathematics and drive their interest high in learning mathematics. This finding is supported by previous studies conducted by Bearcane (2005), Oraneto (2021) and Abasi (2025) whose results revealed among others that ethnomathematics approach was more effective in facilitating students' interest and achievement in mathematics.

The findings shown in testing of hypothesis two in table 4 revealed that there is a significant difference in the mean attitude scores of students in mathematics exposed to ethnomathematics incorporated instruction and expository teaching method. The results of findings revealed that ethnomathematics incorporated instruction was found to be more effective in driving students' positive attitude towards mathematics than expository teaching method. The better facilitating effect of ethnomathematics incorporated instruction as experience in this study could be attributed to the facts that students in ethnomathematics classroom explore examples of mathematical concepts and ideas that are rooted in the common plays, games and activities that take place in their various homes in solving mathematical problems in schools. This finding is supported by previous studies conducted by Oyovwe, Ijeh and Ajaja (2022) and Aktuna (2018) whose results revealed among others that there was a significant difference between the mathematics mean attitude scores of students taught with ethnomathematics using guided instruction and those taught with lecture method, favoring students who were taught with ethnomathematics using guided instruction.

The findings shown in testing of hypothesis three revealed that that there is a significant difference in the mean performance scores of students in mathematics exposed to ethnomathematics incorporated instruction and expository teaching method. The results of findings revealed that ethnomathematics incorporated instruction was found to be more effective in enhancing students' performance in mathematics than expository teaching

method. The better facilitating effect of ethnomathematics incorporated instruction as experience in this study could be attributed to the facts that students in ethnomathematics classroom explore examples of mathematical concepts and ideas that are rooted in the common plays, games and activities that take place in their various homes in solving mathematical problems in schools. The practical knowledge and relationship in which they have between the mathematical practices in schools and that which they practice at home through games, rhymes, puzzles, exercise and so on aided them in solving mathematical problems at ease more than other students who only depended on the conventional formulae and system taught in school. This finding is supported by previous studies conducted by Oyovwe, Ijeh and Ajaja (2022), Accra-Jaja, Adolphus and Omeodu (2023) and Abiam, Abonyi, Ugama and Okafor (2016) whose results revealed among others that ethnomathematics-based instructional approach was superior to the conventional method in enhancing pupils' achievement in geometry. The result of this study also confirmed the results of similar studies done in other countries using ethnomathematics approach. Such findings include that of Arismendi-pardi (2001) who discovered that ethnomathematics pedagogy showed a positive effect on the mean scores of students in intermediate algebra than the conventional method.

CONCLUSION

The findings of this study serve as the basis for making the following conclusions; that incorporating ethnomathematics in the teaching and learning of mathematics provided a premise for students to embrace the beauty of mathematics, realizing the practicability of mathematics thereby appreciating the study of mathematics. This of course boosted their interest and drives a more positive attitude towards the study of mathematics. The shown eagerness in participating in mathematical activities as they were presented to them with peculiarities within their cultural and societal practices.

RECOMMENDATIONS

Based on the findings of this study, the researchers offered the following recommendations relevant for the improvement of Mathematics education.

1. If Mathematics is to gain popularity, capture the interest of the learners, redirect their attitude positively towards the subject and challenges their intellect, the content must be made more appealing to them. This can be done by linking classroom instructions to the learner's immediate environmental experiences through incorporating ethnomathematics in the teaching and learning of mathematics.
2. Mathematics teachers should recognize and realize the special role of ethnomathematics in mathematical instruction to students. That is, they should be sensitized through seminars, workshops and symposium on the usefulness and importance of ethnomathematics in mathematics classroom.

REFERENCES

1. Abasi, A. U. (2018a). Teachers' instructional strategies and upper basic students' academic achievement in mathematics in Essien Udim Local Government Area of Akwa Ibom State. International Journal of Educational Benchmark, 9(3) 76-83.
2. Abasi, A. U. (2018b). Availability and utilization of mathematics laboratory kits in teaching and learning of junior secondary school mathematics in Mkpat Enin Local Government Area of Akwa Ibom State. Journal of Issues in Mathematics, 19(1) 56-63.
3. Abasi, A. U. (2025). Effects of ethnomathematics approach on achievement in number and numeration concept among junior secondary school students in Akwa Ibom State. Zamfara International Journal of Education, 5(1).
4. Abasi, A. & George, I. (2025). Game-based instructional approach and mathematics students' interest and academic performance in Oruk Anam Local Government Area, Akwa Ibom State. International Journal of Science Education, 6(1).
5. Abasi, A. U. (2024). Enhancing junior secondary school Students' spatial ability in the concept of geometry in Mathematics using Origami-based instruction. Ibadan Journal of Educational Studies, 21(2), 12-20.

6. Abasi, A., Okri, J. & Adie, P. (2022). Instructional manipulatives and students' academic
7. performance and retention in mathematics in Mkpat Enin Local Government Area of Akwa Ibom State, Nigeria. Prestige Journal of Counseling Psychology, 5(2), 1-12
8. Abasi, A. U. & Umoinyang, I. E. (2020). Innovative mathematical pedagogical methods and strategies for improving the teaching and learning on mathematics. Journal of Science Teachers Association of Nigeria, 55(1) 114-123.
9. Abasi, A. U. & Ado, I. B. (2021). Effect of Problem-solving Method on Secondary School Students' Academic Achievement and Attitude in Mathematics in Uyo Local Government Area of Akwa Ibom State. The Journal of Mathematical Association of Nigeria, 46(1) 342-352.
10. Abiam, P. O., Abonyi, O. S., Ugama, J. O. & Okafor, G. (2016). Effects of ethnomathematics-based instructional approach on primary school pupils' achievement in geometry. Journal of Scientific Research & Reports, 9(2), 1-15.
11. Abid, A. & Noori, A. S. (2023). Exploring the influential factors on students' mathematical interest in schools. Journal for Research in Applied Sciences and Biotechnology, 2(3), 72-76.
12. Abonyi, O. S (2015). Effects of ethnomathematics based instructional approach on primary school pupils' achievement in geometry. Journal of Scientific Research, 9(2), 1-15
13. Accra-Jaja, F. S., Adolphus, T. & Omeodu, D. M. (2023). Effect of ethnomathematics-based instructional approach on academic performance in plane geometry among senior secondary school students in Rivers State. International Journal of Innovative Social & Science Education Research, 11(3), 43-51.
14. Adigun, O. T. (2018). Students' interest in learning mathematics as a means of economic recovery. Journal of Curriculum and Instruction, 1(2), 1-9.
15. Ado, I. B. & Abasi, A. U. (2021). Programmed-based Instructional Method and Students' Academic Performance and Retention in Mathematics in Uyo Local Government Area of Akwa Ibom State. International Journal of Education and Ethical Issues in Research 2(1) 76 -87.
16. Ado, I. B. & Abasi, A. U. (2014). Effect of practical approach on basic 7 mathematics students' interest and performance in fraction in Uyo Akwa Ibom State of Nigeria. Journal of Education and Practice, 5(28), 77-80.
17. Ado, I. B.,Abasi, A. U.& Nwankwo, F. M. (2017). Information and communication technology (ICT) as resource for teaching surface area of solid shapes in mathematics in Bayelsa State of Nigeria. IOSR Journal of Research & Methods in Education, 7(1) 43-48.
18. Akhter, N. & Akhter, N. (2018). Learning in mathematics: Difficulties and perceptions of students. Journal of Educational Research, 21(1), 1027– 9776.
19. Aktuna, E. H. (2018). Sixth grade students' perceptions of and engagement in ethnomathematical tasks in the area measurement concept. Unpublished M.Sc. thesis, Middle East Technical University.
20. Anaduaka, U. S., Olaoye, A. E. & Sunday, O. A. (2018). Effect of jigsaw instructional strategy on mathematics achievement of secondary school students. ABACUS, Journal of Mathematical Association of Nigeria, 43(1), 51 – 58.
21. Anaeche, K. C. & Ezeamaenyi, M. O. N. (2019). Effect of geo-board game on academic achievement of junior secondary school students in selected mathematical concepts in Ideato North, L.G.A., Imo State. International Journal of Studies in Education, 13(1), 45- 55.
22. Arismendi-Pardi, E. J. (2001). Comparison of the final grades of students in intermediate algerbra taught with and without an ethnomathematical pedagogy. Retrieved on December 7, 2005 from http//www.rip.edu/eglash/isgem.dir/tests.dir/ejap.htm.
23. Babayemi, J. O, Akpan, A. O. & Abasi, A. U. (2022). Self-efficacy and motivation as determinants of students' performance in basic science and technology examinations in Mkpat Enin Local Government Area of Akwa Ibom State, Nigeria. Journal of Research in Education and Society, 13(3), 147-157.
24. Bearcane, R. (2005). Task force on mathematics teaching and learning in poor communities. Crow Indian: Quick Links N. C. T. M. Standard.
25. Clore, G. L. & Schnall, S. (2015). The influence of effect on attitudes. In Albarracin, D., Johnson, B. T., & Zanna, M. P. (Eds.). The Handbook of Attitudes (pp. 437–489). Mahwah, NJ: Erlbaum.
26. D'Ambrosio, V. (2015). Ethnomathematics, what it might be? International study Group on ethnomathematics. News letter 3 (1) sept.

27. Daso, P. O. (2019). School variables and senior secondary students' achievement in mathematics in Rivers State, Nigeria. Mediterranean Journal of Social Sciences, 4(2), 709-718.
28. Edoho, E. A. & Abasi, A. U. (2019). Effect of guided-discovery instructional strategy on performance and interest of upper basic students towards geometry in Uyo Local Government Area, Akwa Ibom State, Nigeria. Nigerian Journal of Science and Science Education, 8(3) 42-53
29. Enukoha, O.I. (2018). Ethnomathematics and Achebe's things fall apart. Paper presented at the West African Conference on Languages and interaction Unical Calabar.
30. Federal Ministry of Education (2014). National policy on education. Federal Government Press, Lagos, Nigeria.
31. Iji, C. O. (2008). Reforming school mathematics curricula in line with global challenges proceedings of the 49th Annual Conference of Science Teachers Association of Nigeria. 226-230.
32. Kiwanuka, H. N., Van Damme, J., Van den Noortgate, W. & Reynolds, C. (2020). Temporal relationship between attitude toward mathematics and mathematics achievement. International Journal of Mathematical Education in Science and Technology, 51, 1–25.
33. Kurumeh, M. S. (2016). Effect of ethnomathematics approach on students' achievement in geometry and mensuration. Abacus, 31(1), 35-44
34. Malik, N. A. & Salman, M. F. (2018). Teachers' perceptions of the use of bridgeit mobile application for teaching mathematics at basic schools in Lagos State, Nigeria. ABACUS, Journal of Mathematical Association of Nigeria, 43(1), 25 – 40.
35. Oraneto, M. C. (2021). Effects of ethnomathematics instructional approach on students' achievement and interest in mathematics. African Journal of Science, Technology & Mathematics Education (AJSTME), 1(6), 95-103.
36. Oyovwe, O. S., Ijeh, S. B. & Ajaja, P. O. (2022). Effect of ethno-mathematics using guided instruction and lecture method on students' attitude towards mathematics in Delta State. International Journal of Academic Pedagogical Research (IJAPR), 6(8), 18-25
37. Ryan, V., Fitzmaurice, O. & O'Donoghue, J. (2022). Students' interest and engagement in mathematics after the first year of secondary education. European Journal of Science and Mathematics Education, 10(4), 436-454.
38. Sunghwan, H. & Taekwon, S. (2021). Students' attitude toward mathematics and its relationship with mathematics achievement. Journal of Education and e-Learning Research, 8(3), 272-280.
39. Yeh, C. Y., Cheng, H. H., Chen, Z. H., Liao, C. Y. & Chan, T. W. (2019). Enhancing achievement and interest in mathematics learning through Math-Island. Research and Practice in Technology Enhanced Learning, 14(5), 1-19.

APPENDIX

Sampled Lesson plan on Mensuration using ethnomathematics incorporated instruction

SUBJECT: Mathematics

TOPIC: **Mensuration**

CLASS: SS 2

DURATION: 45 minutes

AGE: 14 – 16years

SEX: Mixed

INSTRUCTIONAL MATERIALS: Local cup (calabash of different sizes), local calabash pots or plates of varying sizes, measuring tape or ruler. Pictures of the ethnomathematics instructional materials are shown below:

Plate 1: Calabash cup

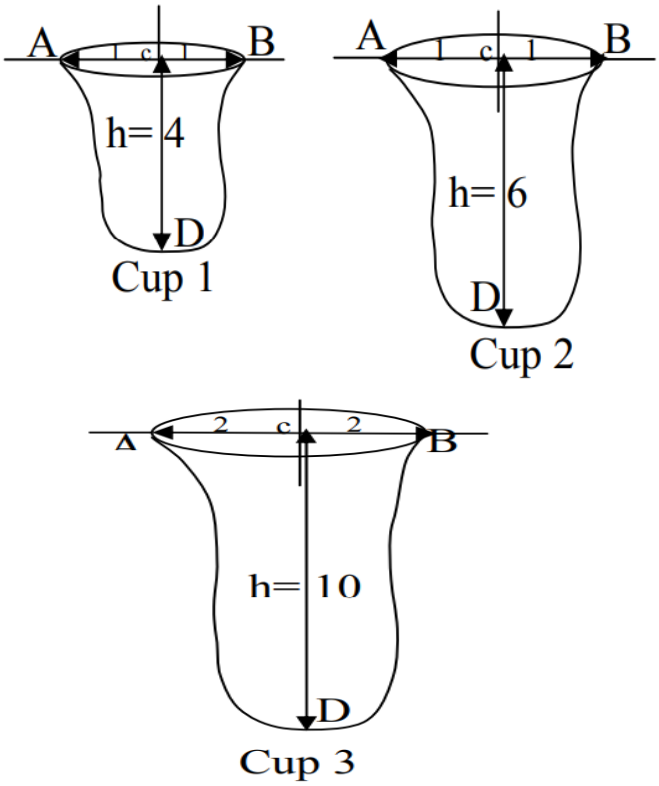
Plate 2: Calabash Plates

Plate3: Volume of the cup

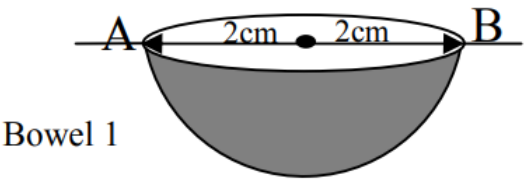
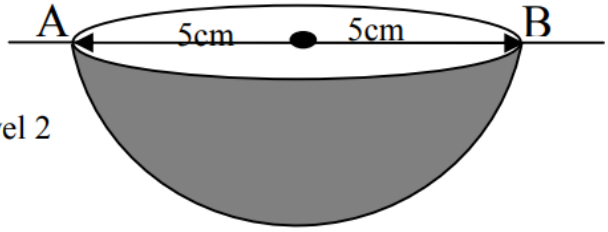
Plate 4: wooden rulers for measurement

Behavioural Objectives: During and at the end the lesson, the students should be able to understand and calculate the volumes of cylinder and hemispehere using native materials such as cylindrical calabash cups

Entry Behaviour: The students have learnt about measurement of volumes in their previous class.

STEP	CONTENT	TEACHER'S ACTIVITIES	STUDENTS' ACTIVITIES
1	Introduction	The teacher first tests the students by asking them to explain the concept of volume from their previous studies.	The students listen and attempt the questions that are being asked by the teacher.
2	Measurements (volume of a cylinder)	The teacher introduces the ethno-mathematics materials as measuring devices commonly produced locally and used at homes by the students. The three ethno-mathematics teaching materials are selected from different sizes and heights of native cups made from a certain type of calabash. They are purposely selected because they possess the shape of cylinder. More so, cylinders of various heights and widths are selected. They are measured with ruler and their ratio of heights is 4cm: 6cm: 10cm and width is 2cm: 2cm: 4cm respectively (as shown in diagrams below).  **Note that** the width is the diameter of the circular mouth of the cylinder	Students pay attention to the teacher's introduction
3	Procedure	To find the volumes of the cups, the teacher leads the students by inserting a ruler inside the cup measuring from its bottom to the point C where it intersects the diameter AB of the circular mouth of the cup. This measurement gives the height (4cm) of the cup. Also, the diameter AB will be measured to obtain 2cm which follows that its radius is 1cm (i.e. diameter ÷2 = radius). Similarly, in cup 2, its height (DC) is measured with	Students pay keen attention to the teacher's explanation and watch how the measurements are carried out.

		ruler inserted inside the cup. This is recorded as 6cm and width (AB) yields 2cm. Therefore, it has radius 1cm. Finally, in cup 3, its measurement of height and diameter gives 10cm and 4cm respectively. Therefore, it has radius 2cm.	
4	Calculation of volumes	The teacher leads the students on substitution of the values obtained from measurement of the heights and radii of the cups in the formula for volume of cylinder given as $\text{Vol.} = \frac{1}{3}\bar{\Lambda}r^2h, where\ \pi = \frac{22}{7}.$ The dimensions (radii and heights) of the cups measured are substituted in the formula as follows. This gives the volumes of the cups 1, 2 and 3. $Vol.o = \frac{1}{3} \times \frac{22}{7} \times \frac{1^2}{} \vee \frac{4}{} - \frac{88}{}$ or $4\frac{4}{}cm^2 \cong 4cm^3$ $Vol.of\ cup\ 2 = \frac{1}{3} \times \frac{22}{7} \times \frac{1^2 \times 6}{1}$ $= \frac{132}{21} = 6\frac{6}{21}cm^2 \cong 6cm^3$ $Vol.of\ cup\ 3 = \frac{1}{3} \times \frac{22}{7} \times \frac{1^2 \times 10}{1}$ $= \frac{1}{3} \times \frac{22}{7} \times \frac{4}{1} \times \frac{10}{1} = \frac{880}{21} = 41\frac{19}{21} \cong 42cm^3$	Student's watch as the teacher put the measurements into calculations, take notes and ask questions where necessary.
5	The concept of hemisphere using native earthen plates or pots	The teacher makes calabash plate by cutting calabash into two-halves: throwing away the top part and using the bottom part as hemisphere. Native earthen pots or plates can be used if available. The teacher introduces the ethno-mathematics materials used locally as plates, measuring devices at the students homes and market places, and bowels in use for feeding domestic animals and birds at homes. The concept of volume of hemisphere is illustrated using the calabash bowels which are of different sizes and volumes. To find the volume, two calabash bowels of different sizes and volumes were arbitrarily selected. An illustration is shown below	Students are attentive to the teacher's explanations.

		 Bowel 1  Bowel 2 The teacher leads the students by using ruler to measure the diameters of bowels 1 and 2 which gave 4cm and 10cm respectively. Therefore, the radii for bowels 1 and 2 are 2cm and 5cm respectively (i.e. obtained by dividing the diameters by 2).	
6	Calculation of the hemispherical bowels	The volumes are calculated by substituting the values of the radii obtained from the practical measurements of the diameters of the bowels drawn above. Volume of hemisphere is given by V= $\frac{2}{3}\pi r^3$, where $\pi = \frac{22}{7}$ $\therefore$ Vol. of bowel 1 $= \frac{2}{3} \times \frac{22}{7} \times \frac{2^3}{1}$ $= \frac{2}{3} \times \frac{22}{7} \times \frac{2 \times 2 \times 2}{1} = 16.76 \cong 17\text{cm}^3$ Again, Vol. of bowel 2 $= \frac{2}{3} \times \frac{22}{7} \times \frac{5^3}{1}$ $= \frac{2}{3} \times \frac{22}{7} \times \frac{5 \times 5 \times 5}{1} = \frac{5500}{21} = 261.9 \cong 262\text{cm}^3$. The volumes of the bowels (1 and 2) in fig. 2 were approximated to 17cm^3 and 262cm^3 respectively. The teacher hinted the students that approximately 17 cubic centimeter of liquid (say palm oil, water, palm wine etc) fills the bowel 1 to the approximate value of 262 cubic centimeter calculated as volume of the second bowel implies that 262 cubic centimeter of liquid, powdered or seeds is the quantity that can fill the bowel 2 to the brim.	Students follow the teacher's calculations and take notes, asking questions where in doubt.
7	Evaluation	The teacher go over the key areas of the lesson to evaluate and summarize	Students take note of the teacher's emphases.