

EFFECT OF ETHNOMATHEMATICS TEACHING APPROACH ON SENIOR SECONDARY SCHOOL STUDENTS' ACADEMIC ACHIEVEMENT IN LOCUS IN ISOKO NORTH LOCAL GOVERNMENT AREA

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Abstract

This study investigated the effect of the ethnomathematics teaching approach on senior secondary school students' academic achievement in locus in Isoko North Local Government Area of Delta State, using Vygotsky's (1978) Social Constructivist Theory. The study was guided by three research questions and three hypotheses tested at a 0.05 level of significance. The study adopted a quasi-experimental research design, specifically the pretest-posttest non-randomised control group design. The population of the study comprised 1,428 Senior Secondary School Two (SSII) students in public secondary schools in Isoko North Local Government Area. A sample of 252 students drawn from four intact classes in four selected public secondary schools was used for the study. The instrument for data collection was the Locus Achievement Test (LAT), which contained 50 multiple-choice items selected from past WAEC Mathematics question papers, from 2015 to 2025. The reliability of the instrument was established using the Kuder-Richardson Formula 21 (KR-21), and a reliability coefficient of 0.70 was obtained. Mean and standard deviation were used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the hypotheses. The findings revealed that students taught locus, using the ethnomathematics teaching approach, achieved significantly better results than those taught using the lecture method. The findings also showed no significant difference between the achievement scores of male and female students taught using the ethnomathematics teaching approach, and no significant interaction effect between teaching approach and gender on students' achievement in locus was observed. The study concluded that the ethnomathematics teaching approach is an effective and gender-inclusive teaching approach for improving students' academic achievement in locus. It was therefore recommended among others that Mathematics teachers should adopt this approach in the teaching of locus and other Mathematics concepts in secondary schools.

Keywords: Academic achievement, lecture method, ethnomathematics teaching approach, locus,
Introduction

Mathematics is a core subject in the secondary school curriculum because of its importance in science, technology, commerce, and everyday life. It serves as a foundation for logical reasoning, problem-solving, and national development (Federal Republic of Nigeria, FRN, 2013). Garba (2024) described Mathematics as a science of magnitude and number that sustains the daily practices of man. From these forementioned assertions, it can be deduced that mathematical knowledge is critical for both human and national development. Despite the importance of Mathematics, students' achievement in the subject at the secondary school level has remained

unsatisfactory. The report from the West African Examination Council (WAEC) Chief Examiner on students' performance in Mathematics in Nigeria in the West African School Certificate Examination shows that the percentage of students who got A1 to C6 grades from 2019 to 2025 ranged from 40.90% to 47.85%, not crossing the 50% average. The report further showed that the percentage of students who got D7 to F9 grades within the same period ranged from 52.02% to 59.10%, exceeding the 50% average (WAEC, 2026). This report indicates that secondary school students in Nigeria are underperforming across several concepts in Mathematics.

Locus is a geometrical concept in secondary school Mathematics that involves the study of the paths traced by points under certain conditions (Awofala, 2017). Segal et al. (2016) described it as a tool for solving problems and conducting geometrical constructions. The topic requires learners to reason logically and visualise geometrical relationships in accordance with the provided data. However, many students perceive locus as abstract and difficult. According to Segal et al., these negative perceptions of students about the concept of locus could be due to the non-allocation of a special chapter in the secondary school Mathematics textbooks to the concept. According to the researchers, the concept is rather implied in other chapters. However, even when the concept is implied in other chapters of Mathematics textbooks, Oribhabor (2020) argued that Mathematics concepts are often taught using the conventional lecture method that emphasises memorisation rather than practical understanding, thereby limiting students' understanding and achievement in the subject. This challenge has necessitated the call for the adoption of innovative instructional approaches capable of improving students' achievement by concretising the concept and making the learning more meaningful. One such instructional innovation that has gained considerable attention in recent years is the ethnomathematics teaching approach.

The ethnomathematics teaching approach refers to the teaching and learning of Mathematics that integrates learners' cultural practices, local experiences, indigenous knowledge, and everyday activities into classroom instruction. According to Rosa and Orey (2018), ethnomathematics promotes culturally relevant pedagogy by connecting mathematical ideas to students' cultural realities, thereby making learning more meaningful and engaging. The ethnomathematics teaching approach emphasises the relationship between Mathematics and culture. It enables learners to understand mathematical concepts through familiar community activities such as farming, trading, weaving, building patterns, local games, and measurement

practices. As a culturally responsive pedagogy, ethnomathematics has been strongly advocated by scholars for integration into Mathematics instruction because it enhances students' participation and understanding. Machaba and Dhlamini (2021) argued that this advocacy is necessary because effective Mathematics instruction should recognise learners' language, culture, and social background to facilitate meaningful learning experiences. Likewise, Nur et al. (2021) explained that ethnomathematics provides contextual learning opportunities that help students relate mathematical concepts to real-life cultural activities. Similarly, Batiibwe (2024) maintained that ethnomathematics provides learners with opportunities to see Mathematics as part of their cultural identity rather than as an abstract discipline.

Research in Nigeria has shown that the ethnomathematics teaching approach can improve students' achievement, retention, and interest in locus (Abiam et al., 2016; Accra-Jaja et al., 2023; Achor et al., 2009; Eze, 2023; Garba et al., 2024; James & Tertsea, 2021; Omere & Ogedengbe, 2025). From a global perspective, Balacuit and Oledan (2024) and Sulistyowati (2024), in their systematic review of ethnomathematics integration in secondary education, reported that ethnomathematics-based instruction improved learners' mathematical performance, higher-order thinking skills, and interest in Mathematics. Jacob and Dike (2023) also observed that ethnomathematics helps students to establish meaningful connections between classroom Mathematics and their daily experiences, thereby improving comprehension, creativity, and participation during instruction. In another systematic literature review on ethnomathematics in geometry, Iskandar et al. (2022) found that many geometric concepts are embedded in traditional cultural activities, fabrics, local architecture, and indigenous designs, and that the ethnomathematics teaching approach helps students visualise geometry from these cultural lenses. Thus, since locus is a geometrical topic, integrating ethnomathematics into its instruction may help students in Isoko North LGA better visualise and understand the concepts through familiar environmental examples. This better visualisation and understanding may occur irrespective of students' gender.

Gender has remained an important variable in Mathematics education research because differences in students' participation, confidence, and achievement in school subjects are sometimes associated with gender-related factors. Abdullahi et al. (2019) described gender as the cultural, economic, and political factors that shape the experiences and opportunities of boys and

girls in society. These factors affect male and female students differently and are promoted by stereotypical perceptions prevalent in society. Researchers have continued to investigate whether male and female students differ significantly in their academic achievement in Mathematics when exposed to culturally responsive instructional strategies such as the ethnomathematics instructional approach. While some studies reported differences in achievement between male and female students, others found no significant difference. For example, Garba (2024) and Accra-Jaja et al. (2023) observed a non-significant difference in the achievement of male and female students taught the concept of locus using the ethnomathematics teaching approach. Similarly, Ozofo and Onos (2018) and Salihu et al. (2024) observed that both male and female students benefited significantly from the ethnomathematics approach. On the other hand, Omere and Ogedengbe (2025) observed a significant gender difference in students' achievement after being exposed to the ethnomathematics teaching approach. Also, Abasi and Ekwueme (2025) observed a significant difference in students' performance when exposed to the ethnomathematics teaching approach in favour of female students.

From the foregoing, it can be deduced that the ethnomathematics teaching approach is effective in enhancing students' academic achievement in Mathematics instruction, particularly in the concept of locus. However, this study was conducted to address the limited empirical evidence on the effectiveness of this approach in teaching locus at the senior secondary school level in Isoko North Local Government Area of Delta State. Also, considering the disparities in research findings regarding gender differences, with the most recent findings suggesting a gender difference in students' achievement when exposed to the ethnomathematics teaching approach, students' gender is considered a moderating variable in this study. This consideration was done to determine whether gender influences the effectiveness of the ethnomathematics teaching approach, in light of the recent advocacy for gender-inclusive pedagogies across all levels of education by the United Nations (UN, 2015). Specifically, this study determined the:

1. difference in the mean achievement scores of students taught Locus using the ethnomathematics teaching approach and those taught using the lecture method in Isoko North Local Government Area.

2. difference between the mean achievement scores of male and female students taught Locus using the ethnomathematics teaching approach in Isoko North Local Government Area.
3. interaction effect of teaching approach and gender on students' achievement in locus. in Isoko North Local Government Area.

Theoretical Framework

This study is anchored on the Social Constructivist Theory propounded by Vygotsky in 1978. The theory postulates that learning is a social process in which knowledge is constructed through interaction with other people and within a cultural environment. Vygotsky maintained that cognitive development does not occur in isolation but develops through social activities, communication, collaboration, and shared experiences. The theory emphasises that learners acquire knowledge more effectively when instruction is related to their cultural background and everyday experiences. Since the theory recognises culture and social interaction as important factors in learning, it provides a suitable foundation for examining the effect of the ethnomathematics teaching approach on senior secondary school students' academic achievement in Locus. The ethnomathematics teaching approach integrates learners' cultural practices, indigenous knowledge, and real-life experiences into Mathematics instruction, thereby making learning more meaningful and understandable. Through the use of culturally familiar examples and collaborative classroom activities embedded in this approach to teaching, students are encouraged to actively construct their understanding of Locus concepts.

Methodology

This study adopted a quasi-experimental research design, specifically the pretest-posttest non-randomised control group design. According to Nworgu (2015), this design suits this study because intact classes were used without randomly assigning participants to groups. The study was carried out in Isoko North Local Government Area of Delta State.

The population of the study comprised 1,428 Senior Secondary School Two (SSII) students offering Mathematics in public secondary schools in Isoko North Local Government Area in the 2025/2026 academic session. The sample comprised 252 SSII students selected from four public secondary schools in the study area. The sampled schools were selected using the purposive sampling technique based on the availability of qualified Mathematics teachers, functional SSII

classes, and the willingness of the school authority to approve the study being conducted in their schools. Four intact classes were used, with one intact class selected from each school. The intact classes were assigned to experimental and control groups using the simple random sampling technique. Two schools constituted the experimental group and were taught locus using the ethnomathematics teaching approach. The remaining two schools formed the control group and were taught using the conventional lecture method.

The instrument used for data collection was a Locus Achievement Test (LAT). The LAT contained 50 multiple-choice items selected from past West African Examinations Council (WAEC) Mathematics question papers on the concept of locus from 2015 to 2025. The instrument was validated by experts in Mathematics Education and Measurement and Evaluation from the College of Education, Warri, Delta State, to ensure its face and content validity. The reliability of the instrument was established using the Kuder-Richardson Formula 21 (KR-21), and a reliability coefficient of 0.70 was obtained, indicating that the instrument was reliable for the study.

The study lasted for six weeks. Before the commencement of treatment, the researcher administered the LAT as a pretest to both the experimental and control groups to determine the students' initial level of achievement. Thereafter, the experimental group was exposed to the ethnomathematics teaching approach, where culturally familiar examples, local activities, and collaborative learning strategies were integrated into the teaching of locus. The control group was taught the same concept using the conventional lecture method. At the end of the treatment, the LAT was reshuffled and administered as a posttest to both groups.

Data collected from the study were analysed using mean and standard deviation to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the hypotheses at a 0.05 level of significance. ANCOVA was considered appropriate because it helped to control the effect of pretest differences among the groups before determining the effect of the treatment on students' academic achievement in locus.

Results

Research Question 1: What is the difference in the mean achievement scores of students taught locus using the ethnomathematics teaching approach and those taught using the lecture method?

Table 1: Mean and Standard Deviation of Pretest and Posttest Achievement Scores Between Students Taught Locus Using Ethnomathematics Teaching Approach and Lecture Method

Group	N	Pretest Mean	SD	Posttest Mean	SD	Mean Gain
Ethnomathematics	128	29.78	6.31	60.03	12.55	30.25
Lecture Method	124	30.03	7.63	49.26	10.83	19.23

Table 1 shows a mean achievement pretest score of 29.78, with a standard deviation of 6.31, for students taught locus using the ethnomathematics teaching approach, and a mean achievement pretest score of 30.03, with a standard deviation of 7.63, for students taught locus using the lecture method. Mere comparison of the mean scores shows that the students in both groups were approximately equivalent in their knowledge of locus before treatment. For the posttest scores, the table indicates a mean achievement score of 60.03, with a standard deviation of 12.55, for students taught locus using the ethnomathematics teaching approach, while their counterparts taught using the lecture method had a mean score of 49.26, with a standard deviation of 10.83. The students taught using the ethnomathematics teaching approach had a higher mean gain of 30.25 compared to their counterparts taught using the lecture method, with a mean gain of 19.23.

Hypothesis 1: There is no significant difference in the mean achievement scores of students taught locus using the ethnomathematics teaching approach and those taught using the lecture method.

Table 2: ANCOVA Summary of Pretest and Posttest Mean Achievement Scores of Students Taught Locus Using Ethnomathematics Teaching Approach and Lecture Method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	7442.409a	2	3721.204	27.011	.000
Intercept	43250.826	1	43250.826	313.949	.000
Pretest	132.375	1	132.375	.961	.328
Methods	7272.271	1	7272.271	52.788	.000
Error	34303.242	249	137.764		
Total	796584.000	252			
Corrected Total	41745.651	251			

Table 2 indicates a significant difference between the mean achievement posttest scores of students taught locus using the ethnomathematics teaching approach and those taught using the lecture method, $F(1, 249) = 52.788$, $P(0.000) < 0.05$. Thus, the null hypothesis was rejected. Therefore, there is a significant difference in the mean achievement scores of students taught locus

using the ethnomathematics teaching approach and those taught using the lecture method, in favour of students taught using the ethnomathematics teaching approach.

Research Question 2: What is the difference between the mean achievement scores of male and female students taught locus using the ethnomathematics teaching approach?

Table 3: Mean and Standard Deviation of Pretest and Posttest Achievement Scores of Male and Female Students Taught Locus Using Ethnomathematics Teaching Approach

Sex	N	Pretest Mean	SD	Posttest Mean	SD	Mean Gain
Male	68	28.62	6.88	60.12	12.69	31.50
Female	60	31.10	5.35	59.93	12.51	28.83

Table 3 shows a mean achievement pretest score of 28.62, with a standard deviation of 6.88, for male students taught locus using the ethnomathematics teaching approach, and a mean achievement pretest score of 31.10, with a standard deviation of 5.35, for female students taught locus using the ethnomathematics teaching approach. The female students had greater knowledge of locus before treatment by mere comparison of the mean achievement scores. For the posttest, the table indicates a mean achievement score of 60.12, with a standard deviation of 12.69, for male students taught locus using the ethnomathematics teaching approach, while their female counterparts had a mean achievement score of 59.93, with a standard deviation of 12.51. The male students had a higher mean achievement gain of 31.50 compared to their female counterparts, with a mean gain of 28.83.

Hypothesis 2: There is no significant difference between the mean achievement scores of male and female students taught locus using the ethnomathematics teaching approach.

Table 4: ANCOVA Summary of Pretest and Posttest Mean Achievement Scores of Male and Female Students Taught Locus Using Ethnomathematics Teaching Approach

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	259.362a	2	129.681	.820	.443
Intercept	23409.239	1	23409.239	148.111	.000
Pretest	258.279	1	258.279	1.634	.204
Sex	4.609	1	4.609	.029	.865
Error	19756.513	125	158.052		
Total	481296.000	128			
Corrected Total	20015.875	127			

A non-significant difference was found between the mean achievement scores of male and female students taught locus using the ethnomathematics teaching approach, as shown in Table 4, $F(1, 125) = 0.029$, $P(0.865) > 0.05$. Thus, the null hypothesis was not rejected. Therefore, there is no significant difference between the mean achievement scores of male and female students taught locus using the ethnomathematics teaching approach.

Hypothesis 3: There is no significant interaction effect of teaching approach and gender on students' achievement in locus.

Table 6: ANCOVA Summary on the Interaction Effect Between Gender and Teaching Approach on Students' Achievement in Locus

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	7513.315a	4	1878.329	13.553	.000
Intercept	41903.551	1	41903.551	302.351	.000
Pretest	107.714	1	107.714	.777	.379
Methods	6927.559	1	6927.559	49.985	.000
Gender	33.564	1	33.564	.242	.623
Methods * Gender	39.601	1	39.601	.286	.593
Error	34232.336	247	138.592		
Total	796584.000	252			
Corrected Total	41745.651	251			

Table 6 shows that there is no significant interaction effect between gender and teaching approach on students' achievement in locus, $F(1, 247) = 0.286$, $P(0.593) > 0.05$. Therefore, the null hypothesis was not rejected. Thus, there is no significant interaction effect of teaching approach and gender on students' achievement in locus.

Discussion of Findings

The findings of the study revealed that the students taught locus using the ethnomathematics teaching approach benefited significantly more than those taught using the lecture method, indicating that integrating culturally familiar activities and real-life experiences into Mathematics instruction enhanced students' understanding and achievement in locus. The improved achievement recorded among students exposed to the ethnomathematics teaching approach may be attributed to the fact that the instructional strategy reduced the abstract nature of

locus by linking the concept to learners' cultural experiences and everyday activities. The findings of this study give credence to Vygotsky's (1978) social constructivist theory, which proposes that learning does not happen in a vacuum. Rather, it uses cultural tools, including culturally familiar activities and everyday experiences, to concretise abstract concepts and facilitate students' cognitive development. These cultural tools were used in this study to bridge the gap between mathematical abstraction and concrete reality, thereby facilitating students' understanding and achievement of the concept of locus. This finding agrees with the studies of Abiam et al. (2016), Achor et al. (2009), Eze (2023), James and Tertsea (2021), who posited that the ethnomathematics instructional approach improves students' academic achievement, retention, and interest in Mathematics. The finding is also in agreement with international studies, such as Balacuit and Oledan (2024), Sulistyowati (2024), Jacob and Dike (2023) and Iskandar *et al.* (2022), who reported that the ethnomathematics instructional approach enhanced students' learning outcomes in locus, by helping them visualise the concept using cultural lenses.

The findings of the study further revealed that both male and female students benefited equally from the ethnomathematics teaching approach, although male students had a slightly higher mean gain score than their female counterparts. The finding suggests that the ethnomathematics teaching approach promotes active participation, collaboration, and confidence among male and female students, creating an equitable learning environment for both groups of students. This inclusive environment must have eliminated any possible gender differences in the study. Furthermore, the study revealed no significant interaction effect between teaching approach and gender on students' achievement in locus. This implies that the effectiveness of the ethnomathematics teaching approach in improving students' achievement in locus was not dependent on gender, as both male and female students benefited similarly from the instructional approach. Thus, the ethnomathematics teaching approach provides equal opportunities for both male and female students to engage meaningfully in Mathematics learning activities and achieve improved academic outcomes in the concept of locus. The findings of this study are consistent with those of Garba (2024) and Accra-Jaja et al. (2023), who reported that gender does not influence the effectiveness of the ethnomathematics teaching approach. The findings also agree with Ozofo and Onos (2018) and Salihu et al. (2024), who observed that both male and female students benefited significantly from the ethnomathematics approach. Nevertheless, the findings

are at variance with those of Omere and Ogedengbe (2025) and Abasi and Ekwueme (2025), who observed a significant gender difference in students' achievement after being exposed to the ethnomathematics teaching approach.

Conclusion

Based on the findings of the study, it was concluded that the ethnomathematics teaching approach significantly improved senior secondary school students' academic achievement in locus more than the conventional lecture method. The integration of culturally familiar activities, local experiences, and learner-centred instructional strategies enhanced students' understanding and participation in the learning process. The study also concluded that male and female students benefited equally from the ethnomathematics teaching approach, as no significant difference was found in their mean achievement scores. Furthermore, the study established that there was no significant interaction effect between teaching approach and gender on students' achievement in locus. Therefore, the ethnomathematics teaching approach was found to be an effective and gender-inclusive instructional strategy for improving students' academic achievement in locus among senior secondary school students in Isoko North Local Government Area of Delta State.

Recommendations

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

1. Mathematics teachers should adopt the ethnomathematics teaching approach in the teaching of locus and other Mathematics concepts to improve students' academic achievement.
2. Mathematics teachers should create learner-centred classroom environments that encourage collaboration, active participation, and the use of culturally familiar examples during instruction.
3. Curriculum planners and textbook authors should integrate ethnomathematics-based instructional activities into the secondary school Mathematics curriculum and textbooks to promote meaningful and culturally relevant learning experiences.
4. School administrators and government agencies should organise workshops, seminars, and training programmes for Mathematics teachers on the effective use of the ethnomathematics teaching approach in classroom instruction.



References

- Abasi, A. U., & Ekwueme, C. O. (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), 162-168.
- Abdullahi, N., Abubakar, A., Abubakar, M. J., & Aliyu, A. C. (2019). Gender gap in science and technology education in Nigeria. *International Journal of Education and Evaluation*, 5(3), 6-13.
- 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 and Reports*, 9(2), 1-15.
- 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.
- Achor, E. E., Imoko, B., & Uloko, E. (2009). Effect of ethnomathematics teaching approach on senior secondary students' achievement and retention in locus. *Educational Research and Review*, 4(8), 385-390.
- Awofala, A. O. A. (2017). Assessing senior secondary school students' mathematical proficiency as related to gender and performance in Mathematics in Nigeria. *International Journal of Research in Education and Science*, 3(2), 488–502. <https://doi.org/10.21890/ijres.327908>
- Balacuit, J. P., & Oledan, R. T. (2024). Ethnomathematics integration in secondary mathematics education: A systematic review. *Journal of Education and Learning*, 13(2), 45–58. <https://doi.org/10.5539/jel.v13n2p45>
- Batiibwe, M. S. K. (2024). Ethnomathematics and culturally responsive mathematics teaching: Perspectives from African classrooms. *International Journal of Mathematics Education*, 15(1), 44–58.
- Eze, F. B. (2023). Ethnomathematics and the primary school pupils' achievement in mathematics in Ogbia Local Government Area, Bayelsa State, Nigeria. *Faculty of Natural and Applied Sciences Journal of Mathematics, and Science Education*, 5(1), 118-123.
- Federal Republic of Nigeria. (2013). *National policy on education (Revised ed)*; Lagos: NERDC Press.
- Garba, A. (2024). Effects of ethno-mathematics instructional approach and problem-based learning strategy on students' interest, achievement and retention in geometry in Benue State, Nigeria. *Turkish Journal of Computer and Mathematics Education*, 15(2), 65-90.
- Iskandar, R., Herman, T., Jupri, A., & Dahlan, J. A. (2022). Ethnomathematics in geometry learning: A systematic literature review. *Journal of Physics: Conference Series*, 2165(1), 012018. <https://doi.org/10.1088/1742-6596/2165/1/012018>
- Jacob, U. S., & Dike, J. W. (2023). Ethnomathematics and students' academic achievement in mathematics in secondary schools. *Journal of Educational Development and Practice*, 7(1), 102–111.
- James, A. T., & Tertsea, J. (2021). The effect of ethno-mathematics on junior secondary school students' achievement and retention in geometry in Benue State, Nigeria: A coronavirus pandemic case study. *International Journal of Research and Innovation in Applied Science (IJRIAS)*, 6(4), 95-100.

- Machaba, F. M., & Dhlamini, J. J. (2021). Ethnomathematics as a fundamental teaching approach for meaningful mathematics learning. *International Journal of Education in Mathematics, Science and Technology*, 9(4), 648–661. <https://doi.org/10.46328/ijemst.1771>
- Nur, A. S., Herman, T., & Mariyana, R. (2021). Ethnomathematics in mathematics learning: A systematic review. *International Journal of Evaluation and Research in Education*, 10(1), 293–301. <https://doi.org/10.11591/ijere.v10i1.20640>
- Nworgu, B.G. (2015). *Educational research: Basic issues and methodology (Third Edition)*. Nsukka, Enugu: University Trust Publishers
- Omere, P. O., & Ogedengbe, S. (2022). Effect of ethnomathematics teaching method on mathematics achievement in geometry among secondary school students in Edo State. *Rivers State University Journal of Education*, 25(1), 99-105.
- Oribhabor, C. B. (2020). Poor performance in mathematics: Causes and implications for secondary school students in Nigeria. *International Journal of Scientific and Research Publications*, 10(11), 614–618. <https://doi.org/10.29322/IJSRP.10.11.2020.p10778>
- Ozofor, N. M., & Onos, C. N. (2018). Effect of ethnomathematics on senior secondary school students' achievement in Ikwuano local government area, Abia State. *Research Journal of Mathematics*, 5(1), 1-14.
- Rosa, M., & Orey, D. C. (2018). Ethnomathematics and the responsible subversion of its pedagogical action: An ethnomathematical perspective. *Revista Latinoamericana de Etnomatemática*, 11(1), 7–26.
- Salihu, A. M., Yusuf, I., & Mohammed, J. (2024). Effect of ethnomathematics teaching strategy on academic performance in solid mensuration among senior secondary students. *UNIZIK Journal of Educational Research and Policy Studies*, 17(3), 74-85.
- Segal, R., Stupel, M., & Oxman, V. (2016). Dynamic investigation of loci with surprising outcomes and their mathematical explanations. *International Journal of Mathematical Education in Science and Technology*, 47(3), 443-462.
- Sulistiyowati, E. (2024). Meta-analysis study of the effectiveness of the ethnomathematical approach on students' achievement. *Pegem Journal of Education and Instruction*, 14(1), 197-204.
- United Nations (UN, 2025). The 17 Goals. <https://www.undp.org/sustainable-development-goals>
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- WAEC (2026). Chief Examiner's Report (2019-2025). Test Development Division, West African Examination Council, Delta State, Nigeria.