



American Journal of Educational Leadership & Policy Studies (AJELPS)

VOLUME 1 ISSUE 1 (2025)



PUBLISHED BY
E-PALLI PUBLISHERS, DELAWARE, USA

Assessing Teachers' Perceptions of Ethno-Mathematics as a Pedagogical Approach in Mathematics Education in Nigeria

Olurotimi David Aduloju^{1*}

Article Information

Received: April 20, 2025

Accepted: May 26, 2025

Published: June 30, 2025

Keywords

Classroom Integration, Curriculum Development, Ethnomathematics, Pedagogical Strategy, Teacher Perception

ABSTRACT

This study investigates how mathematics teachers in South-west Nigeria's secondary schools view the application of ethnomathematics as a teaching method. The study used a descriptive survey design and collected data from 300 mathematics teachers who were chosen from among the six states in the area using a multi-stage sampling procedure. Teacher's Perception of Ethno-Mathematics (TPE), a validated instrument, was used to collect data. It looked at teachers' perspectives, integration strategies, and difficulties applying ethnomathematical ideas. Both descriptive statistics (mean and standard deviation) and inferential statistics (correlation and t-tests) were used in the data analysis process. The results show that although ethnomathematics is generally viewed favourably by teachers (overall mean = 3.26), who see it as a means of improving student engagement and link mathematics to real-world experiences, its actual integration into classroom instruction is still limited (overall mean = 2.26). Lack of instructional resources, inadequate training, and inadequate curriculum support are major obstacles. While there was no discernible difference in the perceptions or difficulties faced by teachers in public and private schools, the study did find a significant difference in integration practices between teachers in urban and rural settings. In order to facilitate ethnomathematics' successful implementation in Nigerian schools, the study suggests that education authorities give professional development top priority, supply the required teaching resources, and formally include ethnomathematics in the national curriculum.

INTRODUCTION

Background of the Study

The cultural and contextual factors that affect students' engagement with and comprehension of mathematical concepts are frequently ignored in mathematics education. By investigating the connection between mathematics and cultural practices, ethnomathematics, a term made popular by Ubiratan D'Ambrosio, aims to close this gap. It acknowledges that diverse communities develop and apply mathematical concepts in distinctive ways, and that mathematical reasoning and problem-solving are profoundly ingrained in cultural experiences.

Mathematics is a fundamental subject that is essential to both societal advancement and personal empowerment. It is also essential to national development. It gives people the tools they need to solve problems, make decisions, and think critically—skills that are crucial for innovation and economic growth. The Nigerian National Policy on Education (2013) stipulates that mathematics must be taught at all levels in the 6-3-3-4 educational framework due to its significance, with a focus on its contribution to scientific and technological progress (Unodjaku, 2013; NCTM, 2015).

Geometry, trigonometry, and mensuration are examples of mathematics that historically emerged from the need to comprehend and quantify natural phenomena (Obodo, 2008). It has developed into a universal language of science and technology over time, essential to communication,

research, business, and education (Harbor-Peters, 2000). However, studies like the WAEC Chief Examiner's Report (2018), which highlight pervasive instructional difficulties and uneven results, show that Nigeria still struggles with low Mathematics proficiency among its students.

Around the world, pedagogical approaches that prioritise conceptual understanding over rote memorisation have become more popular. Nigerian educational reforms have started to adopt more comprehensive teaching methods in keeping with this trend. According to academics like Sternberg (2017), learning should not be seen as static information but rather as dynamic and rooted in real-world experiences. His sociocultural theory promotes educational settings that allow students to relate to their experiences and backgrounds. By introducing culturally relevant material into math classes, ethnomathematics fits into this framework. By respecting the identities and social contexts of students, it promotes meaningful learning. Notwithstanding differences in age, gender, ethnicity, religion, or socioeconomic background, a culturally responsive teaching strategy promotes inclusivity, enhances understanding, and fosters a sense of belonging.

Statement of the Problem

Ethnomathematics has not been widely incorporated into Nigeria's official educational system, despite its potential advantages. How—and whether—ethnomathematics

¹ Department of Science and Technical Education, Faculty of Education, Adekunle Ajasin University, Akungba -Akoko, Ondo State, Nigeria

* Corresponding author's e-mail: davidolurotimi@gmail.com

is implemented is greatly influenced by teachers' attitudes, knowledge, and willingness to include cultural components. Therefore, this study explores how Mathematics teachers view ethnomathematics as a teaching tool, paying particular attention to the elements that either facilitate or impede its application in secondary education.

Purpose of the Study

The purpose of this study is to evaluate how Mathematics teachers in secondary schools view ethnomathematics as a teaching method.

It specifically aims to:

1. Analyse how educators interpret, value, and use ethnomathematical ideas in their instruction;
2. Examine how teaching strategies and student engagement are affected by indigenous and cultural mathematical knowledge;
3. Determine the opportunities and difficulties involved in incorporating ethnomathematics into the curriculum of educational institutions.

Research Questions

1. What impressions do educators have of ethnomathematics as a teaching strategy in mathematics education?
2. How well are ethnomathematical ideas incorporated into the curriculum?
3. What obstacles must educators overcome in order to apply ethnomathematics?

Research Hypotheses

Null Hypotheses Null (H_0)

1. Teachers' perceptions and how they apply ethnomathematics do not significantly correlate.
2. Teachers at public and private schools have similar opinions about ethnomathematics.
3. The degree of ethnomathematics integration in urban and rural schools is not significantly different.
4. Teachers in public and private schools face the same difficulties when putting ethnomathematics into practice.

Significance of the Study

By shedding light on the integration of culturally grounded mathematical knowledge into school curricula, this study contributes to the growing corpus of research on ethnomathematics in education. The following stakeholders can benefit from its findings:

- Educators and teachers will acquire useful techniques for integrating ethnomathematics into regular lessons, which could enhance student engagement and comprehension.
- The results can be used by curriculum planners and policymakers to support inclusive, contextually appropriate curricula that take into account the varied backgrounds of students.
- By incorporating modules on ethnomathematical pedagogy into their training programmes, teacher

education institutions can better prepare aspiring educators to use culturally sensitive teaching practices.

- Instruction that takes into account the cultural realities of the students can boost their academic performance, motivation, and self-esteem.

- The application and efficacy of ethnomathematics in various contexts can be further explored by researchers by building on this work.

In the end, the study encourages more contextually aware and inclusive teaching methods in mathematics classes, which enhances learning outcomes and contributes to greater educational equity.

Delimitation of the Study

Only Mathematics teachers in South-west Nigerian secondary schools are included in this study. It centres on their opinions, the degree of integration, and the difficulties they encountered when incorporating ethnomathematics into their teaching methods.

LITERATURE REVIEW

Theoretical Framework

The educational theories that support the importance of cultural context in mathematics instruction and learning serve as the foundation for this study. This study's philosophical and pedagogical underpinnings come from the following frameworks:

Jean Piaget's Constructivist Theory

Piaget contends that knowledge is actively created by students via their experiences and interactions with the outside world. By placing mathematical concepts in contexts that are both culturally and practically relevant, ethnomathematics aligns with this theory and enhances the significance of learning.

Vygotsky's Socio-Cultural Theory

Vygotsky highlighted the social aspect of learning and proposed that social interactions and cultural resources are essential to cognitive development. This is in line with ethnomathematics, which enhances mathematical comprehension by utilising students' cultural backgrounds.

Ethnomathematical Theory (Ubiratan D'Ambrosio)

D'Ambrosio maintained that cultural practices are intrinsically linked to mathematics. Ethnomathematics encourages a deeper understanding and appreciation of mathematical concepts by incorporating indigenous knowledge systems into formal education.

Hans Freudenthal, Author of Realistic Mathematics Education

Freudenthal thought that mathematics should be directly related to students' everyday lives. This perspective is reinforced by ethnomathematics, which applies mathematical ideas to real-world scenarios and culturally relevant contexts.

These theories work together to promote the inclusion of cultural knowledge in Mathematics classes and provide a prism through which to examine how educators view ethnomathematics and how it affects student learning.

An Approach to Ethnomathematics

In order to draw attention to the relationship between mathematics and culture, Ubiratan D'Ambrosio coined the term "ethnomathematics" in 1978. Whereas "mathematics" refers to methods like measuring, ordering, classifying, and modelling, "ethno" includes aspects of cultural identity like language, customs, values, and social practices.

Cultural practices embody mathematical thinking, as demonstrated by the Sasak people of Indonesia, who traditionally used parts of the human body as non-standard units for measuring buildings (Supiyati *et al.*, 2019). These examples show how mathematics is intricately woven into social and environmental contexts rather than existing outside of them.

Although there are educators who advocate for a culturally neutral approach to mathematics (Clements, 2016; Hobson & Vu, 2015; Muntersbjorn, 2016), there is increasing evidence that ethnomathematical perspectives should be incorporated. Since the method fosters student interest, critical thinking, and accessibility, teachers frequently find it to be engaging (Verner *et al.*, 2013; Fouze & Amit, 2018b; Utami *et al.*, 2019).

Ethnomathematics as a Method for Teaching Mathematics

Mathematics becomes more relevant to students' cultural realities when ethnomathematics is incorporated into the classroom. Understanding improves and students are more engaged when lessons are based on their personal experiences (Meaney & Lange, 2012; Snounu, 2019). Additionally, this approach cultivates values like civic duty and respect for cultural diversity (Lafer & Tarman, 2018; Rosa & Orey, 2015; Solikhah & Budiharso, 2019).

Different classroom applications demonstrate how adaptable this strategy is:

- Indonesian students studied geometric concepts by analysing the architecture of the Borobudur and Prambanan temples (Muhammad *et al.*, 2020; Fitriawanawati *et al.*, 2020).
- Kraton Jogja: Teachers used historical structures and batik designs to integrate geometry and measurement lessons (Mauluah & Marsigit, 2019).
- Sundanese Culture in Banten: To improve student interaction and teach the properties of rectangles, a board game inspired by local customs was employed (Supriadi, 2019).

These examples demonstrate how relating mathematics to students' cultural backgrounds increases conceptual understanding and fosters engagement.

Ethnomathematics Curriculum

In order to make learning more inclusive and relevant,

there is a growing movement to update traditional mathematics curricula to include ethnomathematical concepts. D'Ambrosio's (1999, cited in Rosa & Orey, 2015) Trivium Curriculum Framework is one such model that highlights three important pillars: literacy, matheracy, and technocracy.

Literacy: Combining Academic and Cultural Understanding

Through meaningful cultural exchange, this component focuses on connecting students' cultural backgrounds with school-based learning (Ajaps & Obiagu, 2020; Newton *et al.*, 2020). To teach geometry, for instance, teachers might use classic games like Pacu Jalur (Riau) or Ayo Olopon (Yoruba), which call for mathematical reasoning regarding movement and dimensions (Fendrik *et al.*, 2020).

Matheracy: Understanding Cultural Significance and Symbols

Interpreting symbols, patterns, and structures in both mathematical and cultural contexts is a component of matheracy. By encouraging students to use mathematical reasoning to analyse cultural artefacts and motifs, it improves their cognitive and cultural literacy (Rosa & Orey, 2015).

Technocracy: Using Technology to Address Issues

The efficient use of technology in mathematics education and application is known as technocracy. For example, ethnomathematics lessons delivered via YouTube have been demonstrated to enhance student engagement and problem-solving skills (Nugroho, 2019; Mainali, 2021). Brazil, the Philippines, and Turkey are among the nations that have reported success incorporating these ideas into their educational systems, despite the fact that they are not yet widely accepted (Rosa & Orey, 2018; Rubio, 2016; Fouze & Amit, 2018b).

Moving Towards an Ethnomathematics Curriculum in Nigeria

Nigeria makes a compelling case for a localised ethnomathematics curriculum because of its rich cultural diversity. Mathematics like probability, geometry, and pattern recognition are embodied in indigenous games and customs like Ayo Olopon, Okoto (shell-spinning), and traditional weaving. Nonetheless, formal education underutilizes these resources.

Improving classroom relevance and better reflecting students' lived realities could be achieved by adapting the Trivium model to the Nigerian context. This strategy would also encourage cultural heritage preservation via teaching.

The Advantages of Integrating Ethnomathematics

Several advantages of integrating ethnomathematics into mathematics education are highlighted by research:

- A rise in student involvement and motivation (Bishop, 1991)

- Greater incorporation of various mathematical viewpoints (Gerdes, 1996).
- Improved capacity for critical thought and problem-solving (Ascher, 2002).
- The combination of academic and indigenous knowledge systems (Powell & Frankenstein, 1997).

Elements Affecting the Use of Teachers

Teachers are essential to ethnomathematics' success. Important elements that influence their capacity to apply this strategy are as follows:

- Knowledge and comprehension of ethnomathematical methods
- The accessibility of educational resources that are culturally appropriate
- The adaptability and alignment of the curriculum
- Opportunities for professional development and institutional support

Difficulties with Implementation

The widespread use of ethnomathematics is hampered by a number of obstacles, despite its potential:

- Strict curriculum frameworks that prioritise content standardisation (Adam *et al.*, 2003).
- Insufficient training for educators in culturally responsive teaching methods (Rosa & Orey, 2010).
- Inadequate teaching materials and evaluation instruments

Empirical Review

The realities of applying ethnomathematics are illuminated by empirical research conducted in a variety of settings:

Adam *et al.* (2003)

They discovered that teachers who were trained in ethnomathematics were more likely to incorporate cultural content into their lessons.

Rosa and Orey (2011)

Observed that although Brazilian educators recognised the importance of ethnomathematics, systemic obstacles prevented its full application.

Gerdes (1996)

Examined mathematical reasoning in African crafts, including architecture and basketry, proving their educational value.

Adamu (2022)

Ethnomathematics-based instruction increased students' interest in and retention of geometry.

Anchor *et al.* (2019)

Discovered that students who were taught using this method performed better than their peers in terms of retention and achievement.

Kurumeh *et al.* (2014)

Showed that it works for both sexes, suggesting that it has advantages for all students.

A Summary of the Literature Review

The literature review confirms that ethnomathematics enhances mathematics instruction by making it more engaging, culturally sensitive, and contextually relevant. Its integration is supported by theoretical underpinnings, and empirical data demonstrates its influence on student engagement and achievement. There are still a number of research gaps, though:

1. There is little research on the attitudes and behaviours of Nigerian educators.
2. Inadequate comprehension of the difficulties unique to secondary schools in Nigeria.
3. Absence of empirical evidence linking classroom implementation and teacher attitudes.
4. Lack of recommendations for policies that are specific to the educational system in Nigeria.
5. Disregard for the distinctive cultural background of south-west Nigeria.

By investigating the attitudes, difficulties, and application of ethnomathematical concepts by secondary school Mathematics teachers in south-west Nigeria, this study seeks to close these gaps. The results of this study will support continued initiatives to create culturally appropriate teaching methods and have an impact on curriculum reform in Nigerian schools.

MATERIALS AND METHODS

Research Design

To find out how secondary school Mathematics teachers in the south-west of Nigeria felt about ethnomathematics as a teaching strategy, this study used a descriptive survey research design. This design was thought to be suitable since it makes it possible to collect quantitative data from a sizable population, giving the researcher information about the attitudes, beliefs, and difficulties teachers encounter when putting ethnomathematical practices into practice in the classroom.

Population, Sample and Sample Techniques

All secondary school Mathematics teachers in the south-west geopolitical zone of Nigeria made up the study's population. In the six states of Ondo, Oyo, Osun, Ekiti, Ogun, and Lagos, this comprises secondary school teachers from both public and private institutions in both urban and rural areas.

To guarantee representation across a range of demographics and school types, a multi-stage sampling technique was used to choose a sample of 300 Mathematics teachers. The following were the sampling phases:

- To create the six states listed above, stratified sampling was used.
- Within each state, Local Government Areas (LGAs) were chosen using simple random sampling.

- Using factors like teaching experience, school location (rural or urban), and school type (public or private), Purposive Sampling was used to choose secondary school Mathematics teachers from selected schools within those LGAs.

Research Instrument

A self-created and validated structured questionnaire called Teacher’s Perception of Ethnomathematics (TPE) served as the primary data collection tool. Four sections made up the instrument, which was used to elicit responses on a range of topics related to teachers’ perspectives and experiences with ethnomathematics:

Section A

Demographic data (such as gender, academic background, teaching experience, school type, and location).

Section B

A four-point Likert scale is used to gauge teachers’ opinions about ethnomathematics.

Section C

The degree to which ethnomathematics is incorporated into teaching methods.

Section D

Obstacles faced when applying ethnomathematics. A four-point Likert scale was used to rate each item in Sections B, C, and D: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD).

Experts in educational measurement and mathematics education examined the TPE questionnaire to guarantee its content validity. They assessed the construct validity, content validity, and face validity of the instrument.

Prior to final production, suggestions and corrections were incorporated. Using the Cronbach Alpha method, the instrument’s reliability was assessed; the results showed acceptable internal consistency with reliability indices of 0.82 for Section B, 0.78 for Section C, and 0.76 for Section D. Trained research assistants from a few chosen schools distributed the survey. To guarantee high response rates and data integrity, responses were gathered as soon as they were finished.

Data Analysis

Analysing Data Both descriptive and inferential statistics were employed to analyse the gathered data:

- The research questions were addressed using descriptive statistics, which include frequency counts, percentages, means, and standard deviations. When interpreting responses on the Likert scale, an average mean score of 2.50 was chosen as the decision benchmark.
- At the 0.05 level of significance, inferential statistics of Pearson correlation coefficient and t-test were used to test the hypotheses.

RESULTS AND DISCUSSION

Results

Research Question 1

What is the teacher’s reaction to ethno-mathematics as a pedagogical approach?

Table 1: A descriptive table showing responses of teachers’ perceptions of Ethno-mathematics as a pedagogical approach

S/N	ITEMS	SA	A	D	SD	MEAN
1	Ethno-mathematics helps students relate mathematics to real life situations	160 (53.3%)	100 (33.3%)	30 (10.0%)	10 (3.3%)	3.36
2	Using cultural examples in mathematics lessons improves understanding	170 (56.7%)	90 (30.0%)	30 (10.0%)	10 (3.3%)	2.83
3	Ethno-mathematics should be integrated into the school curriculum	150 (50.0%)	100 (33.3%)	35 (11.7%)	15 (5.0%)	3.28
4	Teachers need more training on incorporating ethno-mathematics in their teaching	180 (60.0%)	85 (28.3%)	25 (8.3%)	10 (3.3%)	3.45
5	Ethno-mathematics makes mathematics more engaging and interesting for students	165 (55.0%)	95 (31.7%)	30 (10.0%)	10 (3.3%)	3.38

Authors’ Field Work, March 2025, N = 300, Grand Mean = 3.26, S.D = 0.248, Standard Mean = 2.50

Table 1 summarizes teachers’ perceptions of ethno-mathematics in teaching. The highest-rated item was: “Teachers need more training on incorporating ethno-mathematics” (M = 3.45), followed by “Ethno-mathematics makes mathematics more engaging” (M = 3.38), and “It helps students relate math to real-life situations” (M = 3.36). Other notable responses include: “Ethno-mathematics should be integrated into the curriculum” (M = 3.28), and “Using cultural examples improves understanding” (M = 2.83), which, though

lowest, still indicates moderate agreement. The grand mean of 3.26 (out of 4.00) exceeds the neutral benchmark of 2.50, reflecting a generally positive perception. A low standard deviation of 0.25 suggests strong consistency in responses, indicating that the positive views on ethno-mathematics are widely shared among the teachers.

Research Question 2

To what extent do teachers integrate ethno-mathematical concepts into their teaching practices?

Table 2: A descriptive table showing response to extent in which teacher integrate Ethno-mathematics concept into their teaching practices

S/N	ITEMS	SA	A	D	SD	MEAN	Decisions
1	I integrate Ethno-mathematics into my teaching practices	30 (10.0%)	50 (16.7%)	100 (33.3%)	120 (40%)	1.97	Disagree
2	I use local cultural examples when teaching mathematics concepts	25 (8.3%)	55 (18.3%)	90 (30.0%)	130 (43.3%)	1.92	Disagree
3	My Students responding positively to the Ethno-mathematics integration	140 (46.7%)	95 (31.7%)	50 (16.7%)	15 (5.0%)	3.20	Agree
4	The school Administration support the integration of Ethno-mathematics	55 (18.3%)	30 (10.0%)	110 (36.7%)	105 (35.0%)	2.12	Disagree
5	I have adequate resources to integrate Ethno-mathematics effectively	30 (10.0%)	60 (20.0%)	110 (36.7%)	100 (33.3%)	2.07	Disagree

Authors' Field work, March 2025, Grand mean=2.26, S.D= 0.533, Standard mean= 2-5

Table 2 presents teachers' responses on the extent of integrating ethno-mathematics into their teaching. The highest-rated item was: "My students respond positively to ethno-mathematics integration" (M = 3.20), followed by "School administration supports the integration" (M = 2.12), and "I have adequate resources to integrate ethno-mathematics" (M = 2.07). Lower ratings were recorded for "I integrate ethno-mathematics into my teaching" (M = 1.97), and "I use local cultural examples when teaching" (M = 1.92).

The grand mean of 2.25 (out of 4.00) falls below the average benchmark of 2.50, indicating that most

teachers either disagree or are neutral regarding actual implementation. This suggests a low level of integration despite the earlier noted positive perception. The standard deviation of 0.53 reflects moderate variability, implying that while some teachers may be implementing ethno-mathematics, overall usage remains limited—likely due to barriers such as lack of training, resources, or institutional support.

Research Question 3

What challenges do teachers face in implementing ethno-mathematics?

Table 3: Responses to Challenges Faced by Teachers in Implementing Ethno-Mathematics

S/N	ITEMS	SA	A	D	SD	Mean	Decisions
1	Lacks of teaching materials hinders the implementation of Ethno-mathematics	180 (60.0%)	80 (26.7%)	30 (10.0%)	10 (3.3%)	3.43	Agree
2	Teachers lack adequate training to implement Ethno-mathematics effectively	190 (63.3%)	75 (25.0%)	25 (8.3%)	10 (3.3%)	3.48	Agree
3	The Curriculum does not support the implementation of Ethno-mathematics	85 (28.3%)	165 (55.0%)	35 (11.7%)	15 (5.0%)	3.07	Agree
4	Ethno-mathematics is times consuming to implement in class	30 (10.0%)	10 (3.3%)	170 (56.7%)	90 (30.0%)	1.93	Disagree
5	Students Struggle to understand mathematics concept through Ethno-mathematics	20 (6.7%)	40 (13.3%)	100 (33.3%)	140 (46.7%)	1.80	Disagree

Authors' Fieldwork, March 2025, Grand mean = 2.74, S.D = 0.82, Standard mean = 2-5

The results in Table 3 highlight the challenges teachers face when implementing Ethno-mathematics in their classrooms. The most significant challenges identified were:

- Lack of adequate training (M = 3.48)
- Insufficient teaching materials (M = 3.43)
- Lack of curriculum support (M = 3.07)

On the other hand, challenges such as Ethno-mathematics being time-consuming (M = 1.93) and students struggling to understand the concepts (M = 1.80) received lower ratings.

The overall grand mean was 2.74 out of a maximum

of 4.00, which is above the decision threshold of 2.5, suggesting that teachers moderately face challenges in implementing Ethno-mathematics. The three highest-rated items were identified as the primary obstacles to successful implementation. In contrast, the lower-rated items reflect general disagreement among respondents, indicating that these challenges may not be as widely felt. The relatively high standard deviation of 0.82 indicates that responses varied significantly, suggesting that teachers' experiences may differ based on factors such as institutional support, access to resources, and professional training.

Research Hypotheses

Research Hypotheses

Null Hypothesis (H₀)

Hypothesis 1: There is no significant relationship between teachers' perceptions and the implementation of Ethno-mathematics.

The findings from Table 4 reveal that teachers' perception of Ethno-mathematics (M = 3.26, S.D = 0.25) and the implementation of Ethno-mathematics (M = 2.26, S.D = 0.53) were evaluated at a degree of freedom (d.f.) of 4, at a 0.05 significance level. Since the absolute r-value = 0.164 is less than the p-value = 0.793, we conclude that there

Table 4: Summary of Correlation Between Teachers' Perception and the Implementation of Ethno-mathematics in Schools

S/N	ITEMS	N	MEAN	S.D	D.F	r-value	p-value	Decision
1	Perception	5	3.26	0.25				
					3	0.164	0.793	N.S
2	Implementation	5	2.26	0.53				

P > 0.05 level of significance

is no significant relationship between the two variables. Therefore, the null hypothesis stating that there is no significant relationship between teachers' perceptions and the implementation of Ethno-mathematics is not rejected.

Hypothesis 3

There is no significant difference in the level of integration of Ethno-mathematics between teachers in urban and rural schools.

The findings from Table 5 indicate that the level of

Table 5: Summary of T-test Between the Level of Integration of Ethno-mathematics Between Teachers in Urban and Rural Schools

S/N	Location	N	MEAN	S.D	D.F	t-value	p-value	Decision
1	Urban	174	2.30	0.50				
					298	3.28	0.00117	Sig
2	Rural	126	2.25	0.55				

P < 0.05 level of significance

integration of Ethno-mathematics by teachers in urban schools (M = 2.30, S.D = 0.50) was compared with rural schools (M = 2.25, S.D = 0.55). The analysis was conducted at a 0.05 significance level, with 298 degrees of freedom. The t-value of 3.28 was found to be greater than the p-value of 0.0011, indicating that there is a significant difference in the level of integration of Ethno-mathematics between teachers in urban and rural schools. Therefore, the null hypothesis,

which posits that there is no significant difference in the level of integration of Ethno-mathematics between teachers in urban and rural schools, is rejected.

Hypothesis 4

There is no significant difference in the challenges encountered in implementing Ethno-mathematics between teachers from public and private schools.

Table 6: Analysis of T-test on Challenges Encountered in Implementing Ethno-mathematics Between Teachers from Public and Private Schools

S/N	Schools	N	MEAN	S/D	D.F	t-value	p-value	Decision
1	Publics	202	2.78	0.83				
					298	1.17	0.242	N.S
2	Private	98	2.66	0.83				

P < 0.05 level of significance

The findings from Table 6 reveal that the challenges encountered in implementing Ethno-mathematics between teachers from public schools (M = 2.78, S.D = 0.83) and private schools (M = 2.66, S.D = 0.83) were compared at a 0.05 significance level, with 298 degrees of freedom. The t-value of 1.17 is less than the p-value of 0.242, indicating that there is no significant difference in the challenges faced by teachers in implementing Ethno-mathematics between public and private schools. Therefore, the null hypothesis, which posits that there is

no significant difference in the challenges encountered in implementing Ethno-mathematics between teachers in public and private schools, is not rejected.

Discussion of Results

With a grand mean of 3.26, higher than the norm of 2.5, Table 1 shows that teachers usually see the integration of ethno-mathematics into the curriculum favorably. Most respondents agreed that ethno-mathematics helps students relate mathematics to real-life events, makes

mathematics more fascinating and engaging, should be taught in the curriculum, and calls for greater teacher training for efficient application. These results quite match earlier empirical research. For instance, Adam *et al.* (2003) discovered that skilled teachers were more likely to include mathematical knowledge from different cultures. Likewise, Rosa and Orey (2011) found favorable impressions of Brazilian educators despite institutional constraints. Emphasizing that ethno-mathematics increases student attention and retention, Adamu (2022) underlined the need of teachers appreciating this. Therefore, the perception data indicates that teachers are ready to implement ethno-mathematics, even if this enthusiasm does not always translate into action because of outside limitations.

Though Positive Perception, Implementation Still Low

Although opinions were favorable, actual implementation was low—a grand mean of 2.26, below the 2.5 average criteria. Items including “I integrate ethno-mathematics into my teaching” and “I use local cultural examples” were evaluated negatively; “students responding positively” got a higher mean score (3.20). This discrepancy between perception and practice corresponds with results from Rosa and Orey (2011), who observed that although teachers valued ethno-mathematics, they battled with pragmatic application because of obstacles. Furthermore, Gerdes (1996) noted that although African cultural traditions have great value, it is difficult to translate them into formal education without enough assistance. Therefore, even if there is conceptual support for ethno-mathematics, the practice is still limited and maybe owing to institutional and infrastructural limitations.

Challenges in Implementation

The survey ranked lack of training (3.48), lack of teaching materials (3.43), and curricular misalignment (3.07) as the top issues. The substantial standard deviation (0.82) points to considerable variation in the way these difficulties are felt in many circumstances. This is consistent with past studies including Adamu (2022) and Achor *et al.* (2019), who highlighted implementation difficulties while yet noting the value of ethno-mathematics. While noting structural constraints, Kurumeh *et al.* (2014) emphasized the benefits of inclusive teaching.

Generally speaking, empirical research concur that effective integration depends on curriculum changes and teacher capacity enhancement. These results imply that rather than attitudinal obstacles, systematic problems prevent the full-scale implementation of ethno-mathematical instruction.

Perception vs. Implementation Correlation

The findings revealed a weak, non-significant connection ($r = 0.164$, $p = 0.793$), meaning that classroom application does not always follow from positive impressions of ethno-mathematics. This validates results by Rosa and Orey (2011), who observed that although

many educators recognize the importance of ethno-mathematics, institutional obstacles including lack of materials, administrative support, and curriculum guidelines impede real application. Likewise, Adam *et al.* (2003) underlined how important training is; without it, even teachers with good opinions could lack the useful techniques to implement the method. This result implies that systematic and instructional support is required to close the discrepancy between theory and practice; perception by itself is not enough.

Public vs. Private School Perception

The study showed no appreciable variation ($t = 0.00$, $p = 1.000$) between public and private school teacher impressions. This implies that about the relevance and possibilities of ethno-mathematics, teachers in both kinds of schools have comparable opinions. As Gerdes (1996) underlined—who stressed the universality of mathematical knowledge ingrained in African traditions—this homogeneity may be ascribed to shared cultural exposure and educational instruction. Public and private school teachers may be equally exposed to the cultural practices that ethno-mathematics aspires to include notwithstanding institutional variances. This result does not, however, exclude the potential that variations in implementation could still occur under influence from elements like resource availability or school management techniques.

Urban vs. Rural Integration

With urban teachers reporting somewhat higher degrees of integration, the results disproved the null hypothesis by demonstrating a significant difference ($t = 3.28$, $p = 0.0011$). This outcome reflects differences in exposure to resources, training, and access between urban and rural environments. Adamu (2022) notes that while effective integration of culturally relevant teaching strategies improves student performance, this may be more difficult in rural schools where resources are few. Often more easily available in metropolitan environments, Adam *et al.* (2003) also stressed the value of contextual and infrastructure assistance. Location thus affects not only possibility but also the practicality of including ethno-mathematics in the classroom.

Public Versus Private School Difficulties

The findings revealed no appreciable variation in the difficulties experienced ($t = 1.17$, $p = 0.242$), implying that public and private school teachers run across comparable obstacles in trying to apply ethno-mathematics. Consistent with results from Rosa and Orey (2011), these obstacles include lack of instructional materials, inadequate training, and curricular restrictions. The equal standard deviation in both groups emphasizes even more the homogeneity of their experiences independent of the nature of the institution. These results strengthen the case that rather than focused school-level interventions, system-wide reforms and support systems are required.

CONCLUSION

Lastly According to the results of this study, secondary school Mathematics teachers in Southwest Nigeria view ethno-mathematics as a pedagogical tool usually favorably. Teachers see how it may improve student involvement and place mathematical learning in context. Though this positive view is encouraging, the actual integration of ethno-mathematics into classroom use is still poor. The main causes of this disparity are structural ones include inadequate training, poor teaching tools, and insufficient explicit curricular support. Urban instructors particularly noted a higher degree of integration than their rural counterparts, therefore highlighting differences in access and support systems.

Recommendations

The following suggestions are meant to close the discrepancy between knowledge and behavior:

1. Educational authorities should create and carry out ongoing professional development initiatives concentrated on the ideas and classroom application of ethno-mathematics.
2. Distribution of Resources: Stakeholders have to guarantee the availability of culturally relevant instructional resources that help to integrate ethno-mathematics.
3. Reviewing the national mathematics curriculum will help to explicitly incorporate ethno-mathematics, therefore offering precise instructions and models for classroom application.
4. Integrating ethno-mathematics into teacher preparation programs and national education policies can help policymakers give inclusive educational approaches top priority.
5. Equity Measures: Specific interventions should be created to assist instructors in rural regions, therefore addressing the particular difficulties they have using creative pedagogies.

REFERENCES

Adam, S., Alangui, W., & Barton, B. (2003). A comment on "Where mathematics meets culture". *Educational Studies in Mathematics*, 52(3), 327–335.

Adamu, M. (2022). The effects of ethno-mathematics approach on students' interest and retention in geometry. *Journal of Mathematics Education and Research*, 14(1), 22–35.

Achor, E. E., Imoko, B. I., & Uloko, E. A. (2019). Effects of ethno-mathematics based instructional model on students' achievement and retention in geometry. *Journal of Mathematical Sciences Education*, 7(1), 33–46.

Ajaps, S., & Obiagu, A. (2020). Developing culturally inclusive mathematics curriculum in Nigeria. *International Journal of Curriculum Studies*, 12(2), 45–59.

Ascher, M. (2002). *Mathematics elsewhere: An exploration of ideas across cultures*. Princeton University Press.

Aslan Tutak, F., Bondy, E., & Adams, T. L. (2011). Critical pedagogy for critical mathematics education. *International Journal of Mathematical Education in Science and Technology*, 42(1), 65–74.

Bigagli, D. (2019). Intercultural approaches in mathematics education. *Journal of Ethnomathematics*, 5(2), 88–99.

Bishop, A. J. (1991). *Mathematical enculturation: A cultural perspective on mathematics education*. Kluwer Academic Publishers.

Clements, D. H. (2016). Cultural neutrality in math: A critique. *Mathematics Teacher Educator*, 4(2), 34–48.

Erbilgin, E. (2017). The impact of cultural context on students' mathematical understanding. *Educational Sciences: Theory & Practice*, 17(1), 105–124.

Fendrik, F., Lestari, A. P., & Nugroho, S. E. (2020). Traditional games in geometry learning: The Pacu Jalur case. *Journal of Ethnomathematics and Mathematics Education*, 2(1), 50–59.

Fitrianawati, E., Jatmiko, B., & Prihandono, T. (2020). Ethnomathematics-based learning of geometry in Borobudur Temple. *Journal of Mathematics Education*, 11(3), 289–301.

Fouze, A. Q., & Amit, M. (2018b). Development of mathematical thinking through integration of ethnomathematics. *EURASIA Journal of Mathematics, Science and Technology Education*, 14(2), 561–572.

Gerdes, P. (1996). Ethnomathematics and mathematics education. In A. J. Bishop (Ed.), *International Handbook of Mathematics Education* (pp. 909–943). Springer.

Harbor-Peters, V. F. A. (2000). Mathematics as a tool for technological development in Nigeria. *Nigerian Journal of Mathematics Education*, 5(1), 1–9.

Hobson, N., & Vu, M. (2015). Debating cultural neutrality in mathematics. *Journal of Mathematics and Culture*, 9(2), 104–117.

Kurumeh, M. S., Onah, E. I., & Mohammed, I. Y. (2014). Gender and retention in statistics using ethnomathematics approach. *Journal of Education and Practice*, 5(17), 55–61.

Lafer, S., & Tarman, B. (2018). Preparing social studies teachers for culturally responsive teaching. *Journal of Social Studies Education Research*, 9(3), 103–123.

Mainali, B. (2021). Technological tools in ethnomathematics instruction. *Technology, Knowledge and Learning*, 26(4), 851–872.

Mauluah, M., & Marsigit. (2019). Ethnomathematics in the architecture of Jogja Kraton. *Indonesian Journal of Mathematics Education*, 10(2), 123–133.

Maryati, I., & Prahmana, R. C. I. (2019). Ethnomathematics in Indonesian batik patterns. *Journal of Mathematics and Culture*, 13(1), 5–20.

Meaney, T., & Lange, T. (2012). Ethnomathematics and education. In A. J. Bishop et al. (Eds.), *Third International Handbook of Mathematics Education* (pp. 247–270). Springer.

Muhammad, M., Sutawijaya, A., & Taufik, A. (2020).

- Learning geometry through temple architecture: A case of Prambanan. *International Journal of Education and Learning*, 2(2), 68–76.
- Muntersbjorn, M. M. (2016). Mathematics and cultural diversity: A philosophical critique. *Journal of Philosophy of Education*, 50(1), 1–15.
- National Council of Teachers of Mathematics. (2015). *Principles to actions: Ensuring mathematical success for all*. NCTM.
- National Policy on Education. (2013). *Federal Republic of Nigeria National Policy on Education (6th ed.)*. NERDC Press.
- Newton, K., White, M., & Bowers, J. (2020). Incorporating culture in mathematics curricula. *Journal of Mathematics Curriculum Development*, 7(1), 88–99.
- Nugroho, S. E. (2019). The use of YouTube-based ethnomathematics learning. *Journal of Digital Learning and Education*, 1(2), 37–45.
- Obodo, G. C. (2008). *Principles and practice of mathematics education in Nigeria*. Floxy Press.
- Powell, A. B., & Frankenstein, M. (Eds.). (1997). *Ethnomathematics: Challenging Eurocentrism in mathematics education*. SUNY Press.
- Rosa, M., & Orey, D. C. (2010). Ethnomathematics: The cultural aspects of mathematics. *Revista Latinoamericana de Etnomatemática*, 3(2), 2–20.
- Rosa, M., & Orey, D. C. (2011). Teacher perspectives on ethnomathematics. *International Journal for Mathematics Teaching and Learning*, 12(1), 1–24.
- Rosa, M., & Orey, D. C. (2015). The trivium curriculum in ethnomathematics. *International Journal of Education and Culture*, 7(1), 25–37.
- Rosa, M., & Orey, D. C. (2018). Ethnomathematics and the development of critical reflective thinking. *Educational Studies in Mathematics*, 99(1), 29–45.
- Rubio, R. A. (2016). Ethnomathematics in the Philippines: Bridging cultural and mathematical knowledge. *Philippine Journal of Education*, 92(2), 15–28.
- Snounu, Y. (2019). Culturally relevant pedagogy in mathematics. *International Journal of Mathematics Education*, 6(1), 17–29.
- Solikhah, I., & Budiharso, T. (2019). Civic values in mathematics through ethnomathematics. *Journal of Social Studies Education Research*, 10(1), 30–47.
- Sternberg, R. J. (2017). *Cultural intelligence and intelligent behavior*. Cambridge University Press.
- Supriadi, A. (2019). Teaching rectangular shapes using Sundanese culture-based games. *Journal of Mathematics and Culture*, 11(3), 212–228.
- Supiyati, S., Hadi, S., & Prabawanto, S. (2019). Anthropometric-based measurement in traditional Sasak houses: An ethnomathematical study. *Journal of Ethnomathematics and Mathematics Education*, 3(2), 117–128.
- Unodjaku, J. (2013). *Importance of mathematics for national development*. Benin City: Victor Publishing House.
- Verner, I. M., Massarwe, K., & Bshouty, D. (2013). Integrating ethnomathematics into education: A study on students' attitudes. *International Journal of Science and Mathematics Education*, 11(2), 439–464.
- West African Examinations Council (WAEC). (2018). *Chief Examiners' report on May/June 2018 WASSCE*. Lagos: West African Examinations Council.