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INCORPORATING TRADITIONAL GAMES INTO THE TEACHING AND LEARNING OF PRIMARY MATHEMATICS AT PONDEROSA PRIMARY SCHOOL IN DOMA CLUSTER.

BY

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DEDICATION

This dissertation is dedicated to my family, whose unwavering support and encouragement have been my foundation throughout this journey. To my parents, for instilling in me the values of hard work and perseverance my partner, for your endless patience and love; and to my friends, for believing in me even when I doubted myself. Thank you for being my inspiration and my strength

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ABSTRACT

This dissertation explores the integration of traditional games into the teaching and learning of primary mathematics at Ponderosa Primary school in Doma cluster. Traditional games, often rooted in cultural heritage, have the potential to enhance educational experiences by fostering engagement, collaboration, and critical thinking among students. The study addresses the pressing need for innovative teaching methodologies that can improve mathematical understanding and performance in primary education.

The research employs a mixed approach, utilizing both quantitative and qualitative data collection techniques. Surveys were administrated to teachers and to gather insights on the current use of students on the current use of traditional games in mathematics instruction, while semi structured interviews provided deeper qualitative data regarding experiences and perceptions. The research aims to answer three primary questions: (1) What traditional games can used to teach primary mathematics concepts at Ponderosa Primary School? (2) How does the incorporation of traditional games affect pupils' understanding and retention of primary mathematics concepts? (3) What challenges and opportunities arise when integrating traditional games into the primary mathematics curriculum?

Findings from the quantitative from analysis revealed a unanimous agreement among teachers regarding the effectiveness of games such as Hopscotch (Pada), Tsoro Yematatu (Three Men's Morris and Nhodo in Teaching various mathematical concepts. Hopscotch was noted for its utility in teaching numerical sequences and counting, while Tsoro Yematatu was highlighted for enhancing spatial reasoning and geometric concepts. Nhodo emerged as a powerful tool for teaching arithmetic operations and strategic thinking. The qualitative data corroborated these findings with teachers expressing that these games foster engagement, enthusiasm and collaboration among students, thereby transforming the learning experience from passive to active.

The study also identified significant positive impacts of traditional games on schools' understanding and retention of mathematical concepts. Teachers reported that these games contextualize abstract mathematical ideas, making them more tangible and relatable. Students demonstrated increased motivation and participation, with many expressing that learning through games was more enjoyable and less intimidating. Moreover, traditional games were

found to encourage critical thinking and problem-solving skills, as learners strategized and reflected on their gameplay experiences.

However, the research also unveiled several challenges associated with integrating traditional games into the game the mathematics curriculum. These included a lack of resources and materials, insufficient training for teachers on how to effectivity implement game-based learning, rigid curriculum structures that prioritize rote memorization, and difficulties in managing large classes during game activities. Despite these barriers, the study underscores the potential of traditional games as valuable educational tools that can bridge the gap between cultural heritage and formal education.

In conclusion, this dissertation advocates for the systematic integration of traditional games into the Ponderosa Primary mathematics curriculum at emphasizing the need for targeted professional development for teachers, curriculum flexibility and resource allocation. By recognizing and harnessing the pedagogical power of traditional games, educators can create a more engaging, inclusive and effective mathematics learning environment that resonates with students 'cultural identities' findings contribute to the growing body of literature on culturally responsive pedagogy and offer practical recommendations for enhancing mathematics education in Zimbabwe. Future research is encouraged to explore the long term impacts of traditional games on students' academic performance and skills, as well as the scalability of this approach in other educational contexts

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Chapter 1: Introduction

In the quest to improve mathematics education at the primary level, teachers and researchers continually seek innovative and culturally seek innovative and culturally responsive teaching strategies. One such approach is the incorporation of traditional games into the teaching and learning process. Traditional games, deeply rooted in the cultural and social fabric of communities, offer a unique opportunity to make mathematical concepts more accessible, engaging, and relevant to learners.

The incorporating traditional games into the teaching and learning of primary level mathematics at Ponderosa Primary in Doma cluster presents an innovative approach to education that not only enhances learner's engagement but also fosters a deeper understanding of mathematical concepts. Goduka, (2000) argues that traditional games, deeply rooted in cultural practices of the Doma community, provide an effective means of bridging the gap between cultural heritage and formal education. The Doma cluster is characterized by its unique cultural practices and community values that offers a rich context for integration of tradition games into the curriculum

According to Mawere (2015), traditional games can serve as a pedagogical strategy that promotes active learning, allowing learners to explore mathematical concepts in a fun and interactive environment. For instance, games that involve counting, measurement, and spatial awareness can be directly linked to mathematical principles, enhancing learners' understanding through practical application (Mawere, 2015). Murray (2019) posits that by utilizing local knowledge and practices, teachers create more inclusive and relevant learning environment that resonates with learners 'experiences and background. This approach not only aids in the comprehension of mathematical concepts but also fosters a sense of identity and belonging among learners 'as they see their cultural heritage reflected in their learning materials. This introductory chapter serves to set the scene for the research by providing some background to the study, statement of the problem, research questions, significance of the study, limitations of the study, delimitations of the study, theoretical frameworks and defining some of the key concepts relevant to their use in this research.

1.1 Background of the study

Cultural vital heritage plays role in shaping identity and fostering a sense of belonging among learners. The context in which mathematics is utilized in different cultures has been severally acknowledged in research and curriculum reforms (Adebar & Swift, 2014; Nabie & Akayuure, 2014; Rosa & Orey, 2013; Chikodzi & Nyota, 2010; Nkopodi & Mosimege, 2009). All these researchers acknowledge the importance of adopting culturally responsive pedagogies to the teaching of mathematics and other disciplines. Research done by Katongomara (2016) indicates that engaging with cultural heritage can enhance learners ' educational experiences and personal development, particularly in subjects like mathematics. In Zimbabwe, a country rich in diverse cultures, the integration of cultural heritage into education is particularly significant (Chere, 2015). The Zimbabwe Heritage Based Curriculum (2024-2030) requires learners to participate in cultural activities that not only enrich their understanding of their heritage but also foster critical thinking skills applicable in mathematics (Mafura & Tichaona, 2020). Thus, the Heritage-Based Junior Mathematics syllabus for primary Schools (2024-2030) emphasizes the use of games by stating that for the study of relationships "games and puzzles" are to be used and concepts developed and established through practical activities. This implies that traditional games should incorporate mathematical concepts such as counting, strategy, and spatial awareness, allowing learners to experience these concepts in a culturally relevant context.

According to Chikunda (2019), the incorporation of cultural elements into the mathematics curriculum is particularly crucial in a diverse society like Zimbabwe, where understanding one's cultural identity can enhance engagement and learning outcomes. Ndlovu (2021) posits that incorporating traditional games in the teaching and learning mathematics encourage collaboration, and strategic thinking, all of which are vital components of effective mathematics education. Thus, integration of traditional games into the teaching of primary mathematics in Ponderosa primary in Doma cluster holds significant potential for enhancing learners' engagement and understanding.

Nyota and Mapara (2007) asserts that incorporating traditional games in the teaching and learning mathematics at primary level, not only addresses the challenges faced in mathematics education but also honours the cultural heritage of the Doma community, fostering a more holistic and meaningful learning experience. The ponderosa Primary School, located in the Doma Cluster, provides a valuable context for this exploration, given its rich cultural heritage and existing challenges in mathematics performance. Nyota and Mapara (2007) argues that by

embedding local cultural practices into the curriculum, understanding of how traditional games can enhance learners' understanding of mathematical concepts, improve participation, and foster a positive attitude toward the subject can be enhanced. Traditional games have the pedagogical potential in promoting active learning, problem solving and critical thinking among primary school learners (Chikunda, 2019).

As indicated by Ndlovu (2021), despite the syllabus requirements advocating for cultural activities, there remains a gap in research regarding their effectiveness in enhancing cultural identity and academic performance among mathematics learners. This study explores the integration of traditional games into the teaching and learning of mathematics at Ponderosa Primary School in the Doma cluster. This study aims to investigate the extent which these cultural activities affect learners' understanding of mathematics and their sense of cultural identity, ultimately contributing to a more inclusive and effective educational approach.

1.2 Statement of the problem

Ponderosa primary in Mhangura, the primary mathematics curriculum faces challenges in engaging learners and fostering a strong sense of cultural identity. Despite the rich cultural heritage present in the country, there is notable disconnect between traditional cultural practices, such as games, and the mathematics education that learners receive. This gap often results in diminished interest in mathematics, as learners struggle to see the relevance of mathematical concepts to their cultural contexts and daily lives. Traditional games, which inherently incorporate mathematical strategies and problem-solving skills, are underutilized in the current educational framework. This oversight not only deprives learners of a valuable resource for enhancing their mathematical understanding but also limits opportunities for them to connect with their cultural heritage. The curriculum requirements, as outlined in the heritage-based curriculum emphasize the importance of integrating cultural elements into subjects like mathematics. However, the practical implementation of these requirements remains inconsistent and often lacks effective strategies for integration.

Understanding the impact of traditional games on primary school learners' participation in mathematics activities is crucial for early childhood education in rural communities due to several significant implications. Several researchers in educational psychology have shown that incorporating familiar cultural elements into learning activities can enhance learners' motivation and engagement (Vygotsky, 1978; Akkerman & Bakker, 2011). In rural settings like Doma cluster, where learners may have limited exposure to formal educational resources,

leveraging traditional games that are part of their cultural heritage can serve as a powerful tool to foster interest and active participation in mathematics activities (Nzuki et al., 2011). Moreover, by identifying the potential benefits of integrating traditional games into teaching and learning mathematics, teachers can design more culturally responsive and engaging learning experiences for young learners.

Culturally responsive pedagogy emphasizes the importance of acknowledging and incorporating learners' cultural backgrounds into the curriculum to promote equitable outcomes (Gay, 2010). By integrating traditional games that reflect the traditional culture into mathematics, teachers can create learning environments that are inclusive, relevant, and meaningful for all learners, regardless of their cultural backgrounds (Banks, 2009). Educational policies and curriculum frameworks often shape the direction of teaching and learning practices in schools (Gewirtz et al., 1995). By highlighting the positive impact of traditional games on mathematics engagement, research findings has advocated for the inclusion of culturally relevant pedagogies in early childhood education policies and curriculum standards. This, in turn, can lead to systemic changes that prioritize cultural diversity and responsiveness in educational practices, benefiting learners in rural communities and beyond.

As a result, there is a pressing need to explore how traditional games can be effectively promoted within the mathematics curriculum to enhance mathematics' engagement, understanding, and appreciation of both mathematical concepts and their cultural identity. Addressing this problem will contribute to a more holistic educational experience that respects and celebrates Zimbabwe's diverse cultural heritage while improving learners' outcomes in mathematics. However, research examining the specific effects of these traditional games on primary school learner's participation in mathematics activities is scarce, particularly in rural areas like Doma cluster. It is against this backdrop that the current study seeks to investigate the incorporating traditional games into the teaching and learning of primary mathematics at Ponderosa Primary in Doma cluster.

1.3 Research Questions

The following research questions guided the study.

1.3.1 What traditional games can be used to teach primary mathematics concepts at Ponderosa primary school?

1.3.2 How does the incorporation of traditional games affect pupils' understanding and retention of primary mathematics concepts?

1.3.3 What challenges and opportunities arise when integrating traditional games into the primary mathematics curriculum?

1.4 Research Objectives

The study is intended to help:

1.4.1To identify the traditional games that can be used to teach primary mathematics concepts at Ponderosa Primary School.

1.4.2 To determine the impact of incorporating traditional games on pupils' understanding and retention of primary mathematics concepts.

1.4.3 To investigate the challenges and opportunities of integrating traditional games into the primary mathematics curriculum.

1.**5 Significance of the study**

The significance of studying the incorporation of traditional games into the teaching and learning of primary mathematics at Ponderosa Primary School in the Doma District Cluster is multi-faceted and affects various stakeholders including students, teachers, the school, the community, and potentially even educational policy. Traditional games often present mathematical concepts in a fun and engaging way, reducing anxiety and fear associated with traditional classroom settings. By making learning playful, students are more likely to approach mathematics with a positive attitude and be more willing to participate.

Many traditional games naturally incorporate mathematical concepts such as counting, spatial reasoning, problem solving, and logical thinking. Using these games allows students to learn these concepts practically and experientially, leading to a deeper and more intuitive understanding than rote memorization.

Games provide intrinsic motivation. The desire to win, compete with peers, and master the game mechanics drives students to engage actively in the learning process. This increased participation can translate to better understanding and retention of mathematical concepts.

Different students learn in different ways. Games can cater to visual, kinaesthetic, and auditory learners by offering a multi-sensory learning experience. This can make mathematics more accessible and engaging for a wider range of students. Traditional games often require students to develop strategies, analyse situations, and make decisions based on mathematical principles. This promotes critical thinking and problem-solving skills, which are essential for success in mathematics and beyond.

Integrating traditional games provides teachers with a wider range of pedagogical tools to use in the classroom. This allows them to move beyond traditional lecture-based methods and create more dynamic and interactive learning environments. Traditional games can be easily adapted to suit the needs of different learners. Teachers can modify the rules or complexity of the game to provide appropriate challenges for students of varying abilities.

Well-structured games can promote collaboration, communication, and teamwork among students, leading to a more positive and manageable classroom environment. Using traditional games connects mathematics to the students' cultural heritage and lived experiences. This makes the subject matter more relevant and meaningful, fostering a sense of pride and ownership in their learning. This research can serve as a basis for teacher professional development programs, providing them with the knowledge and skills to effectively integrate traditional games into their mathematics lessons.

By improving student learning and engagement in mathematics, the research can contribute to higher test scores and overall academic performance at Ponderosa Primary School. Implementing innovative teaching methods like integrating traditional games can enhance the school's reputation and attract more students.

Traditional games often require minimal resources, making them a cost-effective and sustainable way to improve mathematics education. The use of traditional games in the classroom helps to preserve and promote local culture, fostering a sense of community and identity among students. The findings of the research can be shared with other schools in the

Doma Cluster, potentially leading to wider adoption of this innovative approach to mathematics education.

The research can involve community members in the identification and development of traditional games that can be used in the classroom. This can strengthen the relationship between the school and the community. By documenting and promoting traditional games, the research can help to preserve a valuable part of the community's cultural heritage. Educating parents about the benefits of traditional games can encourage them to play these games with their children at home, reinforcing mathematical concepts learned in the classroom. When the community is involved in the educational process, they feel a sense of ownership and responsibility for the success of the school.

The research can provide evidence to support the integration of traditional games into the mathematics curriculum at the national or regional level. The findings can inform the development of new mathematics curricula that incorporate culturally relevant games and activities. The research can lead to policy recommendations for supporting the use of traditional games in schools, such as providing funding for teacher training and resource development.

If the research demonstrates positive results, the approach can be scaled up and implemented in other schools and communities. The study can encourage other educators and researchers to explore innovative approaches to teaching and learning, particularly those that are culturally relevant and engaging.

In conclusion, this research has the potential to significantly impact mathematics education at Ponderosa Primary School, within the Doma District Cluster, and potentially beyond. It addresses critical issues of student engagement, conceptual understanding, teacher development, cultural preservation, and policy implications. By demonstrating the effectiveness of incorporating traditional games into mathematics education, the study can contribute to creating more engaging, effective, and culturally relevant learning experiences for students. It highlights the importance of connecting education with local culture and the power of play in promoting deeper learning.

1.6 Limitations

According to Simon & Goes (2013), limitations are outside forces beyond the researcher's control and which limit the transferability of the study. Appreciably, notwithstanding the fact that this study provides pertinent insights into the incorporating traditional games into the teaching and learning of primary mathematics at Ponderosa Primary in Doma cluster, there are inherent limitations to it. Respondents of the study were drawn from one school in Doma cluster limiting the generalisation of the findings.

The other limitation related to the duration of the study on the incorporating traditional games into the teaching and learning of primary mathematics at Ponderosa Primary in Doma cluster. The time to carry out the research could have been limited. As a way of mitigating this challenge, the researcher followed stringent timeframes to meet set deadlines.

By concentrating exclusively on mathematics education, the research considers the potential influences of cultural heritage on other subjects or holistic educational experiences. This narrow focus may overlook broader educational implications.

1.7 Delimitations of the study

This study focusses on Ponderosa primary school in the Doma cluster of Mhangura, Zimbabwe. It involved primary school teachers and students from grades 1 to 7. The research explored the integration of traditional games into mathematics curriculum over one academics

The research involved mathematics learners in selected at Ponderosa primary school in Doma cluster who were currently studying at the primary level.

1.8 Definitions of terms

1.8.1 Traditional games: Games that are passed down through generations, often reflecting the cultural heritage of a community. (Smith,2006). Traditional games are defined as activities that have been passed down through generations within a culture and often embody significant cultural values and community practices. They promote social interaction, physical activity and cognitive development. In Zimbabwe, traditional games such as Nhodo, Chimurenga (a strategic board game) and Dama (checkers) are prevalent. These games can effectively bridge the gap between that is both engaging and relevant (Mavhunga and Rollnick,2013).

1.8.2 Mathematics curriculum: A structured set mathematical concepts and skills that students are expected to learn at particular grade level. (Hall,1990).

1.8.3 Mathematics education: Mathematics education refers to the teaching and learning process associated with mathematics, encompassing the curriculum, instructional strategies, and assessment methods used to facilitates students' understanding of mathematical concepts (NCTM,2000).

1.8.4 Engagement: The level of interest, motivation, and participation that students exhibit in their learning activities. Kahn (1990)

1.9 Organization of the study

This study is arranged into six chapters. Each chapter of this study was written with the focus on the incorporating traditional games into the teaching and learning of primary mathematics at Ponderosa Primary in Doma cluster. Each chapter covers a certain aspect of the study. Below are summaries of each chapter's main points.

1.9.1 Chapter 1: Introduction and Background

The first chapter provides context by focusing on the background information about the research topic, statement of the problem, significance of study, justification of the study, Objectives of the study, research questions the study sought to answer, limitations and delimitations of study.

1.9.2 Chapter 2: Literature Review

Chapter 2 provides a review of the literature, and the work done by other researchers the incorporating traditional games into the teaching and learning of primary mathematics at Ponderosa Primary in Doma cluster. The conceptual and theoretical frameworks underpinning the study are outlined.

1.9.3 Chapter 3: Research Methodology

Chapter 3 presents the methodology of the study by articulating the theoretical basis of the methodology. This chapter includes discussions of research paradigm, research design, research approach, research strategy and research methods, data analysis, data trustworthiness, reliability and validity as well as ethical issues.

1.9.4 Chapter 4: Data Presentation, and Analysis of results

This chapter presents and analyses both qualitative (QUAL) and quantitative (QUAN) data emanating from the research questions.

1.9.5 Chapter 5: Discussion of findings

This chapter discusses the analysed results presented in chapter 4. This marks the point where the analysed data in chapter 4 is interpreted in relation to literature and past researches discussed in chapter 2

1.9.6 Chapter 6: Conclusion, Implications and Recommendations

Chapter 6 presents the summary of research study, conclusions and recommendations based on the findings of the study.

Chapter 2: Literature review

2.1 Introduction

This literature review explores the integration of traditional games into the teaching and learning of primary mathematics at Doma cluster. The integration of traditional games into the teaching of primary mathematics offers a unique approach to education that respects cultural heritage while enhancing learning outcomes. Akben (2019). Traditional games, deeply rooted in cultural practices, offer an innovative approach to enhancing mathematical understanding. Thus, this section discusses the literature review, which forms part of the conceptual and theoretical frameworks of the study. The literature review serves to set the stage for the research undertaken.

2.2 Theoretical framework

The integration of tradition games into the teaching of primary mathematics at Ponderosa Primary in the Doma cluster can be understood through theoretical lens. The study is framed within the social constructivist theory, which states that reality is socially constructed through human activity as in traditional game activity (Owusu-Mensah & Baffour, 2015). The advocates of this theory (Piaget, Vygotsky and Bruner) say knowledge is derived from interactions between people and their environment (Ernest, 1994). In social constructivism, both the learning of mathematics concepts and the social contexts are central to learners' creation, discovery and attainment of the desire knowledge.

This theory encourages teaching to learning where the teacher acts as a guide and not the sage on the stage, spoon feeding learners with knowledge (Owusu-Mensah & Oppong, 2015). On the other hand, instead of simply reproducing what the teacher or textbook presents, the learners are engaged to construct understanding in their own minds. Moloi (2014) admits that no matter how lucidly and patiently teachers explain the subject-matter to learners, the truth is that teachers cannot understand for their learners. Consequently, the researchers can construct much more meaning from data they gather when they are fully involved with subjects in the data collection process. Thus, in relation to this framework, the study is set to (i) identify the traditional games that can be used to teach primary mathematics concepts at Ponderosa Primary School. (ii) Determine the impact of incorporating traditional games on pupils' understanding and retention of primary mathematics concepts and (iii) investigate the challenges and opportunities of integrating traditional games into the primary mathematics curriculum.

Sparrow and Hurst (2012) observe that learners understand what they learn well when teachers design and build learning situations upon the experiences learners bring to the classroom. Vygotsky highlights the role of game activities in learners' socialisation (Vankus, 2005). Owusu-Mensah and Baffour (2015) maintain that game play can help learners achieve the mathematical connections to life situations if teachers can link them to the mathematics in the classroom. As learning is achieved by doing, game play can be useful platform for better construction of mathematical knowledge (Vankus, 2005). In line with the constructivist principles, the researcher seeks to explore the integration of traditional games into the teaching and learning of primary mathematics at Doma cluster.

2.3 Utilising traditional Zimbabwean games to teach primary school mathematics.

This section explored how specific traditional Zimbabwean games can be effectively integrated into primary school mathematics instruction, fostering a deeper understanding and appreciation for the subject while preserving cultural heritage. According to Chikodzi and Nyota (2010), Zimbabwe's rich cultural heritage offers a wealth of resources beyond the textbook for engaging primary school students in learning mathematics. Thus, traditional games, deeply ingrained in the social fabric, provide a dynamic and culturally relevant context for introducing and reinforcing mathematical concepts.

Nyota and Mapara (2008) argues that traditional games, passed down through generations and enjoyed across cultures, offer a powerful and engaging tool for teaching mathematics in primary schools. Moving beyond rote memorization and abstract formulas, these games embed mathematical concepts within playful contexts, fostering a deeper understanding and appreciation for the subject (Shumba et al., 2014). This implies that by leveraging the inherent motivation and collaborative nature of games, teachers can create dynamic learning environments that cater to diverse learning styles and make mathematics accessible and enjoyable for young learners. Thus, specific traditional games can be effectively utilized to teach key mathematical concepts in primary school.

Shumba et al., (2014) posits that, one fundamental mathematical concept readily taught through traditional games is counting and number recognition. Games like Hopscotch (Pada) are inherently tied to numerical sequences (Shumba et al., 2014). In Hopscotch, learners verbally count as they hop from square to square, reinforcing number identification and sequence. As

Van den Heuvel-Panhuizen and Treffers (2009) argue, these activities allows students to internalize numerical patterns through physical interaction, making the learning process more concrete and memorable. Furthermore, the competitive aspect of the traditional game can motivate children to ensure fair gameplay, thereby subtly reinforcing the importance of precision in mathematics.

Clements and Sarama (2014) asserts that Tsoro Yematatu (also known as Three Men's Morris or Nine Holes), a strategic traditional game played on a board with intersecting lines and using counters, inherently involves spatial reasoning, a crucial element in geometry. According to Clements and Sarama (2014), spatial reasoning abilities are directly related to success in mathematics and science. By playing Tsoro Yematatu, learners develop an intuitive understanding of concepts like points, lines, angles, and spatial relationships (Shumba et al., 2014). Thus, learners learn to visualize patterns, plan strategies, and predict outcomes, all of which contribute to their spatial reasoning skills. Furthermore, analysing the game board can introduce the concept of symmetry and geometric shapes (Clements & Sarama, 2014). Teachers can encourage students to identify different angles formed by the intersecting lines or analyse the symmetry of the board itself. This gamified approach makes learning geometry less abstract and more engaging, allowing students to learn through hands-on experience (Van Oers, 2010).

Another valuable traditional game as indicated by Nyota and Mapara (2008) is Nhodo, a game played with stones or counters, often in a designated area drawn in the sand. While variations exist across different regions of Zimbabwe, the core gameplay usually involves moving counters in a strategic manner to capture the opponent's pieces (Nyota & Mapara, 2008). Nhodo readily lends itself to teaching counting, addition, subtraction, and strategic thinking. Shumba et al., (2014) asserts that teachers can incorporate scenarios where learners need to calculate the number of spaces a counter needs to move, the number of counters they need to capture, or the number of counters remaining for each player.

According to Chikodzi and Nyota (2010), Nhodo game also promotes problem-solving skills, as learners must devise strategies to outmanoeuvre their opponent. Moreover, introducing different scoring systems allows learners to practice arithmetic operations in a meaningful context. For example, a point system based on the number and type of captured pieces can be used to reinforce addition and subtraction skills (Kamii, 2000). The competitive nature of

Nhodo adds an element of excitement and motivation, encouraging students to actively participate and learn from their mistakes.

A study by Clements and Sarama (2014) established that the use of songs and rhymes, often accompanied by clapping games, offers a fun and engaging way to teach counting and sequencing. Traditional Zimbabwean children's songs often involve repetitive counting patterns and rhythmic sequences. These songs can be adapted to teach basic arithmetic operations or introduce concepts like skip counting (Clements & Sarama, 2014). For example, a song about counting chickens hatching from eggs can be used to illustrate addition or multiplication. The rhythm and repetition make these concepts easier to memorize and understand, particularly for younger children (Berghoff & Egawa, 1991). Furthermore, these songs often contain elements of cultural heritage, connecting mathematics to the learners' identity and background, thereby making learning more relevant and enjoyable.

Further, Clements and Sarama (2014) argues that the benefits of integrating traditional games into mathematics instruction extend beyond improved mathematical understanding. These games foster collaboration, communication, and critical thinking skills (Clements & Sarama, 2014). Students learn to work together, negotiate rules, and strategize as a team. They also develop their communication skills as they explain their reasoning and justify their moves. Furthermore, playing these games exposes learners to their cultural heritage, promoting a sense of pride and identity. This is particularly important in a globalized world where local cultures are often overshadowed by dominant influences (Bishop, 1988). By incorporating traditional games into the curriculum, teachers can create a more inclusive and culturally relevant learning environment that values and celebrates diversity.

Nyota and Mapara (2008) posits that successfully integrating traditional games requires careful planning and implementation. Teachers need to be adequately trained on the rules and variations of these games. They also need to develop pedagogical strategies for using these traditional games to effectively teach mathematical concepts (Nyota & Mapara, 2008). This may involve adapting the rules of the game, modifying the scoring system, or creating specific worksheets or activities to reinforce the learning objectives. Furthermore, Nyota and Mapara (2008) argues that it is important to ensure that all learners have equal access to the games and resources. Thus, this may require providing alternative materials or adaptations for students with disabilities or those who are unfamiliar with the games.

In Zimbabwe, the current Heritage-Based Curriculum and competence-driven education reform emphasize the need for contextualized learning that draws from learners lived cultures and indigenous knowledge systems. This creates an opportunity for teachers to integrate traditional games into mathematics instruction, particularly at the primary level. Research conducted in Zimbabwe and the wider southern African region since 2020 shows that indigenous games carry rich mathematical ideas, and when these are harnessed in structured classroom settings, they can significantly improve numeracy, problem-solving skills, and learner engagement (Moyo & Chinamasa, 2022; Tarashika & Jairo, 2023).

One of the most notable examples is *tsoro*, a Shona and Ndebele two-player pit-and-pebble game. Studies have demonstrated its potential to teach counting-on and counting-back, grouping, comparison of quantities, parity, and even the foundations of multiplicative thinking (Moyo & Chinamasa, 2022). In practice, teachers can begin with free play to help learners articulate the rules, then gradually introduce recording of moves using tally marks or number lines. Over time, these representations can be linked to number sentences and extended to arrays, thereby connecting informal strategy play to formal arithmetic and early algebraic reasoning.

Similarly, *nhodo*, a game involving tossing and picking up small stones offers a natural platform for developing counting fluency, subitizing, and combinatorial thinking. Early Childhood Development (ECD) research in Zimbabwe confirms that nhodo supports mathematical language and number concepts (Tarashika & Jairo, 2023). By adjusting the number of stones to be picked up, teachers can guide learners through various counting ranges, even/odd number identification, and basic probability discussions when learners observe which totals occur more frequently.

Hopscotch, known locally as *pada*, provides an embodied number line that allows learners to experience addition and subtraction through movement. Number patterns emerge as players follow rules that involve skipping certain squares, which can also introduce concepts such as even and odd sequences, symmetry, and modular arithmetic (Moyo & Chinamasa, 2022). By labelling the grid with numbers or coordinates, teachers can further extend the game to introduce coordinate geometry concepts informally at primary level.

Rope-skipping and clapping games, which remain popular in many Zimbabwean schoolyards, also lend themselves to mathematical exploration. The rhythms in these games can be used to

teach skip counting, least common multiples, and fractions as parts of a whole. For example, a pattern of two claps for every three jumps can be transformed into a lesson on ratios and rates. Regional studies since 2020 have found that embedding such games into lessons strengthens both numeracy and learner participation (Matsekoleng, 2024; SAJCE, 2024).

The effective use of traditional games in mathematics aligns strongly with the Ministry of Primary and Secondary Education's 2024–2030 Heritage-Based Curriculum, which encourages culturally grounded, performance-based teaching approaches (MoPSE, 2024). Teachers can deliberately link the mechanics of each game to syllabus objectives, progressively increase complexity for different grades, and capture artefacts of play such as recorded moves, game logs, or outcome charts as evidence for continuous assessment.

However, research also reveals that while many Zimbabwean teachers value ethno mathematics, some lack the confidence to translate games into formal lessons without losing academic rigor (Sunzuma & Maharaj, 2020). Professional development that models how to set learning goals, script guiding questions, and design assessments from game-based activities is therefore essential.

Ultimately, Zimbabwean traditional games like tsoro, nhodo, pada, and rope skipping are not merely recreational activities but complex, mathematically rich systems. When intentionally integrated into primary mathematics instruction, they support curriculum objectives, strengthen core numeracy skills, and affirm cultural identity. In this way, the mathematics classroom becomes a place where learning is both rigorous and deeply connected to Zimbabwean heritage.

In conclusion, traditional Zimbabwean games offer a valuable and engaging resource for teaching primary school mathematics. Games like Tsoro Yematatu and Nhodo provide opportunities for students to develop spatial reasoning, problem-solving, and arithmetic skills in a culturally relevant context. The use of traditional songs and rhymes further enhances the learning experience by incorporating rhythm and repetition. By carefully integrating these games into the curriculum, teachers can create a more engaging, inclusive, and culturally relevant learning environment that fosters a deeper understanding and appreciation for mathematics while preserving and promoting Zimbabwe's rich cultural heritage.

2.4 Impact of traditional games on mathematics understanding and retention in Zimbabwean primary school.

The incorporation of traditional games into the mathematics curriculum has been shown to positively affect learners' understanding and retention of concepts. According to Mapfumo (2013), Zimbabwe is a nation rich in cultural heritage but faces the challenge of enhancing mathematics education. While modern pedagogical approaches are gaining traction, a wealth of untapped potential lies within traditional Zimbabwean games. Mapfumo (2013) argues that incorporating traditional games into the primary mathematics curriculum can significantly affect learners' understanding and retention of key concepts by fostering engagement, contextualizing learning, and promoting a deeper, and more intuitive grasp of abstract mathematical ideas.

As indicated by Kihara (2018), learners who engaged in learning through traditional games demonstrated higher levels of enthusiasm and participation, leading to improved comprehension of mathematical principles. In a Zimbabwean context, the use of culturally relevant games allows learners to connect new mathematical concepts with familiar practices, which aids retention. Chikoko and et al (2019) indicates that learners are more likely to remember mathematics concepts that are taught in a context they understand and enjoy. This connection is crucial in primary education, as learners are often more engaged when learning is interactive and fun.

As indicated further by Mapfumo (2013), traditional Zimbabwean games, like Tsoro Yematatu (a variation of Tic-Tac-Toe), Nhodo (a strategy game with counters), and Pada (a type of seed game), are more than just recreational activities. They inherently embody mathematical principles. Tsoro Yematatu, for example, requires strategic thinking, pattern recognition, and spatial reasoning skills directly relevant to understanding geometric concepts and problem solving in mathematics (Mapfumo, 2013). Nhodo involves counting, strategic placement of counters, and understanding symmetrical arrangements, all contributing to a foundational understanding of arithmetic and geometry (Chikwature & Jeke, 2015). Pada necessitates careful calculation, resource management, and strategic planning, reinforcing basic arithmetic operations and logical thinking (Mukwada, 2007).

Mutodi (2014) established that integrating traditional games into mathematics instruction foster engagement and motivation. Traditional games are inherently engaging, drawing upon learners' cultural familiarity and natural inclination towards play. This intrinsic motivation can translate into increased participation and a more positive attitude towards mathematics, combating the prevalent anxiety and apprehension often associated with the subject (Mutodi, 2014). By associating learning with enjoyment, teachers can create a more conducive learning environment, encouraging active participation and minimizing passive reception of information.

A study by Chikwature and Jeke (2015) found that traditional games contextualize learning, making abstract mathematical concepts more tangible and relatable. In traditional Zimbabwean communities, these games are often passed down through generations, embedded within cultural practices and social interactions. By using these games as teaching tools, teachers can connect mathematical principles to learners' lived experiences, bridging the gap between abstract theory and practical application (Chikwature & Jeke, 2015). This contextualization enhances understanding by allowing learners to see the relevance of mathematics in their daily lives, making the learning process more meaningful and memorable. For example, calculating scores in Pada directly reinforces addition and subtraction skills in a fun and engaging context.

Mukwada (2007) argues that traditional games promote a deeper, more intuitive understanding of mathematical concepts. Learning through play allows learners to explore mathematical principles through trial and error, experimentation, and collaborative problem solving (Vygotsky, 1978). This active learning approach fosters a more profound understanding than rote memorization, enabling learners to internalize concepts and apply them to new situations with greater confidence (Mukwada, 2007). For instance, playing Nhodo helps learners visualize and manipulate geometric shapes, leading to a more intuitive understanding of spatial relationships and geometric transformations.

The findings of the study done by Mukwada (2007) also shows that effective learning through traditional games involves reflection on experiences that allows students to reflect on their strategies and decisions, leading to abstract conceptualization. This reflection helps the learners to articulate their understanding and solidify mathematical concepts in their minds. The fun

and social nature of traditional games enhances engagement, making it more likely that learners remember what they learned.

A research by Mapfumo (2013) found that traditional games allow learners to engage with experimentation with mathematical concepts in a playful context, reinforcing retention. For example, learners might play a game that requires them to use addition and subtraction, and then apply those skills in real world scenarios, thus strengthening their grasp of the concepts.

Mapfumo (2013) also asserted that the effective integration of traditional games requires careful planning and execution. Teachers need to be trained on how to identify the mathematical principles embedded within these games and design appropriate activities that leverage their potential (Mapfumo, 2013). Furthermore, the curriculum needs to be adapted to incorporate these games seamlessly, ensuring that they complement and reinforce existing teaching methods. A simple add-on is insufficient; integration requires thoughtful planning to align the game's mechanics with specific learning objectives.

A research by Mutodi (2014) indicated that access to resources, including materials needed to play the games, could be limited in some schools. Furthermore, some teachers may be hesitant to adopt new teaching methods, requiring professional development and ongoing support (Mutodi, 2014). Overcoming these challenges requires a concerted effort from policymakers, teachers, and the community to prioritize the integration of traditional games into the curriculum.

In recent years, the Zimbabwean education system has embraced a competence-based, Heritage-Based Curriculum (HBC) that emphasizes culturally relevant learning approaches. One of the approaches gaining traction in primary mathematics education is the incorporation of traditional games as teaching tools. Traditional games are not only a valued part of Zimbabwe's cultural heritage but also contain embedded mathematical concepts that can enhance pupils' conceptual understanding and retention of knowledge. Research conducted in Zimbabwe and neighbouring countries since 2020 suggests that using traditional games in the classroom improves learners' grasp of mathematical ideas, strengthens long-term memory of concepts, and fosters a more positive attitude towards the subject (Moyo & Chinamasa, 2022; Tarashika & Jairo, 2023).

One-way traditional games improve understanding is by providing a concrete and familiar context for abstract mathematical concepts. For example, the Shona and Ndebele game *tsoro* requires players to count, group, compare, and strategically manipulate pebbles. By linking game moves to mathematical operations such as addition, subtraction, and multiplication, pupils can visualize number relationships in a practical and meaningful way. This concreteness bridges the gap between abstract symbols and real-world actions, making it easier for learners to internalize concepts (Moyo & Chinamasa, 2022).

Similarly, games like *nhodo* (stone toss and pick-up) support counting fluency, pattern recognition, and basic probability reasoning. Pupils repeatedly engage in counting sequences and decision-making about which stones to pick, which helps to reinforce number sense through active involvement. Studies at Early Childhood Development (ECD) level in Zimbabwe show that pupils taught mathematics through familiar cultural games demonstrate stronger immediate understanding compared to those taught through purely textbook-based methods (Tarashika & Jairo, 2023).

Beyond initial understanding, traditional games also have a strong effect on retention. The multisensory and interactive nature of game-based learning engages pupils emotionally and physically, which research in cognitive psychology links to better memory consolidation. Pupils are more likely to recall a mathematical concept if they experienced it in a lively, social setting rather than as an abstract drill. For example, hopscotch (*pada*) can be used to model number lines, even and odd sequences, and coordinate positions. Because the learning is embedded in a physical activity, pupils are more likely to remember the rules and mathematical principles long after the lesson ends (Matsekoleng, 2024).

Games also promote repetition in a non-repetitive format. In *tsoro*, for instance, learners may execute addition or subtraction multiple times during a match, but because each move is embedded in strategy and competition, the repetition does not feel tedious. This form of "hidden rehearsal" improves automaticity of skills while maintaining engagement, which in turn supports retention. A 2024 regional study on indigenous games and numeracy confirmed that pupils involved in structured, game-based mathematics lessons outperformed peers in delayed post-tests, indicating stronger long-term retention of skills.

Moreover, the collaborative and competitive nature of traditional games fosters peer-to-peer explanation and discussion, which further deepens understanding. When pupils explain their

moves or strategies to others, they are in effect verbalizing mathematical reasoning, a process known to consolidate learning. Such social interaction is especially important in the Zimbabwean context, where oral explanation and shared activity are integral to community-based learning traditions (MoPSE, 2024).

However, effective incorporation of traditional games into mathematics lessons requires deliberate planning. Without structured teacher guidance, the activity can remain purely recreational and fail to make the mathematical connections explicit. Research also indicates that some teachers feel uncertain about which traditional games are best suited for specific mathematical topics or how to adapt them without losing their cultural authenticity (Sunzuma & Maharaj, 2020). This suggests a need for professional development that equips teachers with strategies for aligning game mechanics to syllabus objectives and assessment requirements.

In summary, incorporating traditional games into primary mathematics lessons in Zimbabwe positively affects both pupils' understanding and retention of concepts. By providing concrete, culturally familiar, and engaging contexts for mathematical thinking, these games help learners build deep conceptual connections and remember what they have learned over the long term. In doing so, they not only enhance academic performance but also strengthen the cultural relevance of mathematics education, making the subject more meaningful to young Zimbabwean learners.

In conclusion, incorporating traditional Zimbabwean games into the primary mathematics curriculum holds significant promise for enhancing learners' understanding and retention of key concepts. By fostering engagement, contextualizing learning, and promoting a deeper, more intuitive grasp of abstract mathematical ideas, these games can transform the learning experience, making mathematics more accessible, enjoyable, and relevant for Zimbabwean learners.

2.5 Challenges and opportunities of integrating traditional games into the primary mathematics curriculum in Zimbabwe.

This section explores the challenges and opportunities, drawing on this research and the Zimbabwean context. Chireshe and Mapfumo (2018) posits that the integration of games into the primary mathematics curriculum holds immense potential to revolutionize how learners learn and engage with mathematical concepts. In Zimbabwe, a nation striving to improve its

educational outcomes, leveraging games in mathematics instruction presents both exciting opportunities and significant challenges.

A study done by Ramirez et al., (2018) established that one of the most significant opportunities presented by traditional game-based learning is its potential to enhance learners' engagement and motivation. Traditional mathematics instruction can often be perceived as dry and abstract, leading to disinterest and anxiety among learners (Ramirez et al., 2018). Traditional games, however, tap into intrinsic motivation, fostering a playful learning environment where learners are actively involved and eager to participate. Traditional games offer the promise of increased motivation and engagement, leading to improved learning outcomes (Prensky, 2001). This is particularly crucial in Zimbabwe, where resource constraints and teacher shortages can lead to large class sizes and limited individual attention, making it difficult to keep all learners engaged. By making learning fun and interactive, traditional games can bridge this gap and foster a more positive attitude towards mathematics. Furthermore, research suggests that games can reduce math anxiety. Ramirez, Hooper, Kersting, Yeo, and Goldin-Meadow (2018) found that incorporating games into mathematics lessons can create a less stressful learning environment, which can, in turn, lead to better performance.

Similarly, a study by Johns (2018) found that traditional games in the teaching and learning mathematics can inherently engage and motivate learners to participate actively in mathematics learning activities. The playful nature of traditional games captures learners' interest, making mathematics more enjoyable and less intimidating. This engagement could lead to increased motivation to learn mathematical concepts. By incorporating mathematical skills such as counting, addition, subtraction and problem solving into traditional gameplay, learners can practice and reinforce their mathematical abilities in a fun and interactive way (John, 2018).

The findings of the research by Mutodi and Ngirande (2014) established that traditional games could incorporate visual, auditory, and kinaesthetic learning elements, making abstract concepts more concrete and accessible to learners with varying learning preferences. For example, a game involving manipulatives like counters or blocks can help learners understand number concepts in a tangible way, benefiting kinaesthetic learners. Similarly, interactive simulations can provide visual representations of mathematical problems, aiding visual learners (Mutodi and Ngirande, 2014). This is particularly important in Zimbabwe, where

classrooms often consist of learners from diverse backgrounds and learning abilities. A study by Mutodi and Ngirande (2014) found that Zimbabwe has diverse cultural beliefs and socioeconomic conditions that influence the pace and patterns of learning of primary school learners. By offering a variety of interactive experiences, traditional games can help address these individual needs and promote inclusive learning environments.

In accordance with the study by Ke (2008), traditional games can foster crucial problem-solving and critical thinking skills, as payers are required to strategize, analyse situations, and make decisions based on mathematical principles. This active application of mathematical knowledge helps learners develop a deeper understanding of the concepts and their real-world applications (Ke, 2008). Traditional games provide opportunities for learners to apply their knowledge in meaningful contexts, fostering critical thinking and problem-solving skills (National Research Council, 2009). In a country like Zimbabwe, where entrepreneurship and innovation are increasingly important for economic growth, developing these skills is crucial for equipping learners with the tools they need to succeed in the future.

According to Foster and Shah (2020), many traditional games are designed for multiple players, promoting social interaction and collaboration among learners. This collaborative environment encourages communication and teamwork, which are essential skills in both mathematics and broader educational contexts. The use of traditional games in the teaching and learning mathematics enables learners to learn discussing their strategies, sharing ideas and supporting each other in problem solving.

Cain (2020) posits that many traditional games incorporate real life scenarios and practical applications of mathematics, helping learners see the relevance of what they are learning. This connection to real world situations enhances learners' understanding and retention of mathematical concepts, as they can relate their learning to everyday experiences. The informal and enjoyable nature of games can create a positive learning environment where learners feel safe to take risks and make mistakes (Williams et al., 2022) Thus, this encourage exploration and experimentation, which are crucial for developing a deep understanding of mathematical concepts.

Chireshe and Mapfumo (2018) asserts that despite the significant opportunities offered by the integration of traditional games into the primary mathematics curriculum in Zimbabwe, one major hurdle is the lack of resources and infrastructure. Many schools in Zimbabwe lack better learning space and classrooms, hindering the implementation of traditional games. Even simple board games and manipulatives may be scarce due to budget constraints. A study by Chireshe and Mapfumo (2018) showed that limited resources can be detrimental to teaching of mathematics using traditional games at primary school level.

Another challenge is the need for adequate teacher training. A study by Mutodi and Ngirande (2014) found that many teachers in Zimbabwe lack the necessary knowledge and skills to effectively integrate traditional games into their lessons. Teachers may be unsure how to select appropriate games, design game-based activities, and assess learners learning within a traditional game context (Mutodi & Ngirande, 2014). Effective integration of games requires teachers to possess a deep understanding of both the game and the mathematical concepts being taught (Ke, 2008). Therefore, comprehensive teacher training programs are essential to equip teachers with the pedagogical skills needed to successfully implement traditional game-based learning in their classrooms. This training should focus not only on the technical aspects of using traditional games but also on the pedagogical strategies for facilitating learning through games, such as scaffolding, providing feedback, and promoting collaboration (Mutodi & Ngirande, 2014).

In their study, Chireshe and Mapfumo (2018) concluded that the curriculum itself might need to be adapted to accommodate traditional game-based learning. The current mathematics curriculum in Zimbabwe is heavily focused on rote memorization and standardized testing, leaving little room for innovative teaching methods like game-based learning (Chireshe & Mapfumo. 2018). A shift in curriculum design is needed to incorporate tasks that are more open-ended, problem-solving activities, and opportunities for creative expression. This also requires a change in assessment practices, moving away from solely relying on standardized tests and incorporating more formative assessment methods that capture students' understanding and problem-solving abilities within a traditional game context.

A study done by Walan et al., (2021) found that many teachers might not have adequate training or knowledge about how to effectively integrate traditional games into their mathematics instruction. This lack of proficiency lead to ineffective implementation, where the educational potential of the traditional games is not fully realized. Incorporating traditional games into the curriculum often requires additional time for preparation and execution. Teachers may struggle to find sufficient time within the existing curriculum to include game-based learning, especially when they are under pressure to cover specific content standards (Erford et al., 2010)
The research by Erford et al., (2010) established that managing large classes make it difficult to implement traditional games effectively in the mathematics classroom. In a crowded classroom, it can be challenging teachers to facilitate traditional games that require interaction and collaboration among learners. This can lead to a less engaging experience for learners and hinder the learning process.

Chen (2021) argues that evaluating learner-learning outcomes from traditional game-based activities can be challenging. Traditional assessment methods may not adequately capture the mathematical skills and knowledge gained through traditional game-play, making it difficult for teachers to assess learners' progress and understanding effectively.

A study by Zarrin et al., (2020) established that some learners might be resistant to learning through traditional games, particularly if they perceive traditional games as less valuable than traditional instructional methods. This resistance can hinder participation and engagement, reducing the overall effectiveness of traditional game-based learning.

Baker (2016) asserts that one significant challenge is the availability of resources and materials needed to implement traditional games effectively. Limited funding can hinder the integration of these games into the curriculum (Baker, 2016). Teachers may lack the training or confidence to incorporate traditional games into their teaching strategies (Jones, 2012). Professional development is essential for equipping teachers with the necessary skills and knowledge.

In conclusion, integrating games into the primary mathematics curriculum in Zimbabwe presents a unique opportunity to enhance student engagement, cater to diverse learning styles, and foster crucial problem-solving skills. However, overcoming the challenges of resource scarcity, inadequate teacher training, and a rigid curriculum is essential for realizing the full

potential of traditional game-based learning. By investing in resources, providing comprehensive teacher training, and adapting the curriculum to embrace innovative teaching methods, Zimbabwe can create a more engaging, effective, and equitable mathematics education for all its learners. Furthermore, it is important to consider the cultural contexts of the traditional games being used to ensure that they are culturally relevant and sensitive to the needs of the learners. By carefully addressing these challenges and capitalizing on the opportunities, Zimbabwe can harness the power of traditional games to transform mathematics education and empower its future generations.

Chapter 3: Methodology.

3.0 Introduction

This chapter comprised of methodology, which includes the research paradigm, research approach, research design, population, sample, and sampling techniques, research design as well as the instruments data collection procedures, data analysis procedures and ethical issues.

3.1 Research Paradigm

A pragmatic research paradigm was employed in this study to enable the researcher to collect data that was both qualitative and quantitative in nature. This is in line with Kivunja and Kuyini (2017) who explained that the pragmatic paradigm focuses on the use of what works to allow the researcher to address the questions being investigated without worrying as to whether the questions are quantitative or qualitative in nature. Kivunja and Kuyini (2017) further elucidated that this paradigm advocates for a relationship in research being best determined by what the researcher deems appropriate to that particular study and that there is no single reality but that all individuals have their own and unique interpretations of reality.

3.2 Research Approach

This study adopted the mixed methods research approach, which combines both quantitative and qualitative methods to gather and analyse data. Mixed methods research approach involves collecting and analysing both quantitative and qualitative data to gain a comprehensive understanding of a research questions (Creswell, 2013). It allows researchers to complement and triangulate findings from different sources to enhance validity and reliability of the study (Dawadi et al., 2021). In this research, findings from teachers' interview was checked against the findings from teachers' questionnaire to ensures validity of the findings. The mixed-methods approach makes the most of both quantitative and qualitative methods in order to overcome each method's unique shortcomings. Thus, mixed method research was used to integrate quantitative and qualitative approaches to capitalise on the strengths of the two approaches while compensating the weaknesses of both approaches. Both data from teachers' questionnaires and teachers' interview were brought together during the analysis and contributing to the findings.

3.3 Research Design

The study employed an explanatory sequential design to find solutions to research questions on the integration of traditional games into the teaching and learning of primary mathematics at Doma cluster. This Sequential Explanatory design also enabled the use of both qualitative and quantitative techniques simultaneously. Thus, the study used both quantitative and qualitative methods.

3.4 Population

Decisions about the population are crucial in any research. Kawulich, (2012) defines a research population as people from which a sample can be chosen. A researcher usually intends to obtain information from this target group on a phenomenon he/she wants to research (Tuckman, 2011). The Population of this study consisted of approximately 75 teachers from 15 primary schools in Doma district. This area was selected by the researcher for the study because the researcher was well aware of the challenge of primary school teachers not adopting traditional games in the teaching and learning of mathematics in the Doma district as that is where the researcher resided and had carried out a survey to that effect.

3.5 Sample Sampling Procedure

The study site, Ponderosa primary school in Doma district was purposively selected from 15 primary schools in Doma district because the school authority and the teachers consented and were willing to participate in the study. The researcher, who is also a primary school teacher, was also familiar with the locality, and the traditional games. Thus, it afforded the researcher the opportunity to explore the integration of traditional games into the teaching and learning of primary mathematics at Ponderosa primary school in Doma district. In all, 14 teachers at Ponderosa primary school in Doma district were also purposively selected to constitute a sample of this research. Purposive sampling was used because the researcher was targeting only teachers at Ponderosa primary school.

3.6 Data collection instruments

Guided by the insight developed from literature review the research used structured questionnaires and a semi structured interview guide to solicit information from participating primary school teachers on the effect of integration of traditional games into the teaching and learning of primary mathematics at Ponderosa primary school in Doma district.

The table below outlines the objective of data collection and tools employed for each data collection strategy.

Objective	**Research question**	**Tool**

To identify the traditional games that can be used to teach primary mathematics concepts at Ponderosa Primary School.	Research question 1.31	(i) Teacher sem-structured interview (ii) Teachers structured questionnaire
To determine the impact of incorporating traditional games on pupils' understanding and retention of primary mathematics concepts.	Research question 1.3.2	(i)Teacher sem-structured interview (ii)Teachers structured questionnaire
To investigate the challenges and opportunities of integrating traditional games into the primary mathematics curriculum.	Research question 1.3.3	(i)Teacher sem-structured interview (ii)Teachers structured questionnaire

3.6.1 Structured questionnaires

The teacher questionnaires were used to provide answers to the following research questions and sub questions:

1.What traditional games can be used to teach primary mathematics concepts at Ponderosa primary school?

2. How does the incorporation of traditional games affect pupils' understanding and retention of primary mathematics concepts?

3. What challenges and opportunities arise when integrating traditional games into the primary mathematics curriculum?

According to Cohen, et al (2011), a questionnaire is a useful instrument for collecting survey information, providing structured numerical data, and can be administered without the presence of the researcher. Despite these strengths, the weaknesses are that the respondents may not complete the questionnaire resulting in low response rates (Cook, et al, 2017). In developing these items, the reviewed literature was taken into consideration. The items on the questionnaire were carefully selected, reviewed, and contextualized from previously reviewed

literature. The items were carefully developed to measure the construct to achieve the purpose of the study. The items were categorised into a five-point Likert scale with various score values.

3.6.2 Semi-structured interview

Teachers' interview was used to solicit answers of the following research questions:

1. What traditional games can be used to teach primary mathematics concepts at Ponderosa primary school?
2. How does the incorporation of traditional games affect pupils' understanding and retention of primary mathematics concepts?
3. What challenges and opportunities arise when integrating traditional games into the primary mathematics curriculum?

A semi-structured interview guide was employed for this study, and it was based on the objectives and research questions of the study. According to Creswell (2009), a semi structured interview is neither completely fixed nor completely free, and they are arguably best understood as adaptable. According to Kusi (2012) using this instrument in collecting data enables the researcher to increase the likelihood that all of the study questions will be answered.

3.7 Data Analysis Procedure

The research data collected were analysed both qualitatively and quantitatively. The data was collated, sifted through, and edited in order to address questions that have been answered partially or not answered. The quantitative data was analysed using statistical means (descriptive statistics) while qualitative data (interviews) were analysed thematically. Thematic analysis is a qualitative data analysis method that involves reading through a data set and identifying patterns in meaning across the data to derive themes. Thematic analysis involves an active process of reflexivity, where a researcher's subjective experience plays a central role in meaning making from data. The researcher codes the transcripts, group the codes and generate themes and sub-themes using the framework method for the analysis of qualitative data.

3.8 Validity and Reliability of Quantitative Instrument

The validation of the instrument was carried out to check the correctness of the data collection instruments. Leedy and Ormrod (2005) emphasizes that pre-testing of study instruments, before the actual study support criterion and construct validation of the tools. Criterion and construct validation was established through pre-testing the instruments used in the study. This checks the appropriateness of the data collection instruments.

3.9 Trustworthiness of the instrument

Trustworthiness criteria were established for the semi-structured interview guide. One major aim of the research was to put the knowledge created into practice. As a result, researchers, practitioners, policymakers, and the general public must understand and accept the findings as legitimate. Trustworthiness criteria are one-way researchers can convince themselves and readers that their study findings are worthy of attention (Nowell, Norris, White, & Moules, 2017). The criteria established were confirmability, dependability, transferability, and credibility.

3.9.1 Confirmability

In qualitative research, confirmability is a crucial criterion for establishing the trustworthiness of the study. It refers to the degree to which the researcher's biases are minimized and the findings accurately reflect the participants' perspectives and experiences (Lincoln & Guba, 1985). Techniques such as member checking and maintaining an audit trail are commonly used to enhance confirmability (Creswell, 2013)." The researcher guaranteed confirmability by preventing his knowledge, values, and conclusions from impacting the study's findings. Each phase of the data analysis was included in the study, including the conclusions that were derived as suggested by Charmaz in Kusi (2012)

3.9.2 Dependability

Dependability is a critical aspect of qualitative research, emphasizing the need for consistency and traceability in the research process (Lincoln & Guba, 1985). By maintaining an audit trail and providing clear documentation of research procedures, researchers enhance the dependability of their study (Creswell, 2013). To increase the dependability of the study findings, the researcher asked clear questions throughout the data collection, minimized bias, and controlled objectivity.

3.9.3 Transferability

Transferability is a key consideration in qualitative research, focusing on the applicability of the study's findings to other contexts (Lincoln & Guba, 1985). By providing rich and detailed descriptions of the research context and participants, researchers enhance the transferability of their findings, enabling readers to assess the relevance to their situations (Creswell, 2013).

3.9.4 Credibility

Credibility is a cornerstone of ensuring the trustworthiness of the study. It focuses on demonstrating the rigor of the research process and the soundness of the interpretations drawn from the data (Horsman, 2018). Techniques such as prolonged engagement, triangulation, and member checking contribute to enhancing the credibility of the study's findings (Creswell, 2013).

3.10 Ethical Considerations

To abide by the ethical principles of the study, the study addressed some ethical concerns, which includes informed consent, anonymity, and confidentiality. Informed consent affords prospective participants the opportunity to accept or decline to engage in the research. It describes the need for participants to understand the aims, objectives, and potential harm that such involvement may have on them (Seidman, 2016). In this study, the purpose of the study was carefully reviewed with the participants before they were involved in the study.

The anonymity of study respondents was highly taken into consideration in the present study. Gujarati (2013) pointed out that anonymity is a vital issue in research ethics because it gives the participants the opportunity to have their identities concealed. In this study, fictitious names were used for identification purposes that could not be traced to the participants. Codes were also adopted where necessary to ensure the anonymity of information and harm.

Neither names nor any identifiable information from respondents was taken as a way of ensuring the ethical principle of anonymity. This was to prevent possible victimization of respondents where certain responses may be viewed as unpalatable to other stakeholders.

On the issue of confidentiality, an effort was made to maintain the confidentiality of the responses of the participants. Participants were told that their responses would be kept confidential, that no one known to them would have access to the information provided, and none of the respondents' names was recorded in the study.

CHAPTER 4. RESEARCH FINDINGS

4.1 Introduction

This chapter presents the findings of the questionnaires and interviews of mathematics teachers on the integration of traditional games into the teaching and learning of primary mathematics at Doma cluster. The analysis of the data was guided by the following research objectives:

1. What traditional games can be used to teach primary mathematics concepts at Ponderosa primary school?

2. How does the incorporation of traditional games affect pupils' understanding and retention of primary mathematics concepts?

3. What challenges and opportunities arise when integrating traditional games into the primary mathematics curriculum?

4.2 BIOGRAPHIC FACTORS

This section presents the demographic characteristics of respondents sampled for the study. The demographic information of the respondents was based on gender, age, education level and years of teaching experience

Table 4.1: Biographic factors of primary school teachers

Factor	Item	%
Gender	Female	57
	Male	43
Age	<30 years	17
	31-40 years	38
	41-50 years	24
	> 50 years	21
Educational level	Certificate in Education (CE)	28
	Diploma in Education (Dip Ed)	56
	Bachelors degree	16
Years of teaching experience	≤10 years	27
	11-20 years	56
	21-30 years	12

	> 30 years	05

Table 4.1 shows the characteristic distribution of the respondents of the study. Majority of the respondents 57% were females whilst a minority of the respondents 43% were males. This indicated that more women teach in the primary school than men do. Table 4.1 indicates that the majority of the respondents 38% were between the ages of 31-40 and 17% were aged below 30years. In addition, 24% were between the ages 41-50 years while 21% were of the age above years. This implies many teachers in the primary school have sufficient energy to use traditional games, which involve more physical abilities to teach. Table 4.1 also shows the educational/professional level of the respondents sampled for the study. Table 4.1 shows that a 28 % are Cert 'A' holders. 56% were diploma holders. 16% were bachelor's degree holders.

4.2 Traditional games used to teach primary mathematics concepts at Ponderosa primary school.

Table 4.2 Traditional games used to teach primary mathematics concepts.

STATEMENTS	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
1. Hop Scotch (Pada) can be used for numerical sequences and for counting	-	-	-	-	100%
2. Tsoro Yematatu (also known as Three Men's Morris or Nine Holes) can be used to teach geometry.	14%	09%	-	25%	52%
3. Tsoro yematatu helps learners to develop understanding	-	-	-	-	100%

of mathematical concepts like points, lines, angles and spatial relationships.					
4.Game board helps students learn the concept of symmetry and geometric shapes.	37%	-	-	-	63%
5. Nhodo can be used to teach problem solving skills in Mathematics	13%	-	-	-	87%
6. Use of different scoring systems in Nhodo game allows learners to practice arithmetic operations in a meaningful context.	-	-	-	-	100%
7. Nhodo can be used to teach counting, addition, subtraction, and strategic thinking.	-	-	-	-	100%
8. Songs and rhymes accompanied by clapping hands can be used to teach counting patterns and rhythmic sequences	-	-	-	-	100%

The data from Table 4.2 shows that all the participating teachers (100%) agreed that Hop Scotch (Pada) can be used for numerical sequences and for counting. Also, 77% agreed that Tsoro Yematatu (also known as Three Men's Morris or Nine Holes) can be used to teach geometry whereas 23% disagreed. Moreover, 100% agreed that Tsoro yematatu helps learners

to develop understanding of mathematical concepts like points, lines, angles and spatial relationships. Furthermore, 63% agreed that Game board helps students learn the concept of symmetry and geometric shapes whereas 37% disagreed. Again, 87% agreed that Nhodo can be used to teach problem solving skills in Mathematics whereas 13% disagreed. In addition, 100% agreed that use of different scoring systems in Nhodo game allows learners to practice arithmetic operations in a meaningful context. Also, 100% agreed that Nhodo can be used to teach counting, addition, subtraction, and strategic thinking. Furthermore,100% were of the view that Songs and rhymes accompanied by clapping hands can be used to teach counting patterns and rhythmic sequences

Exploring Traditional Games to Teach Primary Mathematics Concepts at Ponderosa Primary School

The teachers' interview sought to investigate which traditional games teachers at Ponderosa Primary School use to teach primary mathematics concepts and how these games support learners' understanding. By drawing on teachers' lived experiences and reflections, the interview aimed to identify practical, culturally grounded methods that enhance student engagement, comprehension, and mathematical thinking. Interviews investigate which indigenous games are in use, the specific mathematics concepts they address, and how learners benefit both cognitively and socially. The focus lies on how these games foster number sense, logical reasoning, arithmetic fluency, and pattern recognition through active and experiential learning. This is discussed under the following sub themes and findings.

1. Pada (Hopscotch): Building Number Sense and Sequencing

Teachers consistently identified *Pada* as a useful game in early mathematics instruction. This traditional form of hopscotch supports learners in grasping mathematical concepts.

Several interviewed teachers reported using Pada in early grades to teach foundational numeracy skills. Below are non-verbatim responses.

> *T2: Yes, I've used Pada to help learners practice counting forward and backward by jumping through numbered squares.*

T7: I found it useful for teaching number recognition and basic sequencing, especially for early grades.

T12: We used it for teaching odd and even numbers by having children jump on specific ones.

Teachers reported that learners engage better with abstract number patterns when they are physically navigating numbered spaces. One-to-one correspondence and recognition of numerical order are reinforced through movement and play.

2. Tsoro yematatu: Spatial reasoning and logical thinking

The strategic game *Tsoro Yematatu* was widely noted for cultivating learners' abilities in logical and strategic reasoning, turn-taking and decision-making, basic geometry, and mathematical language development.

Tsoro Yematatu emerged as a tool for enhancing learners' strategic and spatial reasoning skills. Below are some of the non- verbatim responses from teachers' interviews.

T10: I've used it as a starter activity to get learners thinking critically—it encourages them to plan and think ahead.

T14: I set up the board and let them play in pairs, then we discuss their strategies and link them to logical thinking.

T5: I use it to encourage turn-taking and explaining moves, which helps with reasoning and mathematical language.

T1: It teaches spatial awareness—learners need to understand where to place their markers to win.

T6: It can help with understanding geometric shapes, like triangles and lines.

T2: The game strengthens logical reasoning and introduces basic ideas of strategy and problem-solving.

By placing markers on a triangular grid, learners begin to understand spatial relationships and think ahead to block or outmanoeuvre an opponent. Teachers also use the game to initiate discussions about shape properties, particularly triangles and lines, supporting geometry instruction.

3. Nhodo: Arithmetic and strategic thinking

Teachers highlighted *Nhodo* as an effective, enjoyable way to introduce and reinforce. This include addition and subtraction, mental computation, One-to-one correspondence, and strategic problem solving.

Nhodo was cited as a rich resource for developing arithmetic operations. Below are some of the non-verbatim responses from the interview.

> *T7: Yes, we use Nhodo to practice addition—counting the stones each player collects.*
>
> *T9: I use it to introduce subtraction, where we remove stones from a pile and find the difference.*
>
> *T14: Learners play the game, then write down the number sentences based on their moves.*
>
> *T14: It's great for reinforcing counting, especially one-to-one correspondence.*
>
> *T8: It supports mental addition and subtraction skills in a fun way.*
>
> *T3: The game encourages strategic thinking—planning the best move to get more stones.*

Learners count stones, calculate remaining quantities, and make strategic decisions to maximize their outcomes—transforming arithmetic into a hands-on activity. Teachers noted the value of connecting physical actions to written number sentences for deeper conceptual understanding.

4. Traditional Songs and Clapping Games: Fluency and Patterns

Rhythm-based games and songs were praised for their role in developing fluency in counting, skip counting and multiplication patterns, memory and recall, and mathematical pattern recognition.

Findings.

Teachers found traditional songs and clapping games effective in building fluency and enthusiasm in math lessons. Below are non- verbatim responses from the interview.

> *T11: Yes, I've used clapping games with number rhymes to teach skip counting.*
>
> *T6: We sing multiplication songs while clapping in rhythm—it helps reinforce tables.*
>
> *T13: I use them at the start of lessons to energize learners and build fluency with counting patterns.*
>
> *T1: Songs make it easier for learners to remember number sequences—it's like learning through repetition.*
>
> *T14: Rhymes break down complex operations into simple, memorable steps.*
>
> *T9: The rhythm helps children internalize counting patterns, like 2s, 5s, and 10s.*

These responses collectively reveal that rhythm-based traditional practices help embed mathematical patterns and improve retention, particularly with arithmetic sequences.

Clapping games accompanied by number rhymes reinforce rhythmic counting and multiplication facts. Teachers found them especially effective at the start of lessons to energize learners and set the tone for numerical fluency. The repetitive and melodic nature of these activities helps embed mathematical structures in a memorable way.

The findings from Ponderosa Primary School indicate that teachers to teach core mathematics concepts, particularly in the areas of number sense, geometry, arithmetic operations, logical reasoning, and pattern recognition, actively use traditional games such as Pada, Tsoro

Yematatu, Nhodo, and clapping-based songs. Teachers reported that these games not only align well with the curriculum but also increase learner engagement, foster critical thinking, and provide culturally meaningful contexts for abstract mathematical ideas. The physical and competitive nature of the game enhances engagement and precision (Shumba et al., 2014; Van den Heuvel-Panhuizen & Treffers, 2009). This evidence supports the growing call for culturally responsive mathematics instruction that draws upon indigenous knowledge systems. Incorporating traditional games into formal learning can make mathematics more relatable, enjoyable, and accessible to primary learners.

4.3 How the incorporation of traditional games affect pupils' understanding and retention of primary mathematics concepts.

Table 4.3 How the incorporation of traditional games affect pupils' understanding and retention.

STATEMENTS	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
1. Traditional games foster engagement and promote learning.	07%	-	-	-	93%
2. Traditional games enhance enthusiasm, motivation and participation in the learning of mathematics.	-	-	-	-	100%
3. Traditional games allows learners to connect new mathematical concepts with familiar practices.	13%	-	-	-	87%

4. Traditional games allows learners to remember taught mathematics concepts and reflect on their strategies and decisions leading to more understanding of mathematical concepts taught.	-	-	-	-	100%
5. Traditional games make mathematical concepts tangible and relatable, thus, making the learning process more meaningful and memorable.	-	-	-	-	100%
6. Traditional games allow learners to see the relevance of mathematics in their daily lives making learning process more meaningful and memorable.	-	-	-	-	100%
7. Traditional games foster a profound understanding than rote memorisation enabling learners to internalise mathematics concepts	22%	-	-	-	78%

8.Traditional games allows learners to engage with experimentation with mathematical concepts in a playful context to reinforce retention.	17%	-	-	-	83%

The table 4.3 shows that 93% agreed that Traditional games foster engagement and promote learning whereas 07% disagreed. Also, 100% agreed that Traditional games enhance enthusiasm, motivation and participation in the learning of mathematics. Moreover, 87% agreed that Traditional games allow learners to connect new mathematical concepts with familiar practices while 13% disagreed. Furthermore, 100% agreed that Traditional games allow learners to remember taught mathematics concepts and reflect on their strategies and decisions leading to more understanding of mathematical concepts taught. Also, 100% agreed that Traditional games make mathematical concepts tangible and relatable, thus, making the learning process more meaningful and memorable. Moreover, 100% agreed that Traditional games allow learners to see the relevance of mathematics in their daily lives making learning process more meaningful and memorable. Also, 78% agreed that Traditional games foster a profound understanding than rote memorisation enabling learners to internalise mathematics concepts whereas 22% disagreed. Finally, 83% agreed that Traditional games allow learners to engage with experimentation with mathematical concepts in a playful context to reinforce retention while 17% disagreed.

Teacher Reflections on the Impact of Traditional Games in Mathematics Classrooms

Incorporating traditional games into primary school mathematics teaching is increasingly being recognized as a culturally relevant and pedagogically effective strategy. The teachers' interviews aimed to capture teachers' non-verbatim reflections and experiences with using traditional games in mathematics lessons. The objective was to understand how these games influence learners' engagement, conceptual understanding, retention, and connection to cultural identity, based on actual classroom observations at Ponderosa Primary School.

1. Learners' response to teaching using traditional teaching games

Teachers consistently noted that learners respond more positively to lessons involving traditional games.

Below are non-verbatim responses of teachers from the interview:

> *T13: Students are usually more excited and actively involved when games are used—they seem to forget they are learning.*
>
> *T07: Traditional methods often bore them, but games make math fun and practical.*
>
> *T03: I have noticed they participate more willingly and are less anxious about making mistakes.*

Teachers unanimously noted a noticeable shift in learners' enthusiasm and participation when traditional games were included in lessons. Game-based activities were seen to reduce anxiety and increase student willingness to take part in mathematical tasks.

2. Changes in engagement, motivation, and attitude

Game-based instruction significantly increased learner engagement.

Below are the non-verbatim responses from the interview.

> *T10: Yes, learners become more eager to join lessons and often ask if we will play a game again.*
>
> *T03: Motivation increases—especially among learners who usually struggle with math.*
>
> *T05: Their attitudes shift positively; math no longer feels like a "hard" subject to them.*

The playful, interactive nature of traditional games was reported to significantly boost motivation, especially among learners who typically struggle in mathematics.

3. Conceptual understanding through traditional games

Teachers believe traditional games enhance understanding by providing tangible experiences.

The following are non-verbatim responses from the interview.

> *T04: Yes, because they see the concepts in action. For example, counting in Nhodo makes addition feel natural.*
>
> *T01: Games give them a visual and physical way to grasp abstract ideas like sequencing or strategy.*
>
> *T06: In my class, learners understood patterns better after we played clapping games that followed specific rhythms.*

Traditional games provided concrete, physical experiences that helped learners internalize abstract mathematical concepts. These embodied experiences helped demystify complex ideas through familiar activities.

4. Memory retention and application of mathematical concepts

Games appear to strengthen long-term memory and practical application.

Findings

Below are the non-verbatim responses from the interview.

> *T08: They remember better—especially with games tied to songs or movement.*
>
> *T04: Some learners recalled subtraction strategies they learned through games months later.*
>
> *T14: It seems like the playful context strengthens memory and helps with application during tests*

Teachers reported stronger long-term memory and better application of mathematical concepts learned through traditional games. The multisensory nature of games (movement, rhythm, visuals) reinforced learning.

5. Linking mathematics to culture and everyday life

Teachers saw traditional games as tools for making mathematics culturally meaningful.

Findings

Below are non-verbatim responses from teachers' interview.

> *T03: Definitely—they recognize these games from home and now see they can be educational too.*
>
> *T01: It bridges the gap between school learning and their community life.*
>
> *T05: I've seen learners get excited when they realize their everyday play has a link to math.*

Traditional games were seen as powerful tools for linking school learning with learners' home environments and cultural practices, making mathematics more relatable and meaningful.

6. Development of broader skills beyond mathematics

Beyond academic learning, traditional games foster essential life skills.

Findings

Below are the non-verbatim responses from the teachers' interview.

> *T07: They develop teamwork and learn to take turns and follow rules.*
>
> *T05: Strategic thinking is sharpened in games like Tsoro Yematatu, where planning ahead is key.*
>
> *T02: I've seen shy learners gain confidence by working with peers during game-based activities.*

Beyond mathematics, teachers identified the development of broader life skills such as teamwork**,** confidence**,** turn-taking**,** and strategic thinking**.**

7. Overall positive learning impacts

Teachers reported multiple educational benefits from integrating traditional games.

Findings

The following are the non-verbatim responses from the teachers.

> *T02: Improved participation—even learners who rarely engage in class get involved.*
>
> *T01: It fosters a positive learning environment where mistakes are part of the fun.*
>
> *T11: There is more peer teaching and support—stronger learners help others during gameplay.*

Traditional games helped foster inclusive, supportive classrooms where learners feel empowered. Teachers noted increased peer collaboration**,** participation**,** and a growth mind set**.**

8. Attitudes toward mathematics and cultural identity

Teachers observed that traditional games helped learners value both mathematics and their heritage.

Findings

The following are the non-verbatim responses from the teachers' interview.

> *T14: learners start seeing math as part of their culture, not just a school subject.*
>
> *T13: They take pride in their heritage when traditional games are valued in class.*
>
> *T05: Math becomes less intimidating and more relatable, especially for learners from rural backgrounds.*

Teachers observed that learners began to see mathematics not just as an academic subject but also as a part of their cultural heritage. This shift in perception promoted a sense of pride and ownership.

Conclusion

The teachers' experiences reflect a strong consensus that traditional games have a transformative effect on how learners learn and perceive mathematics. These games not only

improve engagement, motivation, and conceptual understanding, but also foster important social and cognitive skills. Traditional games increase learners' interest and participation, leading to a deeper and more intuitive grasp of mathematical ideas (Mapfumo, 2013). Significantly, they help learners form a connection between mathematics and their cultural identity, making learning more meaningful and empowering. Games help learners relate new math concepts to familiar, culturally relevant practices, improving understanding and memory (Chikoko et al., 2019). These insights highlight the potential of traditional games as a sustainable, inclusive, and effective pedagogical tool in primary mathematics education.

4.4 Challenges and opportunities arise when integrating traditional games into the primary mathematics curriculum.

Table 4.4 Challenges and opportunities arise when integrating traditional games into the primary mathematics curriculum.

STATEMENTS	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
1. Constraints of resources and materials needed to implement traditional games effectively.	-	-	-	-	100%
2. Teachers lack the necessary knowledge and skills to effectively integrate traditional games into their lessons.	48%	-	-	-	52%
3.Adaptation of curriculum to accommodate traditional game-based learning	-	-	-	-	100%

4. Managing large classes make it difficult to implement traditional games effectively in the mathematics classroom.	-	-	-	-	100%
5. Learners' resistant to learning mathematics through traditional games	34%	-	-	-	66%
6. Failing to link the traditional games and mathematics concepts being taught.	27%	-	-	-	73%
7. Limited time to include game-based learning.	43%	-	-	-	57%
8. Difficulty to evaluate learner-learning outcomes during teaching and learning mathematics using games	31%	-	-	-	69%

The data from the table 4.4 showed that 100% agreed that constraints of resources and materials needed to implement traditional games effectively. In addition, 52% agreed that teachers lack the necessary knowledge and skills to effectively integrate traditional games into their lessons while 48% disagree. Also, 100% agreed that another challenge is the adaptation of curriculum to accommodate traditional game-based learning. Moreover, 100% agreed that managing large classes make it difficult to implement traditional games effectively in the mathematics classroom. Furthermore, 66% agreed that learners' resistant to learning mathematics through traditional games is a challenge when integrating traditional games in the learning of mathematics whereas 34% disagreed. In addition, 73% agreed that failing to link the traditional

games and mathematics concepts being taught is a challenge in integrating traditional games in the learning of mathematics whereas 27% disagreed. In addition, 57% agreed that another challenge was the limited time to include game-based learning while 43% disagreed. Finally, 69% agreed that another challenge was difficulty to evaluate learner-learning outcomes during teaching and learning mathematics using games while 31% disagreed.

Qualitative analysis

Theme: Teachers' perspectives on integrating traditional games in primary mathematics classrooms

Introduction

The teachers' interview aimed to explore teachers' experiences, perceptions, and challenges in integrating traditional games into the teaching of mathematics at the primary level. The responses, drawn from non-verbatim interviews, reflect practical classroom realities and highlight both the benefits and barriers teachers encounter. Through this lens, the study examined how traditional games influence learner engagement, conceptual understanding, critical thinking, collaboration, and the feasibility of implementation within the constraints of the curriculum and classroom environment.

Sub themes

1. Enhancing student engagement and motivation

Teachers widely agreed that traditional games significantly increase student motivation and enthusiasm for learning mathematics.

Findings

Some of the non- verbatim responses are below.

> *T11: Yes, learners become more interested in lessons when games are involved—it makes math less intimidating.*
>
> *T14: I have seen disengaged students become active participants when we use games like Pada or Nhodo.*

T02: Games add a fun element, which motivates even struggling learners to try.

Teachers overwhelmingly noted that traditional games create an engaging, enjoyable classroom atmosphere, particularly for learners who typically struggle with mathematics. The interactive nature of these games makes learning feel less formal and more inviting.

2. Improving conceptual understanding

Traditional games were seen as valuable tools for making abstract mathematical concepts more accessible.

Findings

Some of the non-verbatim responses are below.

T03: Games make abstract ideas more concrete and easier to understand.

T05: When learners physically interact with concepts like counting or sequencing, they grasp them better.

T01: Repetition through gameplay reinforces concepts without it feeling like rote learning.

Traditional games were identified as effective in translating abstract mathematical ideas into tangible, relatable experiences. Physical interaction with mathematical content deepened learner comprehension.

3. Fostering problem-solving and critical thinking

Several teachers highlighted the strategic nature of many traditional games, which nurtures higher-order thinking skills.

Findings

Some of the non-verbatim responses are below.

T10: Many games require students to think ahead and plan, which boosts critical thinking.

T09: Learners learn to solve problems on their own or in groups when deciding how to win a game.

T04: I have noticed students start applying similar strategies in non-game math tasks.

Teachers highlighted that many traditional games involve planning, prediction, and reasoning, which align well with higher-order cognitive skills.

4. Promoting social interaction and collaboration

The social dimension of traditional games was also emphasized as a key educational benefit.

Findings

Some of the non-verbatim responses are below.

T07: Absolutely—students talk, help each other, and even negotiate rules during gameplay.

T04: For example, in Tsoro Yematatu, players must take turns and think aloud, which encourages discussion.

T02: It creates a sense of teamwork and strengthens relationships among learners.

The communal nature of traditional games supports peer interaction**,** turn taking, and communication**,** making learning both collaborative and inclusive.

5. Challenges with resources and space

Despite the benefits, resource constraints were a major concern among teachers.

Findings

Some of their non-verbatim responses are below.

T08: Yes, space can be a challenge, especially with large classes and small rooms.

T11: Some games need materials that we do not always have or cannot easily improvise.

T14: I sometimes use outdoor spaces, but weather and time can limit that option.

Despite the benefits, teachers frequently cited physical and material constraints that limit implementation. Large class sizes, limited classroom space, and the lack of game materials were common issues.

6. Need for professional development and support

Most teachers expressed a desire for more structured training on using traditional games effectively.

Findings

Some of the non- verbatim responses are below.

T09: Yes, I would benefit from guidance on how to connect the games directly to math objectives

T04: Training would help us align games with the syllabus and assessment goals.

T07: We need support on how to structure lessons so the games are more than just playtime.

Teachers expressed a clear need for training to effectively integrate games with curriculum objectives and formal assessment standards**.**

7. Time constraints in the curriculum

The rigid structure of the current curriculum was identified as another limiting factor due to the time constraint.

Findings

Below are some of the non-verbatim responses.

T14: Not really—the syllabus is already packed, and there is pressure to finish it quickly.

T10: It is hard to justify game time when we have so much content to cover.

T01: With better planning or integration, it could work, but as it stands, time is limited.

A rigid and overloaded syllabus was cited as a significant obstacle to using traditional games consistently. Teachers felt pressured to meet syllabus requirements within limited instructional time.

8. Managing large classes during traditional game-based learning

Classroom management was noted as a practical challenge, especially in larger settings.

Findings

Some of the non-verbatim responses are below.

T12: It is quite challenging—keeping everyone involved and disciplined can be tough.

T08: Noise levels and movement can be hard to control, especially indoors.

T03: With support or smaller groups, it becomes more manageable, but it requires planning.

Teachers noted that classroom management becomes more complex when using games in larger groups. Issues such as noise control**,** discipline, and equal participation were prominent.

Conclusion

The teachers' responses reveal that traditional games are highly effective in improving learner engagement, motivation, understanding, and critical thinking in mathematics. Additionally, they promote social interaction and a more inclusive, culturally resonant learning environment. However, effective integration of these games faces several practical challenges, including limited classroom space, scarcity of resources, insufficient training, time constraints, and classroom management issues. Overcrowded classrooms limit the feasibility of interactive and collaborative game-based activities, hindering learner engagement (Erford et al., 2010). Many teachers lack training on how to effectively select, adapt, and assess traditional games for mathematics instruction (Mutodi & Ngirande, 2014; Ke, 2008).

Despite these challenges, teachers remain optimistic about the potential of traditional games as powerful pedagogical tools. Addressing the identified barriers through professional development, resource support, curriculum flexibility, and better planning could greatly enhance the use of traditional games in primary mathematics classrooms, making learning more meaningful and engaging for all learners.

4.5 Discussions

Research question 1: What traditional games can be used to teach primary mathematics concepts at Ponderosa primary school?

The data from both quantitative and qualitative analysis shows that teachers agreed that Hop Scotch (Pada) can be used for numerical sequences and for counting. This is consistent with result from the past studies. Games like Hopscotch (Pada) are inherently tied to numerical sequences (Shumba et al., 2014). In Hopscotch, learners verbally count as they hop from square to square, reinforcing number identification and sequence. As Van den Heuvel-Panhuizen and Treffers (2009) argue, these activities allow students to internalize numerical patterns through physical interaction, making the learning process more concrete and memorable. Furthermore, the competitive aspect of the traditional game can motivate children to ensure fair gameplay, thereby subtly reinforcing the importance of precision in mathematics.

The result of quantitative and qualitative also showed that participating teachers agreed that Tsoro Yematatu (also known as Three Men's Morris or Nine Holes) can be used to teach geometry and helps learners to develop understanding of mathematical concepts like points, lines, angles and spatial relationships. This is in accordant with studies from the past. Clements and Sarama (2014) asserts that Tsoro Yematatu (also known as Three Men's Morris or Nine Holes), a strategic traditional game played on a board with intersecting lines and using counters, inherently involves spatial reasoning, a crucial element in geometry. According to Clements and Sarama (2014), spatial reasoning abilities are directly related to success in mathematics and science. By playing Tsoro Yematatu, learners develop an intuitive understanding of concepts like points, lines, angles, and spatial relationships (Shumba et al., 2014). Thus, learners learn to visualize patterns, plan strategies, and predict outcomes, all of which contribute to their spatial reasoning skills.

The results of the study revealed that Game board helps students learn the concept of symmetry and geometric shapes. This is in agreement with results from the past studies. A study by Clements and Sarama (2014) established that analysing the game board can introduce the concept of symmetry and geometric shapes. Teachers can encourage students to identify different angles formed by the intersecting lines or analyse the symmetry of the board itself. This gamified approach makes learning geometry less abstract and more engaging, allowing students to learn through hands-on experience (Van Oers, 2010).

The result of the study also showed that Nhodo can be used to teach problem solving skills in Mathematics. This is consistent with the studies from the past. According to Chikodzi and Nyota (2010), Nhodo game also promotes problem-solving skills, as learners must devise strategies to outmanoeuvre their opponent. Moreover, introducing different scoring systems allows learners to practice arithmetic operations in a meaningful context. For example, a point system based on the number and type of captured pieces can be used to reinforce addition and subtraction skills (Kamii, 2000). The competitive nature of Nhodo adds an element of excitement and motivation, encouraging students to actively participate and learn from their mistakes.

The result of the study also showed that use of different scoring systems in Nhodo game allows learners to practice arithmetic operations in a meaningful context. This in line with result of the previous studies. The study by Nyota and Mapara (2008) indicated that Nhodo readily lends itself to teaching counting, addition, subtraction, and strategic thinking. Shumba et al., (2014) asserts that using Nhodo teachers can incorporate scenarios where learners need to calculate the number of spaces a counter needs to move, the number of counters they need to capture, or the number of counters remaining for each player.

The result of the study also showed that Songs and rhymes accompanied by clapping hands can be used to teach counting patterns and rhythmic sequences. This is in agreement with the result from the past studies. A study by Clements and Sarama (2014) established that the use of songs and rhymes, often accompanied by clapping games, offers a fun and engaging way to teach counting and sequencing. These songs can be adapted to teach basic arithmetic operations or introduce concepts like skip counting (Clements & Sarama, 2014).

Research Question 2: How does the incorporation of traditional games affect pupils' understanding and retention of primary mathematics concepts?

The analysed data clearly shows that Traditional games foster engagement and promote learning. This is in line with studies from the past. Mapfumo (2013) argues that incorporating traditional games into the primary mathematics curriculum can significantly affect learners' understanding and retention of key concepts by fostering engagement, contextualizing learning, and promoting a deeper, and more intuitive grasp of abstract mathematical ideas.

The result of the study also show that Traditional games enhance enthusiasm, motivation and participation in the learning of mathematics. This is in agreement with the past studies. As indicated by Kihara (2018), learners who engaged in learning through traditional games demonstrated higher levels of enthusiasm and participation, leading to improved comprehension of mathematical principles.

Moreover, the result of the study revealed that Traditional games allow learners to connect new mathematical concepts with familiar practices. This is consistent with the results from the past. Chikoko and et al (2019) indicates that learners are more likely to remember mathematics concepts that are taught in a context they understand and enjoy. This connection is crucial in primary education, as learners are often more engaged when learning is interactive and fun.

Furthermore, the result of the study also show that Traditional games allow learners to remember taught mathematics concepts and reflect on their strategies and decisions leading to more understanding of mathematical concepts taught. This is in agreement with the previous results. The findings of the study done by Mukwada (2007) also shows that effective learning through traditional games involves reflection on experiences that allows students to reflect on their strategies and decisions, leading to abstract conceptualization. This reflection helps the learners to articulate their understanding and solidify mathematical concepts in their minds.

Also, the result of the study showed that Traditional games make mathematical concepts tangible and relatable, thus, making the learning process more meaningful and memorable. This is in line with result from the past studies. A study by Chikwature and Jeke (2015) found that traditional games contextualize learning, making abstract mathematical concepts more tangible and relatable.

Moreover, the study also showed that Traditional games allow learners to see the relevance of mathematics in their daily lives making learning process more meaningful and memorable. This is in agreement with the studies from the past. The study by Chikwature and Jeke, (2015) established that by using traditional games as teaching tools, teachers can connect mathematical principles to learners' lived experiences, bridging the gap between abstract theory and practical application. This contextualization enhances understanding by allowing learners to see the relevance of mathematics in their daily lives, making the learning process more meaningful and memorable (Chikwature & Jeke, 2015).

In addition, the study established that Traditional games foster a profound understanding than rote memorisation enabling learners to internalise mathematics concepts. This is in line with the result from the past studies. Mukwada (2007) argues that traditional games promote a deeper, more intuitive understanding of mathematical concepts. Learning through play allows learners to explore mathematical principles through trial and error, experimentation, and collaborative problem solving (Vygotsky, 1978). This active learning approach fosters a more profound understanding than rote memorization, enabling learners to internalize concepts and apply them to new situations with greater confidence (Mukwada, 2007).

Finally, the study showed that Traditional games allow learners to engage with experimentation with mathematical concepts in a playful context to reinforce retention. Research by Mapfumo (2013) found that traditional games allow learners to engage with experimentation with mathematical concepts in a playful context, reinforcing retention. Mapfumo (2013) further argues that learners might play a game that requires them to use addition and subtraction, and then apply those skills in real world scenarios, thus strengthening their grasp of the concepts.

Research question 3: What challenges and opportunities arise when integrating traditional games into the primary mathematics curriculum?

In this research question, both qualitative and quantitative results showed that there are constraints of resources and materials needed to implement traditional games effectively. The results of the study showed that teachers lack the necessary knowledge and skills to effectively integrate traditional games into their lessons. This is consistent with results from the past studies. A study by Mutodi and Ngirande (2014) found that many teachers in Zimbabwe lack the necessary knowledge and skills to effectively integrate traditional games into their lessons.

Teachers may be unsure how to select appropriate games, design game-based activities, and assess learners learning within a traditional game context (Mutodi & Ngirande, 2014). Effective integration of games requires teachers to possess a deep understanding of both the game and the mathematical concepts being taught (Ke, 2008).

Also, the study showed that another challenge is the adaptation of curriculum to accommodate traditional game-based learning. This is in line with result from the past studies. In their study, Chireshe and Mapfumo (2018) concluded that the curriculum itself might need to be adapted to accommodate traditional game-based learning. The current mathematics curriculum in Zimbabwe is heavily focused on rote memorization and standardized testing, leaving little room for innovative teaching methods like game-based learning (Chireshe & Mapfumo. 2018).

Moreover, the study showed that managing large classes make it difficult to implement traditional games effectively in the mathematics classroom. This is in line with the results from previous studies. The research by Erford et al., (2010) established that managing large classes make it difficult to implement traditional games effectively in the mathematics classroom. In a crowded classroom, it can be challenging teachers to facilitate traditional games that require interaction and collaboration among learners. This can lead to a less engaging experience for learners and hinder the learning process.

Furthermore, the findings of the study showed that learners' resistant to learning mathematics through traditional games is a challenge when integrating traditional games in the learning of mathematics. This is in line with the result from the past studies. A study by Zarrin et al., (2020) established that some learners might be resistant to learning through traditional games, particularly if they perceive traditional games as less valuable than traditional instructional methods. This resistance can hinder participation and engagement, reducing the overall effectiveness of traditional game-based learning.

In addition, the result of the study established that failing to link the traditional games and mathematics concepts being taught is a challenge in integrating traditional games in the learning of mathematics. This is consistent with the findings from the past studies. A study done by Walan et al., (2021) found that many teachers might not have adequate training or knowledge about how to effectively integrate traditional games into their mathematics

instruction. This lack of proficiency lead to ineffective implementation, where the educational potential of the traditional games is not fully realized.

In addition, the study showed that another challenge was the limited time to include game-based learning. This is in agreement with the results from the past studies. The study by Erford et al., (2010) established that incorporating traditional games into the curriculum often requires additional time for preparation and execution. Teachers may struggle to find sufficient time within the existing curriculum to include game-based learning, especially when they are under pressure to cover specific content standards.

Finally, the study showed that another challenge was difficulty to evaluate learner-learning outcomes during teaching and learning mathematics using games. This is consistent with the findings from the past studies. Chen (2021) argues that evaluating learner-learning outcomes from traditional game-based activities can be challenging. Traditional assessment methods may not adequately capture the mathematical skills and knowledge gained through traditional game-play, making it difficult for teachers to assess learners' progress and understanding effectively.

CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This final chapter comprises a summary of the study, the conclusion and recommendations.

5.1 Summary

5.1.1 Summary of research question 1: What traditional games can be used to teach primary mathematics concepts at Ponderosa Primary School?

The findings from both quantitative and qualitative analyses revealed that teachers recognized the educational value of various traditional games in enhancing pupils' understanding of primary mathematics concepts, a view strongly supported in the literature. Teachers agreed that Hopscotch (*Pada*) is effective in teaching numerical sequences and counting, confirming earlier studies such as Shumba et al. (2014), who highlight that the game's structure inherently reinforces number identification and sequencing. Learners count aloud while hopping from square to square, a physical interaction that, as Van den Heuvel-Panhuizen and Treffers (2009) note, helps them internalize numerical patterns and make learning more concrete and memorable. The competitive element of Hopscotch, as observed in the current study, also mirrors findings in past research that competition motivates learners to maintain precision, thereby reinforcing accuracy in mathematical work.

The study also found agreement among teachers that *Tsoro Yematatu* (Three Men's Morris or Nine Holes) can be used to teach geometry, specifically points, lines, angles, and spatial relationships. This finding aligns with Clements and Sarama's (2014) assertion that the game develops spatial reasoning, which is directly linked to achievement in mathematics and science. Shumba et al. (2014) similarly point out that through *Tsoro Yematatu*, learners learn to visualize patterns, plan strategies, and predict outcomes, thus improving their spatial awareness. The present findings on symmetry and geometric shapes echo Clements and Sarama's (2014) and Van Oers' (2010) conclusions that analyzing the layout of a game board can make abstract geometry more tangible, enabling students to engage with the subject through hands-on exploration.

In addition, the study confirmed that *Nhodo* is effective in promoting mathematical problem-solving skills, a conclusion consistent with Chikodzi and Nyota (2010), who argue that the strategic nature of the game nurtures planning and adaptability. Introducing different scoring systems not only sustains interest but also, as Kamii (2000) and Nyota and Mapara (2008) observe, provides an authentic context for practicing counting, addition, subtraction, and strategic thinking. Shumba et al. (2014) further emphasize that such adaptations in *Nhodo* can foster quick mental calculations as learners determine moves, captures, and remaining counters.

Lastly, Clements and Sarama (2014), who note that these activities create an enjoyable and interactive approach to learning mathematics, support the study's findings on songs and rhymes accompanied by clapping to teach counting patterns and rhythmic sequences. They can be adapted for skip counting, basic operations, and sequencing, with their rhythmic and repetitive nature aiding retention.

Overall, the results of this study resonate strongly with the existing literature, which consistently shows that integrating traditional games and culturally embedded activities into mathematics lessons makes learning more concrete, contextually relevant, and engaging. This not only supports conceptual understanding but also promotes long-term retention, aligning with the broader body of research advocating for culturally responsive mathematics education.

5.1.2 Summary of research question 2: How does the incorporation of traditional games affect pupils' understanding and retention of primary mathematics concepts?

The analysis of the data clearly demonstrated that traditional games play a significant role in fostering engagement and promoting learning in primary mathematics. This finding is consistent with earlier studies, such as Mapfumo (2013), who argues that incorporating traditional games into the mathematics curriculum can greatly influence learners' understanding and retention of key concepts. By fostering active engagement, contextualizing content, and promoting a deeper, more intuitive grasp of abstract ideas, traditional games become a powerful pedagogical tool.

The results further revealed that traditional games enhance enthusiasm, motivation, and participation in mathematics learning. This aligns with Kihara's (2018) observation that learners who engage in mathematical activities through traditional games display higher levels of interest and active involvement, which translates into improved comprehension of mathematical principles. Such motivation stems from the interactive and enjoyable nature of games, which transform learning from a passive process into an active, collaborative experience.

An equally important finding was that traditional games enable learners to connect new mathematical concepts with familiar cultural practices. This supports Chikoko et al.'s (2019) assertion that learners are more likely to remember concepts taught within contexts they understand and enjoy. In primary education, where learners thrive on concrete and relatable experiences, this connection strengthens comprehension and retention.

The study also highlighted that traditional games encourage learners to recall mathematical concepts and reflect on their strategies and decisions, leading to deeper conceptual understanding. Mukwada (2007) similarly observed that reflection is a critical component of learning through games, as it allows pupils to analyze their decision-making processes, identify patterns, and abstract key principles. This process helps learners articulate and consolidate their mathematical understanding.

Moreover, the results showed that traditional games make mathematical concepts tangible and relatable, enhancing the meaningfulness and memorability of the learning process. Chikwature and Jeke (2015) confirm that such contextualization transforms abstract concepts into concrete experiences, allowing pupils to visualize and apply mathematical principles in familiar scenarios. This not only bridges the gap between theory and practice but also reinforces the relevance of mathematics in everyday life.

The findings also emphasized that traditional games promote a deeper understanding of mathematical concepts than rote memorization. Mukwada (2007) and Vygotsky (1978) argue that play-based learning supports intuitive comprehension through exploration, trial and error, experimentation, and collaborative problem solving. This active engagement helps learners internalize concepts and confidently transfer their knowledge to new situations.

Finally, the study revealed that traditional games allow learners to experiment with mathematical concepts in a playful context, which strengthens retention. Mapfumo (2013) notes that such experimentation often requires the application of skills like addition and subtraction during the game, with learners then able to transfer these skills to real-life scenarios. This cycle of playful application and real-world transfer solidifies both understanding and memory.

In summary, the findings, supported by literature, affirm that traditional games are more than recreational activities; they are culturally grounded, interactive learning tools that engage learners, contextualize abstract concepts, enhance motivation, and promote long-term retention. By integrating these games into primary mathematics teaching, educators can make learning both meaningful and enduring.

5.1.3 Summary of research question 3: What challenges and opportunities arise when integrating traditional games into the primary mathematics curriculum?

The findings of this study revealed that implementing traditional games in mathematics education faces several challenges, a reality supported by existing literature. Both qualitative and quantitative results indicated that there are significant constraints in terms of resources and materials required for effective implementation. Teachers often lack the necessary knowledge and skills to integrate traditional games into their lessons, a finding consistent with Mutodi and Ngirande (2014), who observed that many teachers in Zimbabwe are unsure about selecting appropriate games, designing game-based activities, and assessing learning in such contexts. Ke (2008) further emphasizes that effective integration demands a deep understanding of both the game and the mathematical concepts it aims to teach.

Another major challenge identified was the need to adapt the mathematics curriculum to accommodate traditional game-based learning. This aligns with Chireshe and Mapfumo's (2018) findings that the current Zimbabwean curriculum emphasizes rote memorization and

standardized testing, leaving minimal space for innovative approaches such as games. Without curriculum flexibility, game-based methods struggle to find a practical place in classroom instruction.

The study also found that managing large classes poses a considerable barrier. Consistent with Erford et al. (2010), large numbers of learners make it difficult for teachers to facilitate interactive and collaborative gameplay. In such environments, the benefits of engagement and participation often diminish, leading to a less effective learning experience.

Learner resistance emerged as another challenge. Some pupils view traditional games as less valuable than conventional teaching methods, which can reduce participation and engagement. This finding mirrors Zarrin et al. (2020), who noted that preconceived attitudes toward games can limit their effectiveness as educational tools.

A further obstacle was the difficulty teachers face in linking traditional games to the mathematical concepts being taught. Walan et al. (2021) found that inadequate teacher training often leads to missed opportunities for making explicit connections between gameplay and learning objectives, resulting in underutilization of the games' educational potential.

Time constraints were also cited as a hindrance. Incorporating traditional games typically requires extra preparation and execution time, which many teachers struggle to find within an already packed curriculum. This agrees with Erford et al. (2010), who noted that such time pressures often lead teachers to prioritize coverage of prescribed content over innovative teaching strategies.

Finally, the study highlighted the difficulty in evaluating learning outcomes from game-based mathematics activities. Chen (2021) points out that traditional assessment tools may not adequately capture the skills and understanding gained through gameplay, making it challenging for teachers to measure progress effectively.

In summary, while traditional games have the potential to enhance mathematics learning, their integration is hampered by a lack of resources, insufficient teacher training, rigid curricula, large class sizes, learner resistance, weak conceptual links, limited time, and difficulties in assessment. These challenges echo past research and underscore the need for targeted interventions, such as teacher professional development, curriculum adjustments, and

innovative assessment methods, to fully harness the benefits of traditional game-based learning.

5.2 Conclusion

The conclusion from the findings and related literature indicates that traditional games hold significant potential as an effective pedagogical tool in mathematics education. The research consistently shows that traditional games foster learner engagement, enthusiasm, motivation, and participation, making mathematical concepts more tangible, relatable, and relevant to learners' everyday experiences. By contextualizing abstract ideas and encouraging interactive, playful exploration, traditional games promote deeper conceptual understanding, long-term retention, and the ability to apply knowledge in varied situations. These benefits align strongly with previous studies, which emphasize the value of connecting new mathematical concepts to familiar cultural practices and integrating reflective, experiential learning into classroom practice.

However, despite these strengths, the integration of traditional games into mathematics teaching is hindered by notable challenges. Teachers often lack the resources, knowledge, and skills necessary to effectively implement game-based learning, and the current curriculum leaves little space for innovative approaches. Large class sizes, learner resistance, time constraints, difficulty in linking games to learning objectives, and limitations in assessing outcomes further complicate adoption. These constraints mirror those identified in past research and highlight the systemic, structural, and professional support required for successful implementation.

Overall, the findings suggest that while traditional games can bridge the gap between abstract mathematical theory and practical application, creating a more engaging and meaningful learning experience, their full potential can only be realized if teachers are adequately trained, the curriculum is adapted to allow flexibility, resources are made available, and assessment methods are aligned to capture the unique learning outcomes of game-based approaches. Addressing these barriers will ensure that traditional games move from being an underused cultural resource to a powerful, integrated element of mathematics instruction.

5.3 Recommendations

Based on the findings, the study recommends several strategies to enhance the effective use of traditional games in teaching primary mathematics in Zimbabwe. Firstly, there is a need for targeted teacher training and professional development programs that equip educators with the knowledge, skills, and confidence to select appropriate games, design relevant activities, and link them effectively to specific mathematical concepts. Such training should also address strategies for managing large classes during game-based learning and methods for evaluating learners' progress in ways that capture both conceptual understanding and practical skills.

Secondly, the primary mathematics curriculum should be reviewed and adapted to create space for innovative teaching approaches, including traditional game-based learning. This would involve integrating games into the curriculum as a legitimate pedagogical tool rather than treating them as supplementary activities. Alongside this, adequate teaching and learning resources, such as game materials and instructional guides, should be provided to schools to reduce the barrier of limited resources.

Thirdly, efforts should be made to raise awareness among learners and parents about the educational value of traditional games in mathematics, to reduce resistance and build a supportive learning culture. This could be achieved through community engagement initiatives that connect classroom learning with cultural heritage, showing the relevance of mathematics to daily life.

Lastly, assessment methods should be diversified to include tools that effectively measure learning outcomes from game-based activities. This might involve performance-based assessments, observation checklists, or reflective learner journals to complement traditional testing methods.

By implementing these recommendations, traditional games can be more systematically integrated into mathematics instruction, maximizing their potential to improve learner engagement, understanding, and retention of key concepts.

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Appendix

INTERVIEW SCHEDULE

Research Question 1: What traditional games can be used to teach primary mathematics concepts at Ponderosa primary school?

Sub Questions

(1) Have you ever used Pada (Hopscotch) in your math lessons? If so, what mathematical concepts do you think Pada can effectively teach?" (e.g., counting, number recognition, sequencing)

(2) Have you ever used Tsoro Yematatu in your math lessons? If so, can you describe how you use it?

(3) What concepts do you think Tsoro Yematatu can effectively teach? (e.g., spatial reasoning, geometry, strategy)

(4) How do you connect the game to formal geometric concepts like points, lines, and angles?

(5) Have you ever used Nhodo in your math lessons? If so, can you describe how you use it?

(6) What mathematical concepts do you think Nhodo can effectively teach? (e.g., counting, addition, subtraction, strategic thinking, problem-solving)

(7) Have you ever used traditional songs and rhymes accompanied by clapping games in your math lessons? If so, describe how you use them.

(8) How do you think songs and rhymes can help with concepts like skip counting or arithmetic operations?

Research Question 2: How does the incorporation of traditional games affect pupils' understanding and retention of primary mathematics concepts?

Sub questions

(1) In your experience, how do students respond to learning mathematics through traditional games compared to more traditional methods?

(2) Do you observe any changes in student engagement, motivation, or attitude towards mathematics when using traditional games?

(3) Do you believe that using traditional games helps students understand mathematical concepts better? Why or why not? Can you provide examples?

(4) Have you noticed any difference in students' ability to remember and apply mathematical concepts learned through traditional games?

(5) Do you think using traditional games helps students connect mathematical concepts to their daily lives or cultural experiences? How so?

(6) Beyond mathematical content, what other skills (e.g., problem-solving, strategic thinking, collaboration) do you think students develop through playing traditional games in a mathematical context?

(7) In your experience, what are some of the positive impacts you've seen on students' learning and engagement when using traditional games?

(8) Have you noticed any impact on students' attitudes toward mathematics or their cultural identity?

Research Question 3: What challenges and opportunities arise when integrating traditional games into the primary mathematics curriculum?

Sub Questions

(1) Do you believe that traditional games can increase student engagement and motivation in mathematics? (Why or why not? Can you provide an example?)

(2) In what ways could the use of traditional games help to improve learners' understanding of mathematical concepts?

(3) How do you see the role of traditional games in fostering problem-solving and critical thinking skills in mathematics?

(4) Do you think playing traditional games promotes social interaction and collaboration among students? (Can you provide an example?)

(5) Do you think the lack of resources and classroom space makes it difficult to implement traditional games in teaching mathematics?

(6) Do you believe you need more training on effectively integrating traditional games into your lessons?

(7) Do you think the current curriculum allows for enough time to incorporate traditional games into your lessons? Why or why not?

(8) How difficult do you think it is to manage a large class while using traditional games in mathematics instruction?

QUESTIONNAIRE FOR TEACHERS

Dear Respondent

The study is on incorporating traditional games into the teaching and learning of primary mathematics at ponderosa primary school in Doma cluster. Your input will help make informed decisions about the use of traditional games in the teaching and learning of primary school mathematics. It would therefore be appreciated if you could provide responses to all items on the questionnaire, and do it honestly. You are assured of complete confidentiality and anonymity of all information provided. **Tick** (√) **the correct option.**

SECTION A

DEMOGRAPHIC CHARACTERISTICS

1. **Sex**:

a) Male [ ]

b) Female [ ]

2. Age

a) Below 30 [ ]

b) 31-40 [ ]

c) 41-50 [ ]

(d) 51-60 [ ]

(e) Above 60 years [ ]

3. **Level of Qualification**

a) Diploma in Education [ ]

b) Teaching Degree [ ]

c) Masters [ ]

d) Others [ ]

4. Years of Teaching Experience
a) 0-5years [ ]
b) 6-10years [ ]
c) 11 years and above [ ]

(i) What traditional games can be used to teach primary mathematics concepts at Ponderosa primary school?

STATEMENTS	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
	1	2	3	4	5
1. Hop Scotch (Pada) can be used for numerical sequences and for counting					
2. Tsoro Yematatu (also known as Three Men's Morris or Nine Holes) can be used to teach geometry.					
3. Tsoro yematatu helps learners to develop understanding of mathematical concepts like points, lines, angles and spatial relationships.					
4.Game board helps students learn the concept of symmetry and geometric shapes.					
5. Nhodo can be used to teach problem solving skills in Mathematics					
6. Use of different scoring systems in Nhodo game allows learners to practice arithmetic operations in a meaningful context.					
7. Nhodo can be used to teach counting, addition, subtraction, and strategic thinking.					
8. Songs and rhymes accompanied by clapping hands can be					

used to teach counting patterns and rhythmic sequences					

(ii) How does the incorporation of traditional games affect pupils' understanding and retention of primary mathematics concepts?

STATEMENTS	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
	1	2	3	4	5
1. Traditional games foster engagement and promote learning.					
2. Traditional games enhance enthusiasm, motivation and participation in the learning of mathematics.					
3. Traditional games allows learners to connect new mathematical concepts with familiar practices.					
4. Traditional games allows learners to remember taught mathematics concepts and reflect on their strategies and decisions leading to more understanding of mathematical concepts taught.					
5. Traditional games make mathematical concepts tangible and relatable, thus, making the learning process more meaningful and memorable.					
6. Traditional games allow learners to see the relevance of mathematics in their daily lives making learning process more					

meaningful and memorable.					
7. Traditional games foster a profound understanding than rote memorisation enabling learners to internalise mathematics concepts					
8.Traditional games allows learners to engage with experimentation with mathematical concepts in a playful context to reinforce retention.					

(iii) What challenges and opportunities arise when integrating traditional games into the primary mathematics curriculum?

STATEMENTS	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
	1	2	3	4	5
1. Constraints of resources and materials needed to implement traditional games effectively.					
2. Teachers lack the necessary knowledge and skills to effectively integrate traditional games into their lessons.					
3.Adaptation of curriculum to accommodate traditional game-based learning					
4. Managing large classes make it difficult to implement traditional games effectively in the					

mathematics classroom.					
5. Learners' resistant to learning mathematics through traditional games					
6. Failing to link the traditional games and mathematics concepts being taught.					
7. Limited time to include game-based learning.					
8. Difficulty to evaluate learner-learning outcomes during teaching and learning mathematics using games					

Thank you.