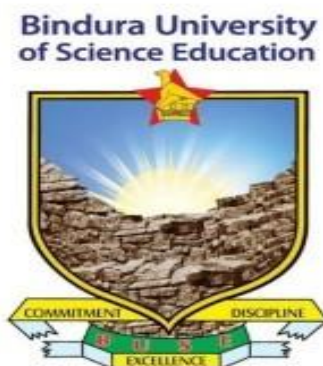




BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE EDUCATION

**BACHELOR OF SCIENCE EDUCATION HONOURS
DEGREE IN MATHEMATICS |**



**THE VIEWS OF TEACHERS TOWARDS INTERGRATING ETHNO MATHEMATICS
INTO SECONDARY SCHOOLS.**

BY

MABURUTSE EUGENIA

REG NO. B225832A

**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS OF THE BACHELOR OF SCIENCE HONORS DEGREE IN
MATHEMATICS EDUCATION**

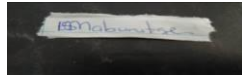
AUGUST 2025

RELEASE FORM

Title of the dissertation: The views of teachers towards integrating ethno mathematics into secondary schools.

To be completed by the student

I certify that this dissertation is in conformity with the preparation guidelines as presented in the Faculty Guide and Instructions for Typing dissertations.



27 AUGUST 2025

(Signature of student)

(Date)

To be completed by the supervisor

This dissertation is suitable for submission to the Faculty. This dissertation should be checked for conformity with Faculty guidelines.

(Signature of Supervisor)

AUGUST 2025
(Date)

To be completed by the chairperson of the department

I certify to the best of my knowledge that the required procedures have been followed and the preparation criteria have been met for this dissertation

(Signature of the chairman)

(Date)

APPROVAL FORM

Name of the student: Maburutse Eugenia

Registration Number: B225832A

Dissertation Title: The views of teachers towards integrating ethno mathematics into secondary schools.

Degree Title: Bachelor of Science Honours Degree in Mathematics Education.

Year of completion: 2025

PERMANENT ADDRESS: Masawi Primary School

Post Office Box 3907

Harare

DEDICATION

I would like to dedicate this project to Tony, my husband and children (Cyrus and Cheryl) who have taught me the hard way of doing things in life. We would always compete for the laptop with my kids whenever I wanted to do my project whilst they wanted to play games.

Furthermore, when they go to sleep and I feel it's the right time for me to work on my project, my husband would want attention from me. Despite these challenges they all want me to be successful in life; I had to work hard to accomplish my ambitions and meet their expectations as well.

ABSTRACT

This study examines the views of teachers towards integrating ethno mathematics into secondary school mathematics education. Ethno mathematics, which emphasizes the relationship between culture and mathematical practices, offers opportunities for contextualizing learning by drawing on learners' cultural experiences and indigenous knowledge systems. The research adopted a qualitative design within the postmodern-interpretive paradigm, focusing on how teachers perceive the relevance, opportunities, and challenges of incorporating ethno mathematical approaches in classroom practice. Data were collected through semi-structured interviews with secondary school mathematics teachers from selected schools. Ten participating mathematics teachers were purposively selected for the study. The findings from the results of the study showed a strong consensus among teachers on the importance of making mathematics culturally relevant through the integration of ethno mathematics. The findings indicate that while teachers generally acknowledge the potential of ethno mathematics to make mathematics more meaningful, engaging, and culturally responsive, they expressed concerns about limited training, lack of teaching resources, and the absence of clear curricular guidelines. The study concludes that effective integration of ethno mathematics requires targeted professional development, curriculum support, and the creation of culturally relevant teaching materials.

Key words: Ethno mathematics; Mathematics education; Teacher perceptions; Secondary schools; Indigenous knowledge.

ACKNOWLEDGEMENTS

I am deeply grateful to Almighty God for the strength and wisdom that sustained me throughout this research. My sincere appreciation goes to my supervisor, Dr Chagwiza, for the guidance and support provided during the study. I also thank the teachers, learners, and school administrators who participated in this research, as well as my family and friends for their constant encouragement and patience. To all who contributed in any way, I extend my heartfelt gratitude.

TABLE OF CONTENTS

Release form.....	(vii)
Approval form.....	(vii)
Dedication.....	(vii)
Abstract.....	(v)
Acknowledgements.....	(vi)

Chapter One: Introduction

1.1 Background to the Study.....	1
1.2 Statement of the Problem.....	2
1.3 Research Objectives.....	3
1.4 Research Questions.....	3
1.5 Significance of the Study.....	4
1.6 Limitation of the Study.....	6
1.7 delimitations of the Study.....	7
1.8 Definition of Key Terms.....	8
1.9 Organization of the project.....	9

Chapter Two: Literature Review

2.1 Introduction.....	11
2.2 Theoretical framework.....	11
2.3 Ethno Mathematics approach.....	14
2.4 The views of mathematics teachers on the integration of ethno mathematics into their teaching practices.....	15
2.5 The factors that influence teachers' decisions to integrate ethno mathematics into their teaching practice.....	18
2.6 The difficulties faced by teachers in integrating ethno mathematics into their teaching practices.....	20

2.7 Summary.....	22
------------------	----

Chapter Three: Research Methodology

3.1 Introduction.....	24
3.2 Research Paradigm.....	24
3.3 Research Methodology.....	25
3.4 Research Design.....	26
3.5 Population.....	27
3.6 Sample and Sampling procedure.....	28
3.7 Data Collection Instruments.....	29
3.8 Data Collection procedure.....	30
3.9 Data analysis.....	31
3.9 Trustworthiness (Credibility, Transferability, Dependability, Confirm ability).....	33
3.10 Ethical Considerations.....	34
3.11 Summary.....	34

Chapter Four: Presentation and Analysis of Findings

4.1 Introduction.....	37
4.2 Biographic factors.....	37
4.3 What are the views of mathematics teachers on the integration of ethno mathematics into their teaching practices?.....	38
4.4 What are the factors that influence teachers' decisions to integrate ethno mathematics into their teaching practices?.....	40
4.5 What are the difficulties faced by teachers in integrating ethno mathematics into their teaching practices.....	42
4.6 Summary.....	43

Chapter Five: Summary, Conclusions and Recommendations

5.1 Introduction.....	45
5.2 Summary of Major Findings.....	45

5.3 Conclusions of the Study.....	48
5.4 Recommendations.....	49
References.....	.57
Appendices.....	.59
Appendix: Interview Guide.....	59

CHAPTER 1: INTRODUCTION

CHAPTER 1

1.0 Introduction

The significance of mathematics in a developing country like Zimbabwe cannot be overemphasised. According to Madusise (2022), mathematics is viewed as a natural human activity which is important as a tool for solving everyday problems. The teaching methods used by the rural mathematics teachers in Zimbabwe have been of late castigated by some researchers, (Madusise, 2022; Sunzuma et al, 2021) due to their failure to link mathematics and the learners' out of school mathematics practices. The lack of connectivity between school mathematics and real life had earlier on been echoed by (Chahine, 2020), who affirms that the present curriculum is so divorced from the learners' out-of-school experience that it makes it difficult for learners to connect their context mathematics to school mathematics. Anisa et al., (2023) assert that learners do not perform well in mathematics due to a negative attitude towards mathematics. In most cases, learners develop a negative attitude towards mathematics because mathematics taught at school is not connected to the learners' real-life situations. Balabuch and Rasoarifetra (2023) assert that the failure rate in mathematics has been exacerbated by the lack of connectivity between learners' culture and school mathematics. This research, therefore, explores secondary school teachers' views on the incorporation of ethno mathematics into the curriculum, analysing the potential benefits, challenges, and implications for teaching and learning in a multicultural society

1.1 Background of the study

In 2025, the discussion surrounding the integration of ethno mathematics into Zimbabwe's secondary education system has gained significant traction. Ethno mathematics examines the relationship between mathematics and culture, emphasizing the importance of local knowledge in teaching mathematical concepts. In a diverse nation like Zimbabwe, where multiple ethnic groups coexist, integrating culturally relevant mathematics into the curriculum has become crucial for enhancing students' engagement and fostering inclusivity in learning. The Zimbabwean education system, while striving for modernization, faces challenges such as curriculum relevance, student engagement, and resource constraints.

As of 2025, efforts to diversify the curriculum have included calls for alternative approaches that respect and incorporate local cultural practices into mainstream education. Lacking cultural contextualized (ethno mathematics) in the teaching process is considered to be some

of the factors influencing students' interest and performance on mathematics (Budiharso & Tarman, 2020). A few studies have focused on cultural contextualization or ethno mathematics. Existing studies on ethno mathematics can be divided into three categories; the first category lists studies about ethno mathematics related to practical mathematics concepts in cultural life. Several studies have found that ethno mathematics concepts have been used in estimating, measuring, and making patterns in creating cultural sites, crafting, and fashion (Matsekoleng et al., 2024 ; Meaney et al., 2021). The second category includes studies that examine the use of ethno mathematics in the mathematics' curriculum and pedagogy in several countries such as in Hawai (Fendrick et al., 2020), Israel (Ghosh et al., 2023) and Indonesia (Handayani & Iswantiningtyas, 2020), specifically in teaching geometry (Sunzuma & Maharaj, 2020; Supriadi, 2023). The third category of studies highlights the teacher's competence on teaching mathematics through ethno mathematics like in Papua New Guinea (Olema et al., 2021) and Indonesia (Sahara et al., 2023). Such studies have failed to present the teachers' perception towards ethno mathematics approach. This study aims to fill the gap by exploring teachers' perception of teaching math through the ethno mathematics approach.

1.2 Statement of the problem

The way in which the Mathematics Curriculum is presented in Zimbabwe Curriculum Framework for Primary and Secondary Education [ZCFPE] (2015-2022) policy documents may sound perfect. However, quite often there are disparities between what is documented in the policy document and what is implemented in the mathematics classroom (Medyasari et al, 2021). According to Madusise (2022), teaching of mathematics in Zimbabwe lacks the desired interconnection between mathematics and culture which is a prerequisite for the learner to see the utility and the social value of mathematics. The failure of the mathematics teacher to form a link between secondary school mathematics and the learners' culture implies that the learners do not understand what the teachers will be teaching. The learners can only see the relevance of mathematics when there is connection between school mathematics and the learners' out of school mathematics practices.

The problem is that the mathematics teachers do not seem to see the connection between some secondary school mathematics topics and the learners' out-of-school mathematics practice (Sunzuma & Maharaj, 2020). It is against this background that this study sought to establish the views of teachers towards integrating ethno mathematics into secondary schools.

1.3 Research questions

1.3.1 What are the views of Mathematics teachers on the integration of ethno mathematics into their teaching practices?

1.3.2 What are the factors that influence teachers' decisions to integrate ethno mathematics into their teaching practices?

1.3.3 What are the difficulties faced by teachers in integrating ethno mathematics into their teaching practices?

1.4 Research objectives

1.4.1 Establish the views of Mathematics teachers on the integration of ethno mathematics into their teaching practices.

1.4.2 Determine the factors that influence teachers' decisions to integrate ethno mathematics into their teaching practices.

1.4.3 Identify the difficulties faced by teachers in integrating ethno mathematics into their teaching practices.

1.5 Assumptions of the study

This study is grounded on several underlying assumptions that are necessary for the research to be valid and meaningful. Firstly, it is assumed that teachers possess varying levels of awareness and understanding of ethno mathematics. Their professional training, teaching experience, and exposure to culturally responsive teaching methods likely influence their familiarity with this concept.

Another key assumption is that teachers' views and attitudes towards integrating ethno mathematics are shaped by their own cultural backgrounds and lived experiences within the classroom and school system. These perspectives may differ depending on their beliefs about the nature of mathematics, their teaching philosophies, and the socio-cultural environment in which they operate.

The study further assumes that teachers will respond to interviews with honesty and thoughtfulness. The reliability of the data collected depends on the willingness of participants to reflect openly on their experiences, practices, and any challenges they face in implementing ethno mathematical approaches.

It is also assumed that the integration of ethno mathematics into secondary school mathematics has the potential to improve student learning by making mathematical concepts more

meaningful, relevant, and engaging. The study operates on the belief that recognizing and incorporating learners' cultural contexts can enhance their understanding and appreciation of mathematics.

Additionally, the research assumes that teachers have at least some level of autonomy in how they interpret and deliver the curriculum. This includes the flexibility to incorporate ethno mathematical content and culturally relevant examples where appropriate, depending on institutional support and policy constraints.

The study also presumes that educational policy, curriculum guidelines, and examination demands play a significant role in influencing teachers' decisions to integrate or exclude ethno mathematics in their teaching. Lastly, it is assumed that the school environment, such as leadership support, resource availability, and the involvement of the local community, can either support or hinder the adoption of ethno mathematical practices in the classroom.

These assumptions provide a foundation upon which the study is designed and carried out, and they shape the interpretation of the findings that will emerge from the investigation.

1.6 Significance of the study

The study on the views of teachers towards integrating ethno mathematics into secondary schools is significant for several important reasons, particularly in the context of promoting culturally relevant and inclusive education.

First, this study contributes to the advancement of culturally responsive teaching. By exploring teachers' perspectives, it sheds light on how ethno mathematics, which connects mathematical concepts to local and indigenous cultural practices, can be used to make mathematics more meaningful and accessible to learners. When learners see their cultural backgrounds reflected in the content they are studying, it enhances their engagement and strengthens their connection to the subject.

Additionally, the study plays a crucial role in bridging the gap between traditional knowledge and formal school mathematics. Many indigenous and local communities possess rich mathematical practices embedded in daily life, such as in farming, construction, weaving, and trade. Understanding how teachers perceive these practices in relation to the secondary school curriculum can help identify ways to incorporate them into classroom teaching. This has the

potential to broaden the scope of mathematical understanding beyond textbook definitions and promote a more inclusive view of what counts as mathematics.

The study also has implications for teacher training and professional development. By identifying teachers' attitudes, experiences, and possible hesitations regarding ethno mathematics, the research can highlight areas where additional support or training is needed. This ensures that teachers are not only aware of ethno mathematical concepts but are also equipped with the strategies and confidence to integrate them effectively into their teaching.

Furthermore, the study can inform curriculum development and educational policy. As education systems increasingly aim to decolonize curricula and reflect local realities, research that captures teachers' views becomes essential. The findings can guide policymakers and curriculum designers in making informed decisions about how to include indigenous mathematical knowledge in a way that supports learning objectives without compromising academic standards.

Another important aspect of this study is its potential to enhance student-learning outcomes. When mathematical content is presented through familiar cultural contexts, learners are more likely to understand and retain concepts. This relevance not only boosts learner motivation but can also contribute to improved performance, especially for those who may struggle with abstract or disconnected teaching methods.

Beyond the classroom, the study supports the preservation and validation of indigenous knowledge systems. By acknowledging the mathematical value of traditional practices, it promotes respect for cultural heritage and reinforces the idea that all cultures contribute to human knowledge. It also encourages teachers to view themselves as key agents in preserving and transmitting this knowledge to future generations.

Lastly, the study fosters reflective practice among teachers. Engaging with the concept of ethno mathematics requires teachers to reflect on their own beliefs, teaching methods, and the cultural assumptions embedded in their instruction. This reflective process is vital for professional growth and for cultivating more inclusive and context-sensitive teaching approaches.

In conclusion, this study is significant not only for its academic contributions but also for its practical implications in teaching, curriculum design, and educational equity. It provides

valuable insights into how ethno mathematics can be meaningfully integrated into secondary schools and highlights the central role of teachers in making mathematics education more inclusive, relevant, and culturally grounded.

1.7 Limitations

The study on the views of teachers towards integrating ethno mathematics into secondary schools is valuable for understanding how cultural elements can enhance mathematics education. However, like any research, it is subject to certain limitations that must be acknowledged to provide a balanced interpretation of the findings.

One major limitation lies in the scope and sample size of the study. The research was conducted within a specific geographical region and among a small group of teachers. Due to this, the views expressed might not be representative of the wider teaching population. Teachers in different regions or cultural settings may have varying experiences, beliefs, and levels of exposure to ethno mathematics, which could affect the generalizability of the results.

Another limitation is the potential subjectivity and variability in interpretation of what constitutes ethno mathematics. Since individuals can understand the concept differently, teachers' responses might reflect personal beliefs rather than a uniform understanding of ethno mathematical practices. This diversity of interpretation can make it difficult to draw consistent conclusions or apply findings across different educational contexts.

Additionally, the study may be limited by response bias. Teachers might provide socially desirable answers, especially if they perceive that supporting the integration of ethno mathematics aligns with current educational trends or cultural expectations. As a result, their responses might not fully reflect their actual classroom practices or personal reservations.

The research might also face constraints in terms of depth of inquiry. The study relies heavily on interviews and might capture surface-level attitudes but not fully explore the practical challenges teachers face when attempting to implement ethno mathematics. Moreover, the study could be limited by the lack of existing curriculum support or institutional frameworks. Teachers' views on ethno mathematics may be shaped by what is or isn't currently emphasized in the curriculum. If the education system does not formally support the integration of

indigenous knowledge, teachers may feel unprepared or uncertain, which in turn may influence their responses in ways that reflect systemic barriers rather than personal attitudes.

Finally, the study may not account for external factors such as time constraints, examination pressures, and resource availability, which significantly affect a teacher's ability to integrate ethno mathematics. These structural limitations can influence teacher attitudes and their willingness or capacity to experiment with new approaches, but may not be fully captured through self-reported data.

In summary, while the study offers important insights into teacher perspectives, its findings must be understood within the context of limitations related to sample size, subjectivity, response bias, research design, and systemic constraints. Acknowledging these limitations is crucial for interpreting the results accurately and for guiding future research on the integration of ethno mathematics in education.

1.8 Delimitations

The study on the views of teachers towards integrating ethno mathematics into secondary schools was guided by specific delimitations that define the scope and focus of the research. These delimitations are intentional boundaries set by the researcher to ensure manageability, clarity, and relevance within the context of the study.

Firstly, the study was delimited to secondary school teachers. While ethno mathematics can be applied across various educational levels including primary and tertiary, the decision to focus solely on secondary education allows for a more targeted investigation. This focus is particularly relevant because secondary school mathematics often becomes more abstract and examination-oriented, making the integration of cultural or indigenous knowledge both more challenging and more critical.

Secondly, the research was confined to teachers' perspectives, rather than including the views of students, parents, curriculum developers, or policymakers. This delimitation helps maintain a focused inquiry on the individuals who are directly responsible for delivering mathematics instruction. Since teachers play a central role in interpreting and implementing curriculum, their views are crucial in understanding both the potential and the challenges of integrating ethno mathematics into classroom practice.

Another delimitation was the geographic and cultural context within which the study was conducted. The research may focus on a particular region, country, or school district, possibly one with a strong presence of indigenous knowledge systems. This allows for a more in-depth exploration of how local cultural practices intersect with formal mathematics education. However, it also means that findings may not be directly applicable to other contexts with different cultural, social, or educational dynamics.

In addition, the study was delimited to qualitative methods using such as interviews. This methodological choice allows for rich, descriptive insights into teachers' beliefs, experiences, and perceptions. However, it also means that the study may not seek to measure statistical trends or generalize findings beyond the sample.

The research was also delimited by its thematic focus on attitudes, beliefs, and perceived strategies, rather than on classroom implementation or student outcomes. This means the study does not evaluate the effectiveness of ethno mathematics in improving academic performance but rather concentrates on understanding how teachers perceive and approach its integration into their teaching.

Lastly, the study excluded policy analysis or curriculum evaluation but only relied on the views of the teachers. While curriculum and policy may influence teacher perspectives, the study prioritized the voices of teachers rather than examining official documents or directives in detail.

In summary, the delimitations of this study helped to narrow its scope by focusing specifically on secondary school teachers, within a defined cultural or geographical context, using qualitative methods to explore their views on ethno mathematics. These boundaries are purposeful and enable a deep, focused investigation into a complex and culturally significant area of mathematics education.

1.9 Definitions of terms

Ethno mathematics

Ethno mathematics is a pedagogy in which the learners' home mathematical practices are put into consideration. Prahmana and D' Ambrosio, (2020) defined ethno mathematics as the way different cultural groups use mathematics. Thus, ethno mathematics refers to the study of the relationship between mathematics and culture. It explores how mathematical concepts and

practices emerge naturally from the daily lives, traditions, and cultural systems of different communities. Rather than viewing mathematics as a purely abstract or universal discipline, ethno mathematics recognizes that people around the world have developed their own ways of counting, measuring, reasoning, designing patterns, and solving problems, often outside the context of formal schooling.

In the classroom, ethno mathematical approaches have also been shown to strengthen students' mathematical communication skills. When learners work with familiar cultural contexts, they tend to express mathematical ideas more confidently and accurately, both orally and in writing (Iswandani et al., 2023). This supports the idea that connecting mathematics to students' lived experiences helps them articulate and internalize abstract concepts more effectively.

In conclusion, ethno mathematics provides a powerful framework for making mathematics more inclusive, relevant, and culturally grounded. It challenges teachers to value the diverse ways in which mathematics exists in everyday life and to use that richness to create more engaging and effective learning experiences. By acknowledging that mathematical thinking exists in many forms across different cultures, ethno mathematics not only enhances learning but also affirms the cultural identities of all students.

1.10 Organisation of the study

Chapter 1 was about introduction, problem statement, and background to the study, motivation, research aims and objectives, research questions, and significance of study. It also looked at limitations, delimitation of the study and finally defined the key concepts used in the study. Chapter 2 focused on literature review. Chapter 3, presents the methodological considerations for the study. Chapter 4, presents the findings of this study. Finally, chapter 5 presents the conclusion and the recommendations of the study.

1.11 Summary

Chapter 1 of this study introduced the research problem, contextual background, and rationale for investigating the integration of ethno mathematics in Zimbabwean secondary school mathematics classrooms. The chapter highlighted that traditional mathematics instruction often lacks cultural relevance, making it abstract and disconnected from learners' daily experiences. This disconnection can lead to reduced motivation, engagement, and understanding among students, which underscores the need for teaching approaches that integrate learners' cultural knowledge and everyday mathematical practices.

The chapter outlined the research problem, focusing on teachers' perceptions, experiences, and challenges in using ethno mathematics as a pedagogical approach. It emphasized that while ethno mathematics has been shown internationally to improve engagement, understanding, and performance, its application in Zimbabwean secondary schools remains limited and underexplored.

The research objectives were clearly stated, including investigating teachers' perceptions and support for ethno mathematics, examining its impact on student engagement and learning, and identifying barriers to its effective integration. The study also formulated research questions aligned with these objectives, aiming to explore both the benefits and challenges of implementing ethno mathematics in classroom practice.

The chapter justified the significance of the study, noting that findings could inform curriculum development, teacher professional development, and the design of culturally relevant teaching materials. It also emphasized the study's potential contribution to improving mathematics teaching and learning by connecting formal mathematical concepts with learners' cultural and everyday experiences.

Finally, Chapter 1 described the scope, delimitations, and limitations of the study. The scope focused on secondary school mathematics teachers in selected Zimbabwean schools, while delimitations included the focus on teachers' perceptions rather than student outcomes. Limitations acknowledged potential challenges such as sample size, subjectivity in qualitative responses, and contextual specificity.

CHAPTER 2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the theoretical framework and literature review underpinning this study. The study sought to explore the views of teachers in integration of ethno mathematics into the teaching of mathematics. The chapter explains how this study is informed by the Sociocultural Theory and explores into the findings of the previous studies on integrating ethno mathematics into the teaching and learning mathematics in schools.

2.2 Socio-Cultural Theory

Sociocultural Theory emanated from the work of Vygotsky (1896-1934) guide this study. The Sociocultural Theory is a theory of mental development that recognises the central role played by social relationships and culturally constructed artefacts in “organising uniquely human form of thinking (Lohse et al., 2020). Although the Sociocultural Theory was developed based on language development, it can also be used as a theoretical framework for exploring the views of teachers in integrating ethno mathematics in secondary school mathematics.

According to Pradana et al., (2022) social interaction plays a fundamental role in the improvement of learning. In this regard, learning is viewed as embedded in social and cultural contexts. Social context refers to how people’s surroundings influence how they view and interpret things, whereas cultural context refers to the environmental situation relevant to the beliefs, values and practices of a given culture (Odora, 2021). In other words, cultural context refers to the social expectations that may be considered normal for the particular time, place and event where it takes place. Social context reflects how the event occurring affects one’s action and attitude at the time and place of its occurrence. The major assertion of Sociocultural Theory is that learning, thinking, and knowing are relations among people in activity with, and arising from the socially and culturally structured world (Bunn et al., 2022).

Vygotsky’s Sociocultural Theory of cognitive development, as outlined in Zuhra et al. (2021), emphasizes the fundamental role that social interaction and cultural context play in shaping a child’s learning and development. Several key ideas form the backbone of this theory:

One of the central concepts is internalisation, which refers to the process through which learners absorb new knowledge from their social and cultural environment. According to Vygotsky, knowledge is first encountered in social settings, through interaction with other and only becomes meaningful and personal to the learner through internalisation. The language

used within the social context heavily influences this process. The language acts as a medium through which cultural knowledge is transmitted and understood.

Another important concept is the Zone of Proximal Development (ZPD). Vygotsky defines this as the difference between what a learner can do independently and what they can accomplish with guidance from a more knowledgeable individual, such as a teacher, parent, or peer. The ZPD illustrates the potential for learning when appropriate support is given, suggesting that cognitive development is most effective when learners are challenged just beyond their current capabilities but still within reach with assistance.

Closely related to the ZPD is the idea of scaffolding, which refers to the support provided by a more competent individual to help a learner perform a task they would not be able to do alone. Scaffolding involves guiding the learner through interaction and feedback, often beginning with collaborative effort and gradually withdrawing support as the learner gains independence. This process facilitates not only cognitive growth but also socio-emotional and behavioural development.

Mediation is another key component of Vygotsky's theory. It posits that learners do not engage directly with the world, but rather interact with it through tools or signs, which mediate their experiences. These tools include both psychological tools (like language, symbols, and concepts) and social tools (like norms, practices, and institutions). Together, these constitute cultural tools, which are instrumental in shaping how individuals think and learn within a given cultural setting.

Lastly, the theory incorporates the notion of dynamic assessment, which shifts focus from what a learner can do independently to what they can achieve with guidance. This form of assessment is considered a more accurate reflection of a learner's cognitive potential. By observing how much assistance a learner requires to solve a problem, teachers or parents can gain deeper insights into the learner's capabilities and tailor their support accordingly.

In sum, Vygotsky's Sociocultural Theory highlights that learning is inherently a social process, deeply embedded in cultural context, and reliant on meaningful interaction with others. It underscores the importance of guided learning, the strategic use of cultural tools, and the potential within each learner that can be drawn out through thoughtful and responsive support.

Of paramount importance of these ideas to this study is the Zone of Proximal Development, which Vygotsky (1978) define as the distance between the actual development level of problem solving that the learner achieves independently and the potential development under the guidance of the teacher or parent or in collaboration with a more capable peer.

Some proponents of Socio-Cultural Theory (Lu & Sides, 2020; Zuhra et al., 2021) argue that learning is enhanced when the activities and the perspectives of the group shape knowledge. They argue that collaborative learning creates a sense of a community in which the learners can be moved from Vygotsky's first level of learning (guided learning) to the second level (independent learning). According to Socio-Cultural Theory, learning happens through social interaction and is situated in specific cultural environments (Brijlall and Abakah, 2022). In addition to this, Socio-Cultural Theory advocates for learner-centred approaches in which the teacher is only a facilitator of learning. In support of this view, Prastika et al., (2021) states that put Socio-Cultural Theory into consideration the important role that social relations, community and culture play in cognitive learning. This implies that the mathematics teachers need to properly design activities such as games in the context of ethno mathematics, which the learners should play. In addition, they should employ group work in order for the learners to help each other since group work can make the learners understand concepts better.

Socio-cultural learning theories regard learning as a product of social interaction and cultural context. De las Penas et al., (2021) posits that in a socio-cultural perspective reality is not something that individuals can discover because it does not pre-exist prior to its social invention. This implies that learners take part in creation of the social reality through participating in the communities in which they live. The learners are not observers in the society they live but they are active participants, and it is through social participation that shapes the way they understand reality. Although learning may involve the learner's mind, Socio-Cultural Theory emphasis that learning is highly dependent on the learner's interaction with other members in the community. According to Bunn et al., (2022), Socio-Cultural Theory takes into consideration social and cultural aspects of acquiring knowledge. This implies that under Socio-Cultural Theory, knowledge construction by the learner is not independent of the social and cultural context. Basing on this perspective, the role of the teacher is to elicit and understand the prior instruction knowledge of the learners to help learners to construct new knowledge and connect it with what they already know.

Vygotsky's Sociocultural Theory provides a strong theoretical foundation for this study because it emphasizes the role of social interaction, cultural context, and language in learning, all of which are central to the integration of ethno mathematics in mathematics teaching. According to Vygotsky (1978), learning is a socially mediated process, where learners construct knowledge through interactions with more knowledgeable others, such as teachers, peers, and community members, within their cultural context. This perspective aligns closely with the principles of ethno mathematics, which seeks to connect formal mathematical concepts with learners' everyday experiences and cultural practices.

Using Vygotsky's framework allows the study to conceptualize mathematics learning as an active, participatory process. It supports the idea that students' prior knowledge, cultural experiences, and social interactions are valuable resources for constructing new mathematical understanding. The framework also highlights the importance of scaffolding, where teachers guide learners to bridge the gap between their existing knowledge and new concepts, which is critical when integrating culturally relevant examples into mathematics instruction.

Furthermore, Vygotsky's theory underscores the significance of language as a tool for cognitive development. In the context of ethno mathematics, mathematical language often differs from everyday language, which teachers identified as a barrier in this study. By framing the research within Vygotsky's theory, the study can explore how teachers mediate learning by linking familiar cultural contexts and everyday mathematical practices to formal classroom instruction, thereby enhancing comprehension and engagement.

In the Zimbabwean educational context, applying Vygotsky's Sociocultural Theory provides a lens to understand how teachers can leverage students' cultural knowledge and prior experiences to make mathematics meaningful and relevant. It also justifies the focus on teachers' perceptions and instructional strategies, as their role in mediating learning within culturally grounded contexts is central to the effective implementation of ethno mathematics.

In summary, Vygotsky's Sociocultural Theory is appropriate for this research because it emphasizes the interconnectedness of culture, social interaction, and learning, providing a theoretical basis for investigating how ethno mathematics can enhance students' understanding, motivation, and engagement in mathematics.

2.3 Ethno mathematics Approach

Prahmana and D' Ambrosio (2020) used the term of ethno mathematics to express the connection between culture and mathematics. Mathematics, which is close to the cultural perspective, includes arithmetic, classifying, ordering, and modelling. Ethno mathematics is simply defined as the style, art, and method of understanding, managing, explaining, and connecting between mathematics and the environment, social and nature. Although criticism emanated from some teachers that believe mathematic teaching should be culture-free (Owusu & Obuo-Adolo, 2023; Melaningsih et al., 2023; Lidinillah et al., 2022), several teachers perceive ethno mathematics approach positively.

2.4 The views of Mathematics teachers on the integration of ethno mathematics into their teaching practices.

The integration of ethno mathematics into secondary school curricula has sparked both enthusiasm and concern among educators. Ethno mathematics, a term coined by, Prahmana and D' Ambrosio (2020) refers to the study of mathematical practices rooted in diverse cultural traditions. It challenges the traditional Eurocentric approach to mathematics by highlighting the mathematical systems embedded in everyday cultural activities around the world. As the push for culturally responsive teaching grows, teachers' perceptions play a pivotal role in determining whether and how ethno mathematics is adopted in classrooms.

Many teachers express support for ethno mathematics due to its potential to make mathematics more relevant and engaging for students, particularly those from marginalized backgrounds. By situating mathematical concepts within students' cultural contexts such as African fractals, indigenous measurement systems, or local architectural design, teachers can make abstract topics more tangible and meaningful (Alangui, 2020). This cultural alignment has been shown to improve student motivation and reduce math anxiety (Mowi et al., 2021).

Ethno mathematics is seen by some teachers as a way to promote inclusivity and social justice. By integrating diverse mathematical knowledge systems into the curriculum, teachers can challenge dominant narratives that often portray mathematics as a purely Western invention (Prahmana & D' Ambrosio, 2020). This aligns with the goals of multicultural education, which aims to provide equitable learning opportunities for all students (Gunawan et al., 2022).

Despite its promise, several teachers voice practical and pedagogical concerns about integrating ethno mathematics. A primary challenge is the lack of training and accessible teaching resources. Many teachers feel ill equipped to teach mathematics through a cultural

lens, particularly when it involves unfamiliar traditions or requires interdisciplinary knowledge (Mania & Alam, 2021). Without sufficient professional development, there is a risk of superficial or incorrect representations of cultural practices.

Curriculum constraints also pose a barrier. The pressure to meet standardized testing requirements and cover a prescribed syllabus can make it difficult for teachers to incorporate additional material, even when they value its importance (Asrial et al., 2020). In many educational systems, the prioritization of exam-oriented content limits the flexibility teachers have to adapt or enrich the curriculum.

Another concern is the perception among some teachers that ethno mathematics may lack the rigor associated with formal mathematics. Critics argue that traditional curricula emphasize abstract reasoning and symbolic manipulation, which may be diluted if too much emphasis is placed on cultural context (Khusaini et al., 2022). As a result, some teachers hesitate to embrace ethno mathematics, fearing it might compromise academic standards.

Kusnandi (2020) also argues that teachers view mathematics taught in the schools as detached from its rich intellectual setting in the culture of civilisation and is reduced to a series of techniques and has been grossly distorted. This means that the mathematics taught in the schools lacks connection with real life mathematics found in the learners' culture, and it is nothing more than sequenced techniques. Integration of ethno mathematics into the teaching of mathematics utilises the local strategies, which can enable the teachers to link the learners' spontaneous ideas to the school mathematics, and in the process assists the learners to understand school mathematics. The teachers' role in an ethno mathematics approach is to narrow the gap between the learners' spontaneous ideas and school mathematics by creating a classroom situation which links the out-of-school mathematics ideas with the school mathematics (Morabito, 2020). The learners may be motivated to do well in mathematics when they see their out-of-school mathematics practices in the classroom.

Integration of ethno mathematics in the teaching of mathematics can encourage learners to construct personal mathematical understanding and be able to explain their work ((Khusaini et al., 2022). Instead of memorising some mathematics formulas and procedures, the learners can understand mathematical concepts and be able to justify and apply their knowledge. The learners can also help each other during the mathematics lesson because each one of them has their own way of understanding the mathematical concepts that will be under consideration.

Morabito, (2020) assert that culturally relevant mathematics pedagogy makes mathematics meaningful. They go further to say that if the mathematics tasks are made meaningful; this may influence the learners' understanding of mathematical concepts and hence improve their achievement. This implies that mathematical tasks become meaningful when they relate to the real world in which the learners live.

Apart from making mathematics understandable and interesting to the learners, culturally relevant mathematics teaching enables the learners to participate in the society in which they live meaningfully. The role of motivation should be on the centre stage when developing a culturally relevant pedagogy. However, this motivation should be brought about through making the learners realise the importance of mathematics in their daily life. Budiharso and Tarman (2020) affirms that a culturally relevant pedagogical approach positively affects engagement, motivation and mathematical performance, for the poor underperforming children. According to (Gunawan et al., 2022), culturally relevant pedagogical approaches are teaching approaches that put into consideration the learners' cultural knowledge, prior experiences, frames of references and performance style of ethnically diverse learners to make learning encountered more relevant and effective to them. According to Jumba and Mwiti (2022), when the learners' out-of-school mathematics activities are incorporated in the school mathematics learners develop self-confidence, which makes them improve their participation in class as well as performance. Furthermore, integrating ethno mathematics does not necessarily mean replacing traditional content, but rather enriching it through culturally responsive examples that maintain mathematical rigor ((Khusaini et al., 2022).

According to Danna (2021), teachers view teaching mathematics through ethno mathematics not only interesting but also capable of presenting context and engagement. When context and engagement appear in the learning process, students find it easier to understand the lesson and are more likely to bring experience into their daily lives (Caporuseio, 2023; Danna, 2021). As a result, students are prepared to live in societies concerning cultural dignity, show critical reflexivity toward social justice, and be aware of their duties or responsibilities in the practice of citizenship (Prahmana & D' Ambrosio, 2020 ; Mowi et al., 2021 ; Chhabra, 2020).

A study done by Prahmana and D' Ambrosio (2020) revealed that teachers view integration of ethno mathematics as enabler to the learner to understand mathematics through seeing the application of mathematics. In other words, integrating ethno mathematics helps the learner to

be mathematically literate. Chivaz and Miyakawa (2020) point out that learners taught using an ethno mathematical approach can contribute and participate in society in which they live with confidence. This may be since ethno mathematics helps the learners to understand their environment and activities, which the teacher mathematics in the mathematics lesson.

Teachers' views on integrating ethno mathematics into secondary schools reflect a balance between enthusiasm for its cultural relevance and caution over practical implementation. While many educators recognize its value in making mathematics more inclusive and engaging, concerns about training, curriculum demands, and academic rigor persist. Addressing these concerns through systemic support and professional development will be essential for the successful integration of ethno mathematics into secondary education.

Teachers' views on integrating ethno mathematics into secondary schools reflect a balance between enthusiasm for its cultural relevance and caution over practical implementation. While many educators recognize its value in making mathematics more inclusive and engaging, concerns about training, curriculum demands, and academic rigor persist. Addressing these concerns through systemic support and professional development will be essential for the successful integration of ethno mathematics into secondary education.

2.5 The factors that influence teachers' decisions to integrate ethno mathematics into their teaching practice.

The daunting task faced by mathematics teachers is to reframe mathematical instruction to be culturally relevant for the learners. According to Medyasari et al., (2021) the teaching of mathematics in Zimbabwe secondary schools is mostly irrelevant to the learners. According to Madusise, (2020), traditionally in the mathematics classrooms, the relevance of culture has been strangely absent from content and instructions. The textbooks make the situation worse that the teachers use which do not have tasks that deal with the learners' out-of-school mathematics experiences. This is supported by Morabito (2022) who argues that instructional choices of several teachers focus on strict adherence to textbook tasks with little or no potential to make connections to students' culture.

Prahmana and D' Ambrosio (2020) affirms that mathematics in many classrooms has practically nothing to do with the world that the learners are experiencing. This results in both

the learners and the teacher thinking that there is no connection between mathematics and culture. According to Munir (2023), mathematics teachers should have a particular ability and responsibility to help learners to find the intersection between their realms of meaning and those of the teacher. In addition to that Hadayat (2021) says that in the mathematics classroom, the teacher should strive to link mathematics with everyday life, with prior knowledge, with familiar contexts within school and outside, with other topics within mathematics and with the past and the likely future.

Traditional mathematics classrooms are characterised by use of formulas without bothering how these formulas are derived resulting in the learners memorising the formulas without understanding the concepts. Lack of connection between culture mathematics and school mathematics results in learners failing to understand mathematics (De las Penas et al., 2021). According to Morabito, (2020), as mathematics teachers strive to use a cultural approach to improve the learners' performance in mathematics, they should re-engineer mathematics classroom content and classroom instruction to support a culturally relevant approach. Integrating ethno mathematics into the school mathematics is therefore the responsibility of the mathematics teachers who should work on the content and instruction to make them relevant to the learners. When integrating ethno mathematics in the teaching of mathematics, the mathematics teachers should design tasks, which appear to be building relationships and utilise mathematics tasks from which learners can read cultural information, (Morabito, 2020).

Mathematics teachers in Zimbabwe seem to have little skills of integrating ethno mathematics in the teaching of mathematics. According to some studies (Dwidayati & Zaenuri, 2021; Sunzuma *et al.*, 2021; Ishartono & Ningtyas, 2021) who carried out studies on the integration of the cultural mathematics practices, mathematics teachers view mathematics found in cultural activities as either too simple or too complex to be incorporated in the secondary school mathematics. For example, Machaba and Dhlamini (2024) in their study of school mathematics and out of school mathematics and Zimbabwe youngsters conclude that mathematics teachers in Zimbabwe regard ethno mathematics as the foundation upon which school mathematics can be built, however, it does not have any place in the secondary school mathematics. Machaba and Dhlamini (2024) argues teachers do not have a clear understanding of ethno mathematics. This is supported by the study by Ismail et al., (2022) that observed that, there is an obstacle between ethno mathematics and school mathematics because teachers doubted the mathematical value of ethno mathematics. Thus, when mathematics teachers do not see the

connection between mathematics and ethno mathematics it implies that they do not understand what ethno mathematics is all about.

The following studies on ethno mathematics in Zimbabwe have failed to realise that ethno mathematics like academic mathematics is stratified; there is both simple and complex mathematics in ethno mathematics as outlined by Musawwir and Survadi (2021). This means that mathematics teachers who pointed out that ethno mathematics is too simple to be included in secondary school mathematics as revealed by Machaba and Dhlamini (2024) might not have adequately mathematised the out-of-school activities of the learners to identify complex mathematics inherent in them. Therefore, the weakness of ethno mathematics studies in Zimbabwe is that teachers assume that ethno mathematics is limited to mathematics topics taught in schools. As a result, teachers fail to link mathematics and culture in the mathematics classroom. In addition, there is a lack of skill on the part of the teacher to identify and select ethno mathematics for the intended level.

Alangui (2020) suggests that inclusion of the African knowledge system into the curriculum may enable many students to access mathematics. Alangui (2020) further says that when students see part of their daily mathematical practices in the curriculum they may be motivated to do better in mathematics. In addition, Chahine (2020) asserts that purposeful engagement in existential experiences that unfold culturally embedded mathematical competences can inspire learners to question enforced imminent boundaries and discover the joy and excitement in making transformation real and possible. Asrial et al., (2020) also adds that the three goals, which are supported by a culturally relevant pedagogy, include academic success, cultural competence, and the ability to analyse social order. This implies that culturally relevant pedagogy makes the learners to perform better in their academic work, to understand their culture and become capable of questioning the norms of their society in pursuit of justice.

2.6 The difficulties faced by teachers in integrating ethno mathematics into their teaching practices

Although proponents of ethno mathematics demand the linking of mathematics teaching to learners' indigenous mathematical practices, it has been mentioned before that there is no one-to-one relationship between cultural mathematics and academic mathematics. All those cultural mathematical practices may need mathematising before they can be integrated into the school

mathematics. Mowi et al., (2021) who refer to ethno mathematics as a form of mathematics that varies because of being embedded in cultural activities also affirm this. By virtue of being embedded in cultural activities, it means that it is not an easy task to extract mathematics from the cultural activities. Chivaz and Miyakawa (2020) studied mathematics used by Brazilian farmers and found that they were different from school mathematics. This situation highlights the challenges associated with extracting ethno mathematics from cultural activities to integrate them into secondary school mathematics. Johnson et al., (2021) asserts that integrating ethno mathematics starts with curriculum contents and teachers are mandated with the implementation of the curriculum in the classroom. However, their task of implementing the curriculum is made difficult if there is no connection between curriculum contents and the culture of the learners.

Hadayat (2021) posits that the most challenging thing in this ethno mathematics is to identify elements of knowledge from the learner's cultural knowledge that can be classified as mathematics. The strong relationship between mathematics and other subjects need not be under-estimated; the integration of ethno mathematics may not be comprehensive if the mathematics concepts that stretch into other areas are ignored. Dwidayati and Zaenuri (2021) notes that if we wish to make connections with aspects of learners' background and culture then it is not mathematics only that we should look at, but we should also look at other subjects in the curriculum since they have their shares of the learners' culture. Focusing on mathematics and neglecting some non-mathematical areas does not fully address the integration of ethno mathematics in the teaching of mathematics.

In addition, Alangui (2020) argues that all cultural activities including non-mathematical activities can be used as a start-up point in the teaching of mathematics. The challenge of most ethno mathematics studies is that they rush to identify some aspects of conventional mathematics found in those cultural activities as though the purpose of those activities is to do mathematics. For example, Ismail et al. (2022) used the thatched roofs of the people of Benue State of Nigeria to teach locus in mathematics. In that study, the learners were taken out of the class to do the thatching practically and measured sizes of arcs, angles, radius and diameter but nothing was said about the beliefs and values of the people of Benue about those round roofs.

The challenges associated with identifying mathematics in other cultures other than the Western cultures remains subjective in that the mathematics in those cultural activities should

be matched with similar concepts in Western mathematics, for them to be recognised as mathematics (Herawaty et al., 2020). For example, it may be said that there is some mathematics in playing a certain traditional game, but those mathematical concepts can only be articulated in terms of Western mathematics when communicated to others. In other words, it is only those people with academic mathematical knowledge who can identify mathematics in those cultural activities. Thus, the supremacy of Western mathematics is maintained because the cultural mathematics should be able to utilise mathematical symbols used by Western mathematics. Therefore, when integrating ethno mathematics in the teaching of mathematics, learners may regard what their ancestors as primitive and backwards practised thereby becoming a serious obstacle to the integration of ethno mathematics.

2.7 Summary

Chapter Two presents the literature review, which provides a theoretical and empirical foundation for the study. It begins by discussing the theoretical framework, particularly Vygotsky's sociocultural theory, which supports the integration of learners' cultural contexts in cognitive development and learning. This chapter of this study also reviewed existing literature on ethno mathematics and its integration into mathematics teaching, with a focus on both international and Zimbabwean contexts. The review highlighted three main areas: teachers' perceptions and support for ethno mathematics, its impact on student engagement and learning, and the challenges faced in its implementation.

Firstly, the literature shows that teachers generally hold positive perceptions of ethno mathematics and recognize its potential to make mathematics more culturally relevant and meaningful. Teachers appreciate that this approach connects classroom mathematics to students' everyday experiences, cultural practices, and prior knowledge, allowing learners to construct personal understanding rather than rely solely on rote memorization. Studies indicate that culturally relevant pedagogy fosters motivation, engagement, and active participation in mathematics classrooms.

Secondly, the literature underscores the impact of ethno mathematics on student learning. By linking mathematical concepts to familiar cultural contexts, learners are more likely to understand, retain, and apply knowledge. Ethno mathematics has been shown to reduce boredom, increase interest, and improve overall performance, as students can relate abstract

concepts to real-life situations. This approach encourages collaborative learning, as learners can share different ways of understanding mathematical ideas derived from their cultural backgrounds.

Finally, the literature identifies several barriers to full integration of ethno mathematics. Teachers face challenges such as the abstract nature of mathematical language, lack of knowledge about local cultural activities, limited pedagogical competence, and insufficient curricular guidance and resources. Some teachers also struggle to align cultural practices with formal mathematics topics, and many feel inadequately trained to implement ethno mathematics effectively.

Overall, the review highlights that while ethno mathematics is valued for its potential to enhance cultural relevance, engagement, and conceptual understanding, its successful implementation requires professional development, curriculum support, and culturally appropriate teaching materials. The literature provides a foundation for understanding teachers' perceptions, experiences, and challenges, justifying the need for qualitative exploration in the Zimbabwean secondary school context.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1. Introduction

This chapter articulates the methodology, which was used in this study focusing on how ethno mathematics was integrated in secondary school mathematics. It also dwells on the research paradigm, research design, population, sample, sampling techniques, research instruments, data collection and analysis. The chapter concludes by discussing the ethical considerations of this study.

3.2 Research Paradigm

The term paradigm is used to describe the worldview of the researcher, (Sefotso, 2020). According to Kivunja and Kuyini (2021), the worldview is the perspective, or thinking, or school of thought, or set of shared beliefs that inform the meaning or interpretation of research data. Creswell and Creswell (2020) see worldview as a general philosophical orientation about the world which affects the nature of the research that the researcher brings to a study. This implies that the researcher's paradigm has some bearings on how the study is carried out. The significance of the research paradigm is that it reveals the researcher's beliefs and dictates the phenomenon that should be investigated and how it should be investigated as well as directing how the results of the study should be interpreted. Therefore, the choice of a research paradigm influences the researcher's methodology, and how meanings are constructed from the data that the researcher collects.

In this study, the postmodern paradigm was used. Cohen, Manion, and Morrison (2021) posit that postmodernism supports interpretive paradigm in one sense or the other. According to Creswell (2020), the key concept of postmodernism is that knowledge claims must be within the conditions of the world today and in multiple perspectives of different groups. In addition to that among other things, postmodern philosophies reject objectivity, absolute facts, and traditional epistemology, (Hossieni & Khalili, 2020). The researcher used the postmodern paradigm in this study because the study of how the mathematics teachers views integrating ethno mathematics in the teaching of mathematics generated subjective knowledge, which depended on how the researcher and the participants understood it. The assumption of subjectivist epistemology that underpins the postmodern paradigm implied that the researcher constructed meaning of the data collected on the views of mathematics teachers in integrating ethno mathematics in the teaching of Mathematics. The use of the postmodern paradigm in this study enabled the researcher and the participants to use their experience to create knowledge

of the views of integrating ethno mathematics in the teaching of mathematics. According to Cohen, Manion, and Morrison (2021), it is understood that the researchers who use a postmodern paradigm construct knowledge socially because of their personal experiences of the real life in the natural setting that they investigate since researchers are part of the world they are researching. Postmodern paradigm enabled the researcher to understand the views of teachers on the integration of ethno mathematics in the teaching of mathematics concepts.

3.3 Research methodology

Qualitative research is a broad umbrella term used to refer to a research approach dealing with people's experiences, behaviours and social context (Linton & Mowat, 2020). The approach that one chooses depends on one's assumptions on the nature of knowledge, the relationship between the researcher and what is been researched, the role played by value in research and finally the language that will be employed in the research (Creswell, 2020). In this research, qualitative research approach was employed because the researcher found that the phenomenon could best be investigated using a qualitative methodology.

From this background, the knowledge sought in this study was unique and subjective because the study focused on mathematics teachers on their views of integrating ethno mathematics in the mathematics classroom in Zimbabwe. The way teachers view the integrating ethno mathematics in mathematics classroom differs from the way other cultures practise them (Dowling, 2021). Cohen and Manion (2021) point out that in an interpretive research knowledge is regarded as personal, subjective and unique. The uniqueness and subjectivity also appeared in this study on integrating ethno mathematics in the teaching of mathematics. This coincides with Willig (2020) who points out that qualitative researcher's study people in their own territory, within their natural occurrences. In conformity to the requirements of a qualitative research, this research was conducted with secondary school mathematics teachers teaching in their natural environment. Willig (2020) affirms that qualitative researchers tend to be concerned with the quality and texture of the experience rather than with the identification of the cause-effect relationship.

The use of qualitative research in the postmodern paradigm for this study is justified because the focus is on understanding teachers' lived experiences, subjective meanings, and multiple realities regarding the integration of ethno mathematics in mathematics teaching. The postmodern paradigm rejects the notion of a single, universal truth, instead acknowledging that

knowledge is socially constructed, context-bound, and shaped by personal and cultural perspectives. In this view, the voices of teachers are not merely data points, but rich narratives that reveal how cultural, institutional, and personal factors influence pedagogical choices.

Qualitative research aligns with this paradigm because it allows for in-depth exploration of these varied perspectives without imposing rigid, predetermined categories. Through interviews, narratives, and thematic analysis, the study can capture the complexity, contradictions, and contextual nuances in teachers' perceptions, motivations, and challenges. This is particularly relevant in ethno mathematics research, where local culture, personal teaching philosophies, and school environments create diverse and sometimes competing interpretations of what constitutes culturally relevant mathematics.

In the postmodern frame, meaning emerges through dialogue between the researcher and participants rather than being “discovered” as an objective fact. This relational and interpretive process fits well with qualitative inquiry, which values co-construction of knowledge and critical reflection on whose perspectives are being represented. It also allows the researcher to recognize and incorporate marginalized or less-heard voices, ensuring that the conclusions reflect the diversity of experiences among Zimbabwean teachers.

By using qualitative research in the postmodern paradigm, this study is able to move beyond measuring whether ethno mathematics “works,” to uncovering how and why teachers engage with it, how they navigate tensions between curriculum demands and cultural realities, and what meaning they attach to their own practices. This richer understanding is essential for developing culturally responsive policies, teacher training, and curriculum materials. Based on the arguments given for the qualitative approach, the researcher was convinced that a qualitative approach was the most appropriate for this study.

3.4 Research Design

Cohen, Manion and Morrison (2021) define a research design as a strategy that is drawn up by the researcher to organise the research to make it practicable so that research questions can be answered based on evidence and warrants. The need to have research questions answered as one of the key purposes of research design is also highlighted by Choongwa (2020) who defines a research design as a specific guide about how the research will be conducted in answering the research questions. This implies that the research design should show the details of the nature of data to be collected and how it is going to be analysed to provide evidence to answer

research questions. Labaree (2020) on the other hand views a research design as a blueprint that integrates all the different parts of the study coherently and logically to ensure that the research problem is addressed. According to Cohen, Manion, and Morrison (2021) there are so many ways of designing the research, however, the purpose and the nature of the study determine the research design. A case study research was employed in this study. Unlike a broad statistical survey or thorough comparative investigation, a case study delves deeply into a specific research subject (Larson, 2022). Case study provides tools and opportunities for researcher to study complex phenomena within their natural environments and contexts (Larson, 2022). In support of this view, Krusenvik (2020) argues that a case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context. Thus, the case study is useful for testing whether a specific theory and model actually applies to phenomena in the real world. This implies that the case study searches for meaning and understanding. Case study research is particularly effective in examining units that have several factors that may be significant. It also enabled the researcher to maintain an all-encompassing perspective on real-world occurrences, such as small-group behaviour and individual life cycles. According to Cope (2020) the best use of case study is for adding to existing experience and improving humanistic understanding.

One of the special strengths of a case study is its capacity to manage and integrate many forms of data collecting, including documents, interviews, questionnaires, objects, and observations (Elman et al., 2021). As noted by Krusenvik (2020), this strength is explained by the fact that case studies are an impartial research tool. For this reason, focus groups are equally important as participant observation and questionnaires. In the context of the current study, the researcher used a case of secondary Mathematics teachers in Zimbabwe.

3.5 Population

The research population consisted of 121 qualified mathematics teachers who have both pedagogical and mathematics content knowledge who were teaching Ordinary level mathematics in secondary schools in particular District in Zimbabwe. In Zimbabwe, qualified mathematics teachers have three categories. The first category is made up of teachers who have a Diploma in Education. These teachers teach up to Ordinary level, they have both pedagogical and mathematics content knowledge to teach up to that level. The second group of qualified mathematics teachers are graduate teachers with both pedagogical and mathematics content knowledge to teach up to Form 6. Another category consists of mathematics teachers who have degrees in mathematics, but they do not have mathematics pedagogical knowledge, they are

recognised as mathematics qualified teachers, and they are allowed to teach mathematics up to Form 6. Due to the nature of the phenomenon that was being studied, it could not be possible to investigate all the entire teacher population of 121 qualified mathematics teachers; hence, the sample was required from the population.

3.6 Sample and Sampling procedure

The researcher to choose ten participating Mathematics teachers of this study used purposive or judgmental (non-probability) sampling. There were 121 Ordinary level Mathematics teachers with at least a professional teaching qualification. The purposive sampling technique is the deliberate choice of participant due to the qualities the participant possesses (Alkassim et al., 2020). This involves identification and selection of participants that are proficient and well informed with a phenomenon of interest. Thus, the choice of sample participants depends exclusively on the judgment of the researcher. The purposive sample is homogenous with respect to several internal and external characteristics, including academic background (all have at least a professional teaching qualification and have been exposed to integrating ethno mathematics in the teaching of mathematics).

The use of purposive sampling in this research is justified because the study seeks to gather in-depth, context-specific insights from teachers who have relevant knowledge, experience, and exposure to the integration of ethno mathematics in mathematics teaching. Purposive sampling is a non-probability sampling technique that deliberately selects participants based on specific characteristics or criteria aligned with the research objectives (Creswell & Creswell, 2023).

In this study, the aim is not to generalize findings to all teachers in Zimbabwe but to deeply explore the perspectives, experiences, and challenges of those who can provide rich, meaningful data on the topic. By selecting teachers who have taught mathematics at the secondary school level, especially those with some familiarity or engagement with culturally relevant pedagogy, the researcher ensures that the participants can speak directly to the issues under investigation.

This approach is particularly appropriate for research within the postmodern and qualitative paradigms, where the emphasis is on depth of understanding rather than statistical representativeness. It allows the researcher to intentionally target participants from diverse school contexts, cultural backgrounds, and levels of experience to capture a broad range of viewpoints and experiences.

Additionally, purposive sampling enables the inclusion of information-rich cases—teachers who can offer concrete examples of ethno mathematics in practice, as well as those who can articulate the barriers and potential solutions to its integration. This enhances the study’s capacity to produce nuanced, contextually grounded findings that can inform policy, curriculum development, and teacher professional development initiatives in Zimbabwe.

3.7 Data Collection Instruments

Guided by the insight developed from literature review the researcher used the Semi-structured interviews to solicit information from participating mathematics teachers on the following research questions:

3.7.1 What are the views of Mathematics teachers on the integration of ethno mathematics into their teaching practices?

3.7.2 What are the factors that influence teachers’ decisions to integrate ethno mathematics into their teaching practices?

3.7.3 What are the difficulties faced by teachers in integrating ethno mathematics into their teaching practices?

Magaldi and Berler (2020) posits that semi-structured interviews are based on a guide and are typically focused on the main topic that provide the general pattern. The study used semi-structured face-to-face interviews to collect data from the participants. When the researcher used semi-structured interviews, the researcher ensured that no assumptions the views of teachers on the integration of ethno mathematics were made. The researcher depended on what the participants said. One advantage of face-to-face interview is that the researcher could pick some non-verbal clues, which may not be possible when other forms of interviews are used (Rosenthal, 2020). Berg (2020) asserts that interviews do not only collect informative data, but they enable the interviewees to speak in their own voice and express their thought and feeling. Furthermore Owuegbuzie, Leech, and Collins (2021) add that although the voice of the interviewee is central in all interviews, nonverbal communications are also important for attaining a deeper shared meaning in which both the interviewer and the interviewee increase their awareness of the contextual nature of the voice. In those interviews, the participants were provided with an opportunity to express their views on integrating ethno mathematics in secondary school mathematics in their own words.

In this research, the use of teacher interviews was justified by the need to gain in-depth, context-rich insights into teachers’ perceptions, experiences, and challenges regarding the integration

of ethno mathematics into mathematics teaching. Interviews allow the researcher to explore not only what teachers think, but also why they hold certain views, and how their beliefs translate into classroom practices.

In the Zimbabwean context, recent studies (e.g., Sunzuma & Maharaj, 2020; Sunzuma et al., 2021) have shown that interviews are effective in capturing the nuanced ways teachers interpret culturally relevant pedagogy, including their interpretations of curriculum demands, cultural knowledge, and pedagogical constraints. Unlike questionnaires, interviews permit follow-up questions, clarification, and probing, enabling the researcher to uncover tacit knowledge, personal experiences, and examples that might not surface in written responses.

Furthermore, teacher interviews are particularly useful for ethno mathematics research because they allow participants to describe their use or non-use of cultural examples in their own words, situating their responses in the realities of their schools, communities, and resources. They also provide opportunities for teachers to reflect on their professional development needs and suggest practical strategies for integration. This aligns with qualitative traditions in education research, where interviews are valued for generating detailed, first-hand accounts that help explain observed trends and statistical findings.

3.8 Data Collection Procedure

The data for this study were collected using a structured and systematic approach to ensure rich, reliable, and contextually grounded information. Prior to data collection, formal permission was obtained from the Ministry of Primary and Secondary Education and from the administrators of the selected schools, ensuring that the study adhered to ethical and institutional requirements.

Participants were selected through purposive sampling, targeting mathematics teachers who had experience in teaching and some exposure to ethno mathematics or culturally relevant pedagogy. Ten schools were chosen from the district, and teachers meeting these criteria were invited to participate in the study.

The primary method of data collection was semi-structured interviews, which allowed teachers to freely express their perceptions, experiences, and challenges regarding the integration of ethno mathematics in their teaching. An interview guide with open-ended questions aligned

with the research objectives was used, and probing questions were employed when necessary to elicit deeper insights. Interviews were scheduled at times convenient to the teachers to minimize disruption to classroom activities.

With the consent of participants, all interviews were audio-recorded to ensure accuracy, and field notes were taken to capture non-verbal cues, contextual details, and immediate reflections. The recordings were later transcribed verbatim, and the transcripts were carefully reviewed to verify accuracy and preserve participants' intended meanings. Any necessary clarifications were sought from participants to reduce the risk of misinterpretation.

Once transcribed, the data were systematically organized, coded, and prepared for thematic analysis. Each participant was assigned a code to maintain anonymity, and all identifying information was removed to protect confidentiality. Ethical considerations, including voluntary participation, informed consent, and the right to withdraw from the study at any point, were strictly observed throughout the data collection process.

This procedure ensured that the collected data were comprehensive, authentic, and sufficiently detailed to provide a robust understanding of teachers' views, experiences, and challenges in implementing ethno mathematics in Zimbabwean secondary schools.

3.9 Data Analysis

The data analysis started as soon as data was collected. According to Mlanga and Shumba (2020), qualitative data analysis starts with preliminary analysis conducted in the field during data collection and continues off the field. The researcher started analysing data when the researcher was doing the first interviews. Doing early data analysis helped me to cycle back and forth between thinking about existing data and generating new strategies for collecting improved data. In this study, Creswell and Creswell (2020) who urge researchers to look at qualitative data analysis as a process guided by sequential steps guided the researcher.

The analysis of the data collected by interviews was subjected to coding for emerging themes based on the research questions. Codes enable the researcher to handle data more easily. This is in line with Mile and Hurlburt (2020) who affirmed that codes promote data handling efficiency, data labelling and data retrieval also empower and speed up data analysis. The codes were created with the aspect to be analysed in mind and guided by the research questions. Gibson (2021) asserts that after identifying words and phrases used frequently as well as ideas

coming from how interviewees had expressed themselves the researcher has to organise those ideas into codes categories. Additional codes would be created as transcription went on to cater for some new aspects which might arise.

Interviews normally result in some issues not being taken in the same order, also, some issues could surface more than once due to follow up questions. Data pieces had to be rearranged several times before the reassembled pieces emerged into a coherent pattern. As a result, there was a need to reorganise the transcripts checking aspects that had been repeated.

According to Sandelowski (2020), saturation in qualitative research is the point in continuous data collection that signals little need to continue because additional data will serve only to confirm an emerging understanding. Re-reading of all interviews were done to ensure that all words uttered by the interviewees regarding their views on the integration of ethno mathematics in the teaching mathematics were considered for analysis. Also, Rosenthal (2020) adds that data saturation occurs when no more new information is being generated. This implied that the re-reading of transcripts would stop when the re-reading no longer generated new information.

The use of themes in the data analysis of this research was justified because the study adopts a qualitative approach aimed at exploring teachers' perceptions, experiences, and challenges regarding the integration of ethno mathematics in mathematics teaching. Thematic analysis provides a systematic method for identifying, analysing, and interpreting patterns of meaning across qualitative data, allowing the researcher to organize complex, narrative-rich information into coherent categories that address the research questions (Braun & Clarke, 2021).

In this study, teacher interviews generated detailed and contextually rich responses about their perceptions of ethno mathematics, its impact on student engagement, and barriers to integration. Thematic analysis enables the researcher to distil these extensive narratives into key themes that reflect shared experiences, concerns, and perspectives among participants, while also highlighting unique or divergent viewpoints. This approach ensures that the findings are both structured and grounded in participants' own words, preserving the authenticity and depth of qualitative data.

Moreover, the use of themes aligns with the postmodern and interpretive research paradigms, which recognize multiple realities and emphasize the construction of meaning through social and cultural contexts. By categorizing responses into themes such as teachers' perceptions and support for ethno mathematics, impact on student learning, effectiveness and relevance, and

barriers to integration the researcher can reveal patterns that inform both theory and practice, while also identifying areas that require further professional development or policy support.

Finally, thematic analysis allows for flexibility in analysing data, accommodating unexpected insights or emergent patterns that may not have been anticipated in the research design. In the context of Zimbabwean studies on ethno mathematics (Sunzuma & Maharaj, 2020; Sunzuma et al., 2021), thematic analysis has been effectively used to capture teachers' nuanced experiences and interpret how cultural and pedagogical factors influence the adoption of ethno mathematics in classrooms.

In summary, the use of themes ensures a rigorous, systematic, and contextually sensitive analysis of qualitative data, making it an appropriate and effective method for this research.

3.10 Trustworthiness

According to Maxwell (2020), trustworthiness of a qualitative research is measured by its credibility of description, conclusion, explanation and interpretation or any other form of account. In this study, the researcher adopted Sandelowski (2020) who presented criteria for evaluation of trustworthiness as credibility, transferability, dependability and conformability. Gunawan (2022) defines credibility as the extent to which the results of the study approximate reality. In order to enhance credibility the researcher audio-recorded the interviews and transcribed the verbatim to ensure accurate recording of all words uttered by the participants on the views on integration of ethno mathematics in the teaching of mathematics.

Transferability means that specific knowledge gained from the study conducted with small numbers of participants is transferable by the reader to other similar settings (Ncube, 2021). In this study, the sample was carefully selected to typically represent secondary mathematics teachers in Zimbabwe. This can enable other researchers to relate the findings of this study to their own settings.

Conformability of the study requires the researcher to indicate in the early stages of the study how conformability is going to be attained or demonstrated at the end of the study, hence it was necessary to outline in the early stage of the this study the expected outcomes (Gunawan, 2022). In this study, the researcher clearly outlined the aims and the objectives of the study at the beginning of the study. The research question to be answered were clearly articulated as a way of assisting conformability of the study.

Dependability is the stability of data over time and over conditions (Guawan, 2022). Dependability involves participants' involvement in evaluation of the finding, interpretation and recommendation of the study. In this study, dependability was enhanced through verification of all data elements with the participants to ensure that data was captured accurately. The participants were also involved in data analysis although the researcher was responsible for developing the codes; however, the participants had to confirm that the codes and the emerging sub-themes and finally the themes were consistent with what has been said by the participants. The provision of narratives by the participants on their understanding of ethno mathematics also built on dependability of this study since it helps the readers of this study to understand what contexts the conclusion of the study was reached.

3.11 Ethical Considerations

The researcher wrote a letter to the DEO asking for permission, explaining the purpose of the study, how it was funded, who was expected to participate, the participants' rights and the risks associated with participation in this study. The DEO permitted the researcher to go to the selected schools where the researcher asked for permission from the headmasters to carry out the study at their schools.

The researcher wrote consent letters to the participants explaining the purpose and the methodology of the research. The willing participants signed the consent letter and assent letters respectively to indicate that they would participate in the study voluntarily. The consent letters also explained the confidentiality of the information that would be collected. The researcher explained to the participants the need for maintaining confidentiality in research, which they came to understand and agreed to be treated anonymously. Therefore, for ethical reasons in this study, no real names of the participants were used; pseudo names were used in place of names of the participants. The recorded audio was kept safely and not accessible to the third party.

3.12 Summary

This chapter has explained the methodology, the research design, data collection and analysis, ethical considerations and validity and reliability of the study. This study employed a qualitative research design within the postmodern, interpretive paradigm, which emphasizes understanding participants' subjective experiences, multiple realities, and socially constructed

meanings. The qualitative approach was considered appropriate because the study aimed to explore teachers' perceptions, experiences, and challenges in integrating ethno mathematics into secondary school mathematics teaching, rather than to measure variables or generalize findings statistically.

The target population comprised secondary school mathematics teachers in selected schools in Zimbabwe. A purposive sampling technique was used to select participants who had relevant experience and knowledge regarding ethno mathematics. This approach ensured that the data collected were rich, context-specific, and directly aligned with the research objectives. A total of ten schools were selected, and from each school, teachers with relevant experience in teaching mathematics and exposure to cultural or ethno mathematical practices were invited to participate.

The primary data collection method was semi-structured interviews with teachers. This method was chosen because it allows participants to express their perspectives in depth, provide examples from their teaching experiences, and clarify their responses. Interviews also enable the researcher to probe emerging ideas and explore nuanced views that would not be captured through surveys or questionnaires.

The study used thematic analysis to interpret the qualitative data. Responses from the interviews were transcribed, coded, and organized into themes that aligned with the research questions. Themes were developed both deductively, based on the research objectives, and inductively, based on patterns emerging from the data. This approach facilitated the identification of recurring patterns, key issues, and unique insights into teachers' perceptions, experiences, and challenges with ethno mathematics integration.

Ethical procedures were observed throughout the study. Participants provided informed consent, and their confidentiality and anonymity were assured. Permission to conduct the study was obtained from relevant educational authorities and school administrators.

In summary, the methodology was designed to generate rich, contextually grounded insights into teachers' views and practices regarding ethno mathematics, while addressing the complexity and diversity of classroom realities in Zimbabwe. The combination of purposive sampling, semi-structured interviews, and thematic analysis ensured that the study produced

detailed, credible, and meaningful findings relevant to the research objectives. The next chapter (Chapter 4) presents the findings of the current study.

CHAPTER 4. RESEARCH FINDINGS

4.1 Introduction

This chapter presents the findings of the interviews of mathematics teachers on their views of integration of ethno mathematics into the mathematics classrooms. The aim of this study was to establish the views of mathematics teachers in integrating ethno mathematics in Zimbabwe secondary school mathematics. The analysis of the data was guided by the following research questions:

1. What are the views of Mathematics teachers on the integration of ethno mathematics into their teaching practices?
2. What are the factors that influence teachers' decisions to integrate ethno mathematics into their teaching practices?
3. What are the difficulties faced by teachers in integrating ethno mathematics into their teaching practices?

4.2 BIOGRAPHIC FACTORS

This section analyses biographic factors of 10 Mathematics teachers who participated in the study.

Table 4 Biographic Factors for Mathematics teachers

Factor	Item	Number	%
Gender	Male	6	60
	Female	4	40
Age	<30 years	0	0
	31-40 years	3	30
	41-50 years	4	40
	> 50 years	3	30
Educational level	Certificate in Education (CE)	1	10
	Diploma in Education (Dip Ed)	3	30
	Bachelors degree	6	60
Years of teaching experience	≤10 years	0	0
	11-20 years	6	60

	21-30 years	3	30
	> 30 years	1	10

The results in Table 4 show that most of the Mathematics are male (60%) and few are female. The results in Table 4 also show that most of the teachers are 50 years or below (70%) and out of these 70%, 40% are aged between 41 and 50 years, that is, are middle aged. It is also shown in Table 4 that most of the teachers (60%) are degree holders. This shows that most of the teachers have taken the root of upgrading themselves from just being Certificate in Education holders.

4.3 What are the views of Mathematics teachers on the integration of ethno mathematics into their teaching practices?

Most of the teachers who participated in this study used ethno mathematics approach in their classroom. The findings of this study indicate that all teachers have a positive perception of ethno mathematics approach. The teachers reported that they were interested and supported ethno mathematics approach to be used in classrooms. In general, teachers claim that ethno mathematics approach can stimulate and motivate students to learn mathematics, it overcomes boredom and gives new nuances as a result as learning becomes more interesting and learning become meaningful.

The above results are consistent with the results of the past studies. According to (Gunawan et al., 2022), culturally relevant pedagogical approaches are teaching approaches that put into consideration the learners' cultural knowledge, prior experiences, frames of references and performance style of ethnically diverse learners to make learning encountered more relevant and effective to them. According to Jumba and Mwiti (2022), when the learners' out-of-school mathematic activities are incorporated in the school mathematics learners develop self-confidence, which makes them improve their participation in class as well as performance.

Integration of ethno mathematics in the teaching of mathematics can encourage learners to construct personal mathematical understanding and be able to explain their work (Khusaini et al., 2022). Instead of memorising some mathematics formulas and procedures, the learners can understand mathematical concepts and be able to justify and apply their knowledge. The learners can also help each other during the mathematics lesson because each one of them has their own way of understanding the mathematical concepts that will be under consideration.

Apart from making mathematics understandable and interesting to the learners, culturally relevant mathematics teaching enables the learners to participate in the society in which they live meaningfully. The role of motivation should be on the centre stage when developing a culturally relevant pedagogy. However, this motivation should be brought about through making the learners realise the importance of mathematics in their daily life. Among some of the responses of the teachers on their views on the integration of ethno mathematics into their teaching practices, a non-verbatim summary of responses from some of the teachers is given below:

Teacher 1 believed that mathematics learning based on the ethno mathematics approach motivates, stimulate students, overcome boredom and provide new nuances in learning mathematics. This is in line with Budiharso and Tarman (2020) who affirms that a culturally relevant pedagogical approach positively affects engagement, motivation and mathematical performance, for the poor underperforming children.

Teacher 2 felt that connecting school mathematics with cultural activities and the context of students' everyday life is not only interesting but also minimize the difficulties that students experienced in learning mathematics. This is in sync with the study by Kusnandi (2020) that argued that teachers view mathematics taught in the schools as detached from its rich intellectual setting in the culture of civilisation and is reduced to a series of techniques and has been grossly distorted. This means that the mathematics taught in the schools lacks connection with real life mathematics found in the learners' culture, and it is nothing more than sequenced techniques. Integration of ethno mathematics into the teaching of mathematics utilises the local strategies, which can enable the teachers to link the learners' spontaneous ideas to the school mathematics, and in the process assists the learners to understand school mathematics.

Teacher 7 really support ethno mathematics-based mathematics learning arguing that students already have mathematical knowledge and experience of mathematics from their cultures and environments. Similarly, Teacher 6 argues that in fact mathematics learning will be more meaningful if it is related to the students' daily life. This is in line with the study by Morabito, (2020) who assert that culturally relevant mathematics pedagogy makes mathematics meaningful. They go further to say that if the mathematics tasks are made meaningful, this may impact on the learners' understanding of mathematical concepts and hence improve their

achievement. This implies that mathematical tasks become meaningful when they relate to the real world in which the learners live.

Teacher 8 argued that the reason they used ethno mathematics is that learning mathematics with an ethno mathematics approach is more effective. This affirms the results of the past studies. According to Danna (2021), teachers view teaching mathematics through ethno mathematics not only interesting but also capable of presenting context and engagement. When context and engagement appear in the learning process, students find it easier to understand the lesson and are more likely to bring experience into their daily lives (Danna, 2021).

However, Teacher 10 argued that teachers do not apply teaching using the ethno mathematics approach because they have not been fully able to integrate the mathematics material. This is consistent with the study by Mania and Alam, (2021) that established that several teachers voice practical and pedagogical concerns about integrating ethno mathematics. Many teachers feel ill equipped to teach mathematics through a cultural lens, particularly when it involves unfamiliar traditions or requires interdisciplinary knowledge (Mania & Alam, 2021). Thus, without sufficient professional development, there is a risk of superficial or incorrect representations of cultural practices.

4.4 What are the factors that influence teachers' decisions to integrate ethno mathematics into their teaching practices?

The findings of this study revealed that all the teachers who participated in this study believe that there is need to make mathematics culturally relevant for the learners. All the participating teachers argued that teaching of mathematics is mostly irrelevant to the learners as the relevance of culture has been strangely absent from content and instructions. The results of the study also showed that all the participating teachers suggested that inclusion of the ethno mathematics into the curriculum might enable many students to access mathematics. Furthermore the results showed that all the Participating teachers have a belief that when students see part of their daily mathematical practices in the curriculum they may be motivated to do better in mathematics.

The above results are consistent with the results from the past studies. According to Medyasari et al., (2021) , the teaching of mathematics in Zimbabwe secondary schools is mostly irrelevant

to the learners. According to Madusise, (2020), traditionally in the mathematics classrooms, the relevance of culture has been strangely absent from content and instructions. The textbooks make the situation worse that the teachers use which do not have tasks that deal with the learners' out-of-school mathematics experiences. This is supported by Morabito, (2020) who argues that instructional choices of several teachers focus on strict adherence to textbook tasks with little or no potential to make connections to students' culture. Among some of the responses of the teachers on factors that influence teachers' decisions to integrate ethno mathematics into their teaching practices, a non-verbatim summary of responses from some of the teachers is given below:

Teacher 3 argued that mathematics in many classrooms has practically nothing to do with the world that the learners are experiencing. This results in both the learners and the teacher thinking that there is no connection between mathematics and culture. Similarly. Teacher 7 felt that there is need to link mathematics with everyday life as lack of connection between mathematics and everyday life results in learners failing to understand mathematics. This is line with the results of the previous studies. Prahmana and D' Ambrosio (2020) affirms that mathematics in many classrooms has practically nothing to do with the world that the learners are experiencing. This results in both the learners and the teacher thinking that there is no connection between mathematics and culture. According to Munir (2023), mathematics teachers should have a particular ability and responsibility to help learners to find the intersection between their realms of meaning and those of the teacher. In addition to that Hadayat (2021) says that in the mathematics classroom, the teacher should strive to link mathematics with everyday life, with prior knowledge, with familiar contexts within school and outside, with other topics within mathematics and with the past and the likely future.

According to Teacher 2 asserted that to improve the learners' performance in mathematics, there is need to make mathematics classroom content and classroom instruction culturally relevant. This confirm with results of the past studies. Lack of connection between culture mathematics and school mathematics results in learners failing to understand mathematics (De las Penas et al., 2021). According to Morabito, (2020), as mathematics teachers strive to use a cultural approach to improve the learners' performance in mathematics, they should re-engineer mathematics classroom content and classroom instruction to support a culturally relevant approach.

According to teacher 1 ethno mathematics is limited to mathematics topics taught in schools and as a result, teachers fail to link mathematics and culture in the mathematics classroom. Similarly, Teacher 5 asserted that there is a lack of skill on the part of the teacher to identify and select ethno mathematics for the intended level. This is consistent with findings from the previous studies. Machaba and Dhlamini (2024) established that the weakness of ethno mathematics studies in Zimbabwe is that teachers assume that ethno mathematics is limited to mathematics topics taught in schools. As a result, teachers fail to link mathematics and culture in the mathematics classroom. In addition, there is a lack of skill on the part of the teacher to identify and select ethno mathematics for the intended level.

4.5 What are the difficulties faced by teachers in integrating ethno mathematics into their teaching practices?

The results of this study showed that all the teachers interviewed on the difficulties faced by teachers in integrating ethno mathematics into their teaching practices reported that mathematical language is different from the way it is used in the day-to-day life of the learners. The findings of the study revealed that all the participating teachers had a belief that lack of knowledge of cultural activities is one of the challenges, which hindered the teachers in integrating ethno mathematics in the teaching of mathematics. Additionally, the results also showed that all the participating teachers concurred that pedagogical competence hindered effective integration of cultural activities in the teaching of mathematics. Among some of the responses of the teachers on the difficulties faced by teachers in integrating ethno mathematics into their teaching practices, a non-verbatim summary of responses from some of the teachers is given below:

Teacher 1 had the view that there are challenges with explaining some mathematics concepts to the learners because the way the mathematical language is used in the mathematics classroom is different from the way it is used in the learners' daily lives. This is in accordant with the results of the past studies. Mowi et al., (2021) established that it is not an easy task to extract mathematics from the cultural activities. This situation highlights the challenges associated with extracting ethno mathematics from cultural activities to integrate them into secondary school mathematics.

Teacher 3 also argued that it is difficult to incorporate cultural activities in the teaching of mathematics because the cultural activities themselves do not seem to fit in the mathematics. Furthermore, Teacher 3 posited that it is difficult to incorporate cultural activities in mathematics because teacher lack knowledge about them, for example, a game or any other cultural activity. This is line with the results of the past studies. Johnson et al., (2021) established that although proponents of ethno mathematics demand the linking of mathematics teaching to learners' indigenous mathematical practices, there is no one-to-one relationship between cultural mathematics and academic mathematics.

Teacher 7 believed that it is difficult to find ways of fitting cultural activities in the teaching of mathematics because mathematics and cultural activities are very different although there are some concepts that can be used as examples.

Teacher 9 felt that cultural activities are generally shallow; it is not possible to find cultural activities to use in some mathematics concept. Similarly, Teacher 10 argued that there are some mathematics topics that are difficult to find cultural activities to incorporate.

The above results confirm with results of the previous studies. Hadayat (2021) posits that the most challenging thing in this ethno mathematics is to identify elements of knowledge from the learner's cultural knowledge that can be classified as mathematics.

4.6 Summary

The purpose of chapter four was to present and analyse data. The chapter began by providing the objectives of the study. Thereafter, the chapter presents the views of mathematics teachers on the integration of ethno mathematics into their teaching practices, factors that influence teachers' decisions to integrate ethno mathematics into their teaching practices, and the difficulties faced by teachers in integrating ethno mathematics into their teaching practices.

The research findings collectively highlight that Zimbabwean teachers hold positive perceptions of ethno mathematics and recognize its potential to make mathematics teaching more meaningful, engaging, and culturally relevant. Teachers reported that integrating ethno mathematics into classroom instruction can motivate students, reduce boredom, and stimulate active participation by linking formal mathematical concepts to learners' everyday experiences and cultural practices. This approach enables students to draw on their pre-existing knowledge,

construct personal understanding, and justify their reasoning, fostering both conceptual understanding and improved performance.

Despite these positive perceptions, the findings reveal significant challenges in implementing ethno mathematics effectively. Teachers face difficulties due to the abstract nature of mathematical language, a lack of knowledge about relevant cultural activities, limited pedagogical competence, and curriculum and resource constraints. Many teachers also struggle to align cultural practices with formal mathematics topics, and some feel inadequately trained to integrate ethno mathematics into lessons without misrepresenting or oversimplifying cultural knowledge.

Overall, the findings suggest that while ethno mathematics is valued for its capacity to enhance engagement, motivation, and understanding, its successful integration depends on professional development, curriculum reform, and access to culturally relevant teaching materials. By addressing these challenges, mathematics teaching can become more contextually grounded, inclusive, and effective for diverse learners in Zimbabwe.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Chapter 5 presents the summary of research study, conclusions and recommendations based on the findings of the study. This section presents the summary of findings on every objective in relationship to the themes that emerged in this study. The following research questions were the focus of this study:

1. What are the views of Mathematics teachers on the integration of ethno mathematics into their teaching practices?
2. What are the factors that influence teachers' decisions to integrate ethno mathematics into their teaching practices?
3. What are the difficulties faced by teachers in integrating ethno mathematics into their teaching practices?

5.2 Summary of the study

It is appealing to find the views of teachers on the integration of ethno mathematics into their teaching practices. The research questions, thus, sought to investigate the views of teachers on the integration of ethno mathematics into their teaching practices. The following is a summary of the research findings.

5.2.1 What are the views of Mathematics teachers on the integration of ethno mathematics into their teaching practices?

The study found that most participating teachers used the ethno mathematics approach in their classrooms and viewed it positively. They expressed strong interest in and support for its integration into mathematics teaching, noting that it stimulates and motivates students, reduces boredom, and makes learning more engaging and meaningful. Teachers believed that this approach connects mathematical concepts to students' cultural backgrounds and everyday experiences, thereby fostering deeper understanding and sustained interest.

These findings align with earlier research showing that culturally relevant pedagogies draw on learners' cultural knowledge, prior experiences, and ways of thinking to make learning more effective (Gunawan et al., 2022). Incorporating students' out-of-school mathematical activities into lessons can boost their confidence, participation, and performance (Jumba & Mwit, 2022). By encouraging students to construct and explain their own mathematical understanding rather

than memorizing formulas, ethno mathematics promotes peer learning, practical application, and meaningful participation in society (Khusaini et al., 2022).

Teachers' responses further illustrated these benefits. For example, some noted that linking mathematics to cultural activities makes lessons more relatable and reduces learning difficulties, addressing the common disconnect between school mathematics and real-world applications (Kusnandi, 2020). Others emphasized that students already possess cultural mathematical knowledge, which, when integrated into lessons, can enhance relevance and achievement (Morabito, 2020). Teachers also observed that ethno mathematics brings valuable context and engagement to the learning process, making concepts easier to grasp and more applicable to daily life (Danna, 2021).

However, the study also revealed challenges. Some teachers, while supportive, admitted they lacked the skills or resources to fully integrate ethno mathematics into their practice. This concern echoes prior research (Mania & Alam, 2021), which highlights the need for professional development to equip educators with the cultural, pedagogical, and interdisciplinary expertise necessary for accurate and meaningful implementation. Without this preparation, there is a risk of oversimplifying or misrepresenting cultural practices.

Overall, the study confirms that ethno mathematics has strong potential to enrich mathematics education by making it culturally relevant, engaging, and meaningful, but its success depends on adequate teacher training and thoughtful integration.

5.2.2 What are the factors that influence teachers' decisions to integrate ethno mathematics into their teaching practices?

The study revealed that all participating teachers believed there is a strong need to make mathematics culturally relevant for learners. They unanimously argued that the current teaching of mathematics is largely irrelevant, as cultural connections are absent from both content and instructional practices. Teachers suggested that including ethno mathematics in the curriculum could help more students access and engage with mathematics. They also believed that when students see elements of their daily mathematical practices reflected in the curriculum, they may feel more motivated to improve their performance.

These findings are in line with earlier studies showing that mathematics education in Zimbabwean secondary schools often lacks cultural relevance (Medyasari et al., 2021; Madusise, 2020). Textbooks frequently omit tasks that connect to students' out-of-school mathematical experiences, and teachers tend to follow textbook content rigidly without incorporating cultural contexts (Morabito, 2020). This absence of connection between mathematics and learners' lived experiences can create a perception that mathematics is detached from reality (Prahmana & D'Ambrosio, 2020).

Teachers' comments reinforced these observations. Some stressed that classroom mathematics often has nothing to do with learners' real-world experiences, which leads both students and teachers to overlook the link between mathematics and culture. They emphasized the importance of connecting mathematics to everyday life, prior knowledge, familiar contexts, and other mathematical concepts (Munir, 2023; Hadayat, 2021). Others noted that improving performance requires re-engineering mathematics content and instruction to support a culturally relevant approach (De las Penas et al., 2021; Morabito, 2020).

However, challenges were also identified. Some teachers believed that ethno mathematics is limited to the topics already taught in schools, making it difficult to establish strong links between mathematics and culture. Others acknowledged a lack of skill in identifying and selecting ethno mathematics examples appropriate for different learning levels. These concerns are consistent with findings by Machaba and Dhlamini (2024), who found that teachers in Zimbabwe often misinterpret the scope of ethno mathematics and lack the training needed for effective integration.

Overall, the study underscores a shared recognition among teachers of the importance of cultural relevance in mathematics education, while also highlighting the need for professional development to equip educators with the skills and resources to meaningfully embed ethno mathematics into their teaching.

5.2.3 What are the difficulties faced by teachers in integrating ethno mathematics into their teaching practices?

The study found that all participating teachers identified significant challenges in integrating ethno mathematics into their teaching practices, with a key issue being the difference between mathematical language used in the classroom and how it is expressed in learners' daily lives.

Teachers agreed that a lack of knowledge about relevant cultural activities was a major obstacle, as was limited pedagogical competence in adapting such activities for mathematics instruction.

Several teachers elaborated on these difficulties. Some noted that explaining mathematical concepts can be challenging when the formal mathematical language does not align with everyday usage, making it harder for learners to connect classroom mathematics with their lived experiences. This aligns with Mowi et al. (2021), who observed that extracting mathematical concepts from cultural activities is not straightforward. Others pointed out that many cultural activities do not fit neatly into mathematics lessons, and that teachers often lack sufficient knowledge about these activities, such as traditional games or practices, to effectively integrate them. This reflects Johnson et al. (2021), who found no simple one-to-one relationship between cultural mathematics and academic mathematics.

Additional challenges included the perception that cultural activities may be too shallow or limited in scope to support certain mathematical topics. Some teachers stated that it is difficult, or even impossible, to find cultural activities that meaningfully align with certain concepts, echoing Hadayat's (2021) argument that the most difficult aspect of ethno mathematics is identifying elements within learners' cultural knowledge that can genuinely be classified as mathematics.

Overall, the findings highlight that while the idea of linking mathematics to cultural practices is valued, practical constraints—such as mismatched language, limited teacher knowledge, and difficulty-aligning activities with curriculum topics—pose significant barriers to effective implementation.

5.3 Conclusion

The findings from the results of the study showed a strong consensus among teachers on the importance of making mathematics culturally relevant through the integration of ethno mathematics. Teachers widely believe that connecting mathematical concepts to learners' cultural backgrounds and everyday experiences can enhance motivation, deepen understanding, reduce boredom, and improve performance. They see ethno mathematics as a way to bridge the gap between school mathematics and the real-life mathematical practices that students engage in outside the classroom, fostering both engagement and meaningful learning.

However, despite this shared positive perception, teachers face notable challenges in implementation. These include the absence of cultural relevance in existing curricula and textbooks, the mismatch between mathematical language and its use in daily life, and the difficulty of identifying and adapting cultural activities that align with academic mathematics topics. Many teachers lack the pedagogical competence, resources, and training to effectively integrate ethno mathematics, with some also holding a limited view of its scope. These constraints often make it difficult to link cultural practices to certain mathematical concepts without oversimplifying or misrepresenting them.

Overall, the evidence suggests that while teachers strongly support ethno mathematics as a pedagogical approach, its successful integration depends on curriculum reform, the inclusion of culturally relevant tasks, and targeted professional development to equip teachers with the skills and knowledge needed to bridge cultural contexts with formal mathematics learning.

5.5 Recommendations

Based on the findings of the results, it is recommended that the integration of ethno mathematics into mathematics teaching be supported through deliberate curriculum reform that embeds culturally relevant content and examples. Textbooks and learning materials should be redesigned to include tasks that draw from learners' cultural backgrounds, everyday experiences, and indigenous mathematical practices, ensuring that mathematics is presented in a way that is both meaningful and relatable.

Comprehensive professional development programs should be provided to equip teachers with the pedagogical skills, cultural knowledge, and confidence needed to identify, adapt, and integrate relevant cultural activities into mathematics lessons. This training should address challenges such as aligning cultural practices with academic mathematics topics, using everyday mathematical language alongside formal terminology, and ensuring that representations of cultural practices are accurate and respectful.

Additionally, schools should encourage collaborative platforms where teachers can share resources, examples, and strategies for implementing ethno mathematics. Partnerships with local communities, cultural practitioners, and elders can further help teachers learn about and incorporate authentic cultural activities into their teaching. By combining curriculum changes,

teacher capacity building, and community engagement, mathematics education can become more engaging, relevant, and effective for diverse learners.

References

- Alangui W. V. (2020). Beyond songs and dances: Ethnomathematics and the challenge of culture. *Revista Latinoamericana de Etnomatemática*, 13(3), 88–107. <https://doi.org/10.22267/relatem.20133.63>**Go to Reference** and Individual Differences, pp 4825-4830.
- Anisa Y., Siregar R. F., Hafiz M. (2023). Ethnomathematics as an exploration of cultural mathematical concepts in traditional Indonesian Engklek games. *Asian Research Journal of Mathematics*, 19(7), 65–75. <https://doi.org/10.9734/arjom/2023/v19i7680>
- Asrial A., Syahrial S., Maison M., Kurniawan D. A., Perdana R. (2020). A study of traditional games ‘Engklek’ in mathematics for elementary school. *Jurnal Ilmu Pendidikan*, 26(1), 15–21. <https://doi.org/10.18844/cjes.v16i6.6500>
- Balabuch A., Rasoarifetra B. (2023). Why weaving? Teaching heritage, mathematics, science and the self. *African Archaeological Review*, 40(3), 481–491. <https://doi.org/10.1007/s10437-023-09541-w>
- Brijlall D., Abakah F. (2022). High school learners’ challenges in solving circle geometry problems. *PONTE International Journal of Sciences and Research*, 78(12), 135–156. <https://doi.org/10.21506/j.ponte.2022.12.9>
- Budiharso T., Tarman B. (2020). Improving quality education through better working conditions of academic institutes. *Journal of Ethnic and Cultural Studies*, 7(1), 99–115. <https://doi.org/10.29333/ejecs/306>
- Bunn S., Nemirovsky R., Crabb M., Jones G., Burns H., Megroureche C. (2022). Basketry and mathematics: Reflections on curves and surfaces. *The Textile Museum Journal*, 49(1), 50–67. <https://doi.org/10.7560/TMJ4904>
- Caporuscio C. (2023). Introspection and belief: Failures of introspective belief formation. *Review of Philosophy and Psychology*, 14(1), 165–184. <https://doi.org/10.1007/s13164-021-00585-y>

Chahine I. C. (2020). Towards African humanicity: Re-mythologising Ubuntu through reflections on the ethnomathematics of African cultures. *Critical Studies in Teaching and Learning*, 8(2), 95–111. <https://doi.org/10.14426/cristal.v8i2.251>

Chhabra N. (2021). Kasuti: The mathematics of embroidery. *Azim Premji University at Right Angles*, 1(11), 7–12.

Choongwa, G. H. (2020). *Fundamentals of Applied Research Methodology: A Complete Guide for Scholars and Researchers in Social Sciences*,

Clivaz S., Miyakawa T. (2020). The effects of culture on mathematics lessons: An international comparative study of a collaboratively designed lesson. *Educational Studies in Mathematics*, 105(1), 53–70. <https://doi.org/10.1007/s10649-020-09980-1>

Cohen, L. Manion, L., & Morrison, K. (2021). *Research Methods in Collection Strategies in Qualitative Research*. The Quality Report 15(3), 696-726. Retrived from <https://ddoz.org/10.46743/2160&3715/2010.1171>.

Cope, M. (2020). Coding qualitative data. *Educational Studies in Mathematics*, 105(1), 53–70

Creswell, J. W. (2020). *Research Design: Qualitative, Quantitative, and Mixed* . Oxford university press

Danna R. (2021). Figuring out: The spread of Hindu-Arabic numerals in the European tradition of practical mathematics (13th–16th centuries). *Nuncius*, 36(1), 5–48. <https://doi.org/10.1163/18253911-bja10004>

De Las Penas M. L. A. N., Garciano A. D., Verzosa D. M. (2021). Mathematics embedded in culture the weaves of Batak basketry. *Philippine Studies: Historical and Ethnographic Viewpoints*, 69(1), 35–70. <https://archium.ateneo.edu/mathematics-faculty-pubs/162https://doi.org/10.1353/phs.2021.0001>

dissertations and thesis. *Journal of Social Sciences*, 42 (1, 2): 23-36.

Dwidayati N., Zaenuri Z. (2021). Ethnomathematics exploration in the remote areas. *Journal of Physics: Conference Series*, 1918(4), 042117. <https://doi.org/10.1088/1742-6596/1918/4/042117>

Fendrik M., Marsigit M., Wangi'd M. N. (2020). Analysis of Riau traditional game-based ethnomathematics in developing mathematical connection skills of elementary school students. *İlköğretim Online*, 19(20), 1605–1618. <https://doi.org/10.17051/ilkonline.2020.734497>

Ghosh S., Meyer-Rochow V. B., Jung C. (2023). Embracing tradition: The vital role of traditional foods in achieving nutrition security. *Foods*, 12(23), 4220. <https://doi.org/10.3390%2Ffoods12234220>

Gunawan R. G., Jamna J., Solfema S., Oktariza F., Erita S. (2022). An ethnomathematics exploration: The beads basket craft context for mathematics learning. *Edumatika: Jurnal Riset Pendidikan Matematika*, 5(2), 122–133. <https://doi.org/10.32939/ejrpm.v5i2.1663>

Handayani A. D., Iswantiningtyas V. (2020). Javanese traditional games as a teaching and learning media to socialize and introduce mathematics since early age. *Journal of Physics: Conference Series*, 1521(3), 032008. <https://doi.org/10.1088/1742-6596/1521/3/032008>
Health, 31(3), 193-195. <https://doi.org/10.1002/nursing.20272>.

Hendriyanto A., Priatna N., Juandi D., Dahlan J. A., Hidayat R., Sahara S., Muhaimin L. H. (2023). Learning mathematics using an ethnomathematics approach: A systematic literature review. *Journal of Higher Education Theory and Practice*, 23(7), 59–74. <https://doi.org/10.33423/jhetp.v23i7.6012>

Herawaty D., Widada W., Adhitya A., Sari R. D., Novianita L., Anggoro A. F. D. (2020). Students' ability to simplify the concept of function through realistic mathematics learning with the ethnomathematics approach. *Journal of Physics: Conference Series*, 1470(1), 012031. <https://doi.org/10.1088/1742-6596/1470/1/012031>

Hidayat A. S. (2021). Study ethnomathematics: Revealing mathematics ideas on Minangkabau traditional weaving Songkets in Pandai Sikek. *Journal of Physics: Conference Series*, 1806(1), 012054. <https://doi.org/10.1088/1742-6596/1806/1/012054>

<https://doi.org/10.1080/13603116.2020.1808717>

in pharmacy teaching and learning, 8(40), 509-516.

Ishartono N., Ningtyas D. A. (2021). Exploring mathematical concepts in Batik Sidoluhur solo. *International Journal on Emerging Mathematics Education*, 5(2), 151–164. <https://doi.org/10.12928/ijeme.v5i2.20660>

Ismail S. M., Rahul D. R., Patra I., Rezvani E. (2022). Formative vs. summative assessment: Impacts on academic motivation, attitude toward learning, test anxiety, and self-regulation skill. *Language Testing in Asia*, 12(1), 40. <https://doi.org/10.1186/s40468-022-00191-4>

- Johnson A., Clavijo A. E., Hamar G., Head D.-A., Thoms A., Price W., et al. (2021). Wood products for cultural uses: Sustaining native resilience and vital lifeways in southeast Alaska, USA. *Forests*, 12(1), 90. <https://doi.org/10.3390/f12010090>
- Jumba H. A., Mwiti F. M. (2022). Teachers' perception on integration of indigenous knowledge systems in competence based curriculum at selected primary schools in Buuri east sub-county. *International Journal of Professional Practice*, 10(1), 1–15.
- Khusaini A., Pradana M. A. R., Kusmayandi D. (2022). The importance of building design and its contribution to human health. *International Journal of Research and Applied Technology*, 2(1), 210–217. <https://doi.org/10.34010/injuratech.v2i1.6929>
- Kivunja, C., & Kuyini, A. B. (2021). Understanding and applying research
- Kusnandi R. (2020). Visualization approach in the framework of APOS learning theory. *International Journal of Arts Humanities and Social Sciences Studies*, 5(4), 9–13.
- Labarec, R. (2020). *Type of Research Design Organizing your Social Science*
- Lidinillah D. A. M., Rahman R., Wahyudin W., Aryanto S. (2022). Integrating Sundanese ethnomathematics into mathematics curriculum and teaching: A systematic review from 2013 to 2020. *Infinity Journal*, 11(1), 33–54. <https://doi.org/10.22460/infinity.v11i1.p33-54>
- Lohse B., Faulring K., Mitchell D. C., Cunningham-Sabo L. (2020). A definition of 'regular meals' driven by dietary quality supports a pragmatic schedule. *Nutrients*, 12(9), 2667. <https://doi.org/10.3390/nu12092667>
- Lu L., Sides M. L. (2022). Instructional design for effective teaching: The application of ADDIE model in a college Reading lesson. *Practitioner to Practitioner*, 11(1), 4–12.
- Machaba F., Dhlamini J. (2021). Ethnomathematics as a fundamental teaching approach. In *Mathematics teaching and professional learning in Sub-Sahara Africa* (pp. 59–76). Springer International Publishing. https://doi.org/10.1007/978-3-030-82723-6_5
- Madusise S. (2022). Towards the implementation of African indigenous mathematical practices into the mathematics curriculum in Southern Africa. Re-imagining indigenous knowledge and practices in 21st century Africa: Debunking myths and misconceptions for conviviality, 69–96. <https://doi.org/10.2307/j.ctv2gs4grp.7>
- Magaldi, D. & Berler, M. (2020). Semi-structured interviews. *Enclopedia of Personality*
- Mania S., Alam S. (2021). Teachers' perception toward the use of ethnomathematics approach in teaching math. *International Journal of Education in Mathematics, Science, and Technology*, 9(2), 282–298. <https://doi.org/10.46328/ijemst.1551>

Matsekoleng T. K., Mapotse T. A., Gumbo M. T. (2024). The role of indigenous games in education: A technology and environmental education perspective. *Diaspora, Indigenous, and Minority Education*, 18(1), 68–82. <https://doi.org/10.1080/15595692.2022.2160436>

Mbabane: SARFED.

Meaney T., Trinick T., Allen P. (2021). Ethnomathematics in education: The need for cultural symmetry. In Danesi, M. (Ed.), *Handbook of cognitive mathematics* (pp. 1–29). Springer. https://doi.org/10.1007/978-3-030-44982-7_4-1

Medyasari L. T., Dewi N. R., Adhi N. (2021). Auditory, intellectually, repetition with ethnomathematics nuance in improving students' mathematical problem solving ability. *Journal of Physics: Conference Series*, 1918(4), 042093. <https://doi.org/10.1088/1742-6596/1918/4/042093>

Melaningsih M., Ananda M., Pahmi S., Kondologit M. (2023). Congklak learning media to increase student learning motivation in class 2 elementary school. In *International conference on education, humanities, social science (ICEHoS 2022)* (pp. 3–14). Atlantis Press. https://doi.org/10.2991/978-2-38476-088-6_2

Methods Approaches (2nd ed). Thousand Oaks, CA: Sage.

Moloi T. J., Mosia M. S., Matabane M. E., Sibaya K. T. (2021). The use of indigenous games to enhance the learning of word problems in grade 4 mathematics: A case of Kgati. *International Journal of Learning, Teaching and Educational Research*, 20(1), 240–259. <https://doi.org/10.26803/ijlter.20.1.13>

Morabito J. P. (2022). Weaving beyond the binary. *Textile*, 20(4), 424–438. <https://doi.org/10.1080/14759756.2022.2046365>

Munir N. P., Anas A., Rosdiana R. (2023). Ethnomathematical student worksheets: Design traditional game Engklek Indonesia. *SUJANA (Education and Learning Review)*, 2(2), 1–10. <https://doi.org/10.56943/sujana.v2i2.313>

Musawwir A., Suryadi D. (2021). The exploration of ethnomathematics based on Rapa'i Geleng dance as mathematics learning media. *Journal of Physics: Conference Series*, 1882(1), 012046. <https://doi.org/10.1088/1742-6596/1882/1/012046>

Ncube, A, C. (2021). Barrier to learners' achievement in rural secondary schools in developing countries. The case study of rural Zimbabwe. *Journal of emerging trends in Educational Research and Policy Studied*, 5(1), 1-5.

Odora Hoppers C. (2021). Research on indigenous knowledge systems: The search for cognitive justice. *International Journal of Lifelong Education*, 40(4), 310–327. <https://doi.org/10.1080/02601370.2021.1966109>

Olema D. K., Nabitula A., Manyiraho D., Atibuni D. Z. (2021). Analysis of the shift from knowledge based to competency based education among secondary school teachers in Uganda. *International Journal of Educational Research*, 9(1), 49–56.

Onwuegbuzie, A. J., Leech, N. L., & Collins, K.M. (2021). Innovative Data

Owusu P., Obuo-Addo A. (2023). Alikoto: Mathematics instruction and cultural games in Ghana. *Cogent Education*, 10(1), 2207045. <https://doi.org/10.1080/2331186X.2023.2207045>
paradigm in educational context. *International Journal of Higher Education*, 6(5) 26-42.

Pourghaderi M., Houshiarrad A., Abdollahi M., Al-Jawaldeh A., Esfarjani F., Khoshfetrat M. R. Mohammadi-Nasrabadi F. (2023). A systematic review on food baskets recommended in the eastern Mediterranean region. *Sustainability*, 15(20), 14781. <https://doi.org/10.3390/su152014781>

Pradana K. C., Rizki Putra A., Rahmawati Y. (2022). Ethnomathematics on traditional culture: A bibliometric mapping analysis and systematic review on database Scopus. *International Journal Corner of Educational Research*, 1(1), 1–8. <https://doi.org/10.54012/ijcer.v1i1.61>

Prahmana R. C. I., D'Ambrosio U. (2020). Learning geometry and values from patterns: Ethnomathematics on the Batik patterns of Yogyakarta, Indonesia. *Journal on Mathematics Education*, 11(3), 439–456. <http://doi.org/10.22342/jme.11.3.12949.439-56>.

Prastika C., Anwar R., Abidin Z. (2021). Ethnomathematics exploration of the rattan handicrafts that can be applied in mathematics learning in secondary schools. *Journal of Physics: Conference Series*, 1882(1), 012073). <https://doi.org/10.1088/1742-6596/1882/1/012073>

Processes. Cambridge, MA: Harvard University Press.

Research paper. Retrieved from <https://libguides.usc.edu/content.phd?pid=8309sid=818072>

Retrieved from <http://www.researchgate.net/publication/284143585>

Rosenthal, M. (2020). Qualitative research methods why, when and how to

Sahara N., Ariaaji R., Azizah J., Lubis M., Lubis J. N. (2023). The role of ethnomathematics based on traditional Engklek games in improving the ability of understanding mathematical concepts SD Muhammadiyah Sipirok. *KnE Social Sciences*, 8(4), 336–342. <https://doi.org/10.18502/kss.v8i4.12915>

Sandelowski, M. J. (2020). Justifying Qualitative research. *Research in Nursing*

Sofotso, M. M. (2020). A Researcher's Dilemma: Philosophy in crafting
Studies, 3(5), 768-774.

Sunzuma G., Zezekwa N., Gwizangwe I., Zinyeka G. (2021). A comparison of the effectiveness of ethnomathematics and traditional lecture approaches in teaching consumer arithmetic: Learners' achievement and teachers' views. *Pedagogical Research*, 6(4), em0103. <https://doi.org/10.29333/pr/11215>

Sunzuma, G., & Maharaj, A. (2020d). Teachers' views on learner-related variables impeding the integration of ethno-mathematics approaches into the teaching and learning of geometry. *International Journal of Inclusive Education*,

Supriadi S., Alfarisa F., Hanif M., Litundzira R. S. (2023, February). Endog-Endogan games of fractional number ideas in ethnomathematics learning. In *AIP Conference Proceedings* (Vol. 2698, No. 1). AIP Publishing. <https://doi.org/10.1063/5.0122422>

Vygotsky, L. (1978). *Mixed in Society: The Development of Higher Psychological*

Zuhra M., Anwar A., Mailizar M. (2021). The development of ethnomathematics-based mathematics students' worksheet for junior high schools using contextual approach. *AIP Conference Proceedings* (Vol. 2331, No. 1). AIP Publishing. <https://doi.org/10.1063/5.0045499>

Khotimah, R. N., Widodo, S. A., & Retnawati, H. (2023). The effect size of ethnomathematics in mathematics learning: A meta-analysis study. *Gondang Education Research Journal*. <https://journal.myresearch.id/gerr/article/view/12>

Roberts, B., & Mbhele, T. (2024). Using Ndebele Art to Teach Geometry in Secondary Schools. *Journal of African Educational Studies*.

Ogbonna, B., et al. (2024). Rethinking Indigenous Mathematics Education: A Scoping Review. *arXiv Preprint* <https://arxiv.org/abs/2406.16921>

Iswandani, T., et al. (2023). Improving students' mathematical communication through ethnomathematics-based learning. *International Journal of Trends in Mathematics Education Research*.

Sibarani, H. R., & colleagues (2023). Mapping the Growth of Ethnomathematics Research 2010–2023. *IJLTER* <https://ijlter.org/index.php/ijlter/article/view/12336>

Appendix

Section A: Views on Ethnomathematics (Research Question 1)

1. Teachers' Perceptions and Support for Ethnomathematics

1. What is your general perception of the ethnomathematics approach in teaching mathematics?
2. Why do you think ethnomathematics should or should not be included in classroom instruction?
3. How would you describe your level of interest in using ethnomathematics in your teaching?

2. Impact on Student Engagement and Learning

4. In your experience, how does the ethnomathematics approach affect students' motivation to learn mathematics?
5. Have you observed any reduction in student boredom or disengagement when using culturally relevant examples?
6. How does linking mathematics to students' cultural contexts influence their understanding and performance?

3. Effectiveness and Relevance of Ethnomathematics

7. In what ways do you think the ethnomathematics approach makes mathematics learning more meaningful or effective?
8. Can you give an example of a lesson where using ethnomathematics improved student participation or comprehension?
9. How do you think students' pre-existing cultural and mathematical experiences help in learning through this approach?

4. Barriers to Full Integration

10. Have you faced any difficulties in fully integrating mathematics content with ethnomathematics activities?

11. What challenges do you think prevent other teachers from applying the ethnomathematics approach?
12. What kind of support or training would help you and others improve the use of ethnomathematics in teaching?

Section B: Influencing Factors (Research Question 2)

1. Teacher Beliefs on Cultural Relevance in Mathematics

1. In your view, why is it important to make mathematics culturally relevant for learners?
2. How do you perceive the current mathematics curriculum in terms of its cultural relevance?
3. What do you think are the consequences of excluding learners' cultural backgrounds from mathematics teaching?
4. Can you share examples of how incorporating students' cultural practices might improve their engagement in mathematics?

2. Perceived Benefits of Ethnomathematics Integration

5. What benefits do you think students gain when ethnomathematics is included in the curriculum?
6. Do you believe that including ethno mathematical content can improve learners' performance in mathematics? Why or why not?
7. How might seeing their own cultural practices reflected in the classroom motivate learners to perform better in mathematics?
8. Have you observed any changes in learner interest or understanding when you relate math to real-life or cultural examples?

3. Factors Influencing Integration Decisions

9. What factors encourage or discourage you from integrating ethnomathematics into your lessons?
10. How do you perceive the relationship between mathematics and students' everyday lives?

11. In your opinion, does the current teaching approach help learners see the connection between mathematics and their lived experiences?
12. What kind of support (e.g., resources, training) do teachers need to confidently integrate ethnomathematics?

4. Challenges and Teacher Preparedness

13. How confident do you feel in your ability to identify and use ethno mathematical content in your teaching?
14. What training, if any, have you received in integrating cultural knowledge into mathematics instruction?
15. In your experience, what challenges do teachers face when trying to link mathematics and culture in the classroom?
16. Do you think ethnomathematics has a legitimate place in the school mathematics curriculum? Why or why not?

Section C: Challenges and Difficulties (Research Question 3)

1. Language and Communication Challenges

1. How does the difference between mathematical language and everyday language affect your teaching?
2. Have you faced situations where students struggled to understand mathematical terms because they differ from daily language?
3. In your experience, how can mathematical concepts be made more understandable using everyday language or examples?

2. Knowledge and Familiarity with Cultural Activities

4. How familiar are you with cultural activities that could be used to teach mathematics concepts?
5. What challenges do you face in identifying cultural activities that align with specific mathematical topics?

6. Can you describe a time when your lack of knowledge about a cultural practice hindered your ability to use it in a lesson?

3. Pedagogical Competence and Teaching Strategies

7. What kind of training or support would help you feel more confident integrating cultural activities into mathematics lessons?
8. Do you feel adequately prepared to design lessons that combine mathematics with cultural practices? Why or why not?
9. How do you handle situations where a cultural activity seems loosely connected to the mathematics topic at hand?

4. Relevance and Suitability of Cultural Content

10. In your opinion, are there some mathematics topics that are harder to connect with cultural activities than others? Which ones?
11. Have you ever found a cultural activity to be too shallow or unrelated to use effectively in teaching a mathematical concept?
12. What do you think can be done to improve the relevance and depth of cultural examples used in teaching mathematics?

