Exploring views of teachers on using cultural games in teaching early-grade mathematics

by

Marciline Kanda [21837105]

Submitted in fulfilment of the requirements for the degree

PHILOSOPHIAE DOCTOR

in

EARLY CHILDHOOD DEVELOPMENT

in the Faculty of Education
University of Pretoria

APRIL 2025

Supervisor: Professor Keshni Bipath

DECLARATION OF ORIGINALITY

I, Marciline Kanda (Student Number 21837105), hereby declare that this study, titled **"Exploring teachers' views on using cultural games in early-grade mathematics"** which I hereby submit for the degree Philosophiae Doctor in Educational Psychology at the University of Pretoria, is my own work and has not been previously submitted by me for a degree at this or any other tertiary institution**.**

28 April 2025

.....

SIGNATURE/HANDTEKENING DATE/DATUM

ETHICAL CLEARANCE LETTER

FACULTY OF EDUCATION
Ethics Committee

RESEARCH ETHICS COMMITTEE

CLEARANCE CERTIFICATE	CLEARANCE NUMBER: **EDU077/22**
DEGREE AND PROJECT	Phd Exploring views of teachers on using cultural games in teaching early grade mathematics
INVESTIGATOR	Ms Marciline Kanda
DEPARTMENT	Early Childhood Education
APPROVAL TO COMMENCE STUDY	30 August 2023
DATE OF CLEARANCE CERTIFICATE	09 October 2024
CHAIRPERSON OF ETHICS COMMITTEE:	Prof Funke Omidire

Mr Simon Jiane
Prof Keshni Bipath

This Ethics Clearance Certificate should be read in conjunction with the Integrated Declaration Form (D08) which specifies details regarding:

- Compliance with approved research protocol,
- No significant changes,
- Informed consent/assent,
- Adverse experience or undue risk,
- Registered title, and
- Data storage requirements.

ETHICS STATEMENT

The author, whose name appears on the title page of this thesis, has obtained, for the research described in this work, the applicable research ethics approval. The author declares that he/she has observed the ethical standards required in terms of the University of Pretoria's *Code of Ethics for researchers and the Policy guidelines for responsible research."*

ABSTRACT

This study examines teachers' views on infusing cultural games into the teaching and learning of mathematics at the Early Childhood Development (ECD) level. Growing evidence has shown potential for improving learners' development and understanding of mathematical concepts when cultural games is infused into pedagogy. However, despite this growing evidence of the strong relationship between cultural games and pedagogical practice, very little attention has been given to why teachers do not fully use them during the teaching process in ECD classes. The school curriculum in post-independent Zimbabwe still reflects the Eurocentric way of teaching ECD learners, and such an approach has overshadowed cultural development among Zimbabwean children. I designed this study using the interpretivism philosophy, which hinges on the belief that knowledge is generated using subjective viewpoints based on how participants view the truth themselves, as well as the issues around them. So, to gather teachers' views and how they interpret the incorporation of cultural games into the teaching of early-grade mathematics, I used a multiple-embedded case study strategy. It was multiple because I collected data from ECD teachers drawn from three different schools, and it was embedded because I only asked for data relating to mathematics and the prospects and challenges of using cultural games in doing so. Within this multiple-embedded case study, I gathered data using twelve in-depth interviews directed by an interview guide generated from multiple real-life situations to enable participants to comprehend ideas more clearly than merely presenting them with abstract principles. Furthermore, I used three focus group interviews to explore group views between and within the three case study schools. I also used a document review of the ECD curriculum and other policy documents to assess their provisions and inherent weaknesses, and I applied observation and photography to capture instrumental cases. I used conversation and textual analyses to examine interviews and textual data. To avoid making essentialist generalisations, I read the text and interpreted experiences, typically in intensive ways, to identify assumptions and locate contradictions and conflicts. Thematic analysis partly enabled me to trace participants' accounts and experiences. Study findings revealed diverse pedagogical approaches, practices, contextual factors, and challenges teachers face when using cultural games

in teaching. Among the reported challenges, time constraints and congested timetables rose above other factors. Despite the clarity in the ECD curriculum regarding the use of cultural games in teaching, some teachers lack interpretive skills on how best to use them in practice or believe that cultural games are an extracurricular activity. Because of these and other reasons discussed in the thesis, some teachers struggle to integrate cultural games into daily teaching practice effectively. Therefore, it is recommended that mentorship programmes or online forums be rolled out so that teachers who have experienced this aspect can share best practices and support their colleagues. This fosters a collaborative environment where teachers can learn from one another and continuously improve their perceptions of using cultural games in teaching. This study's major contribution is the Cultural Games Integration Framework for Zimbabwe (CGIZ).

Keywords: early childhood development; early-grade learners; early-grade mathematics; cultural games; teachers' views

DEDICATION

To my family, for their boundless support.

ACKNOWLEDGMENTS

First and foremost, I would like to extend my deepest gratitude to my principal supervisor, Prof. K. Bipath. Her unwavering support and enthusiasm for my research were instrumental in shaping this work. Prof. Bipath's insightful feedback and constant encouragement inspired me to explore new avenues and strive for excellence throughout this journey.

I am also profoundly grateful to my initial supervisor, Prof. R. Venketsamy, from the University of Kwa-Zulu Natal. Prof. Venketsamy's expertise and guidance proved invaluable in providing clarity and direction during the early stages of my research. His thoughtful advice was a cornerstone that supported the foundation of my study.

I wish to acknowledge the dedicated teachers from the three schools that constituted my sample. Their willingness to participate and share their insights greatly enhanced the richness of my research, and I truly appreciate their contributions and open-heartedness.

A heartfelt thanks goes to Dr. F. Rafamoyo, a skilled data scientist whose work on Nvivo 12 was critical for my data analysis. Dr. Rafamoyo's willingness to assist me with data reduction and his shared experiences as a qualitative data analyst enriched my understanding and approach, making me more proficient in my methodologies.

Additionally, I am deeply thankful to my technical editor, Dr. S. S. Mazongonda. His meticulous attention to detail and suggestions helped me connect the dots, improve the coherence of my line of argument, and enhance the overall flow of my thesis. Dr. Mazongonda's contribution transformed my thesis and elevated its quality beyond measure.

A big thank you also goes to the language editor, Anna M. de Wet, who refined the thesis and removed obscurities in meaning. Her editorial role improved the flow of the study.

I am also grateful to my colleagues at work, who listened to me explain the unfolding of my thesis. Their moral support and understanding created a nurturing environment that helped me maintain focus and motivation during challenging times.

I want to express my heartfelt gratitude to my mother, who, even though she may not fully understand the research complexities, always asked, *"How is school, my daughter?"* Her caring concern reminded me of the importance of perseverance.

To my brother and sister, thank you for your patience and encouragement; I often wondered when this seemingly unending research journey would end. Your support has meant a great deal to me.

To my husband, Mr. P. Mangwende, words cannot express the depth of my gratitude for your steadfast support and encouragement. Your belief in me and my work has been an unwavering source of strength.

Lastly, I express my profound gratitude to God, the Almighty, for giving me the strength and determination to undertake this study. Through His grace, I navigated this journey, and I am eternally thankful.

LANGUAGE EDITOR'S LETTER

Member South African Translators' Institute
www.language-services.online

23 April 2025

TO WHOM IT MAY CONCERN

The thesis titled " Exploring teachers' views on using cultural games in early-grade mathematics" by Marciline Kanda has been proofread and edited for language by me.

I verify that the dissertation is ready for publication or public viewing in terms of language and style and that it has been formatted according to the prescribed style.

Please note that no view is expressed regarding the document's subject-specific technical contents or changes made after the date of this letter.

Kind regards

Anna M de Wet

SATI MEMBER 1003422

BA (Afrikaans, English, Classical Languages) (Cum Laude), University of Pretoria.
BA Hons ((Latin) (Cum Laude), University of Pretoria.
BA Hons (Psychology), University of Pretoria.

LISTS OF ACRONYMS

CBC	Competency-Based Curriculum
CG	Cultural Game
CHAT	Cultural Historical Activity Theory
DSI	District Schools Inspector
E2030FA	Education 2030 Framework for Action
ECD	Early Childhood Development
EGL	Early-grade learner
ESD	Education for Sustainable Development
FGI	Focus Group Interview
GFALC	Grand Fun Alley Learning Centre
HBC	Heritage-Based Curriculum
IKS	Indigenous Knowledge Systems
L1	Local Language
MHTESTD	Ministry of Higher and Tertiary Education, Science and Technology Development
MPSE	Ministry of Primary and Secondary Education
NAEYC	National Association for the Education of Young Children
PED	Provincial Education Director
SDG	Sustainable Development Goals
SI	Statutory Instrument
STC	Seke Teachers' College
TP	Teaching Practice
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UP	University of Pretoria
UPREC	University of Pretoria Research Ethics Committee
WHO	World Health Organization's
ZEGU	Zimbabwe Ezekiel Guti University
ZPD	Zone of Proximal Development

TABLE OF CONTENTS

List of Figures

List of Tables

List of Plates

CHAPTER ONE: GENERAL ORIENTATION OF THE STUDY

1.1 INTRODUCTION

This study aimed to examine teachers' views on infusing cultural games into the teaching and learning of mathematics at the Early Childhood Development (ECD) level. Cultural games have long been a tool of great interest in pedagogy and vary in scope and objectives (Bahrami et al., 2012). Despite their diverse objectives, cultural games have been commended for instilling and acknowledging cultural pride and identity (Singh & Reyhner, 2013). Scholars such as McInnes and Birdsey (2013) and Kylasov (2014) have concurred that cultural games collectively define ethnocultural activities that children engage in, mainly for pleasure and entertainment. Mutema (2014) underscored the long-held assumption that foundational learners learn naturally and retain much of what they learn when they learn and play simultaneously, which is often a direct outcome of cultural games.

Arguably, early-grade learners (EGLs) are active explorers of their environments. It has been argued that they learn and construct their knowledge by doing and discovering through engaging in games (Essa, 2014). Against this background, Bahrami et al. (2012) underlined that, in both formal and informal settings, there is a strong correlation between childhood and games for educational purposes and fun. In support of their assertion, Bahrami et al. gave some evidence around this correlation by revealing that the use of cultural games during early grades allows learners to relate their experiences outside the classroom to mathematical concepts and processes encountered in the classroom. So, growing evidence has shown that during ECD, children start understanding mathematical concepts through play. Since most cultural games occur at home, guided by Indigenous Knowledge Systems (IKS), it implies that parents are the primary educators of mathematics (Hedegaard & Fleer, 2013). In the same line of argument, Fleer (2015) asserted that with continuous play, through fun and games, foundational learners develop a sound understanding of mathematical concepts as they apply in real-life settings.

In addition to learning from home, children interact with their peers and exchange their experiences through playing games in educational environments (Nabie, 2011).

According to Dziva et al. (2011), cultural games develop a positive self-concept among learners since they can identify with their cultural upbringing and situation. Similarly, Bahrami et al. (2012) and Fleer (2015) argued that the general use of games in learning during early grades provides learners with opportunities to relate their experiences with learning outside the classroom. Despite the benefits associated with infusing cultural games into teaching and learning mathematics at the foundational level, a study by Dewah and Van Wyk (2014) in Zimbabwe revealed that young children are rarely exposed to cultural games when learning mathematical concepts. In the quest to teach mathematics at a foundational level, most teachers use toys and teacher-directed methodologies. However, these methods are less attention-grabbing and stimulating than children's natural curiosity and playfulness, argued Feza (2018). Recently, Ekeh and Venketsamy (2020) clarified that through exploration and play activities, EGLs are stimulated cognitively and emotionally, thus enhancing the development of numeracy, logical and critical thinking, and problem-solving skills.

Growing evidence has shown latent potential for improving learners' development and understanding of mathematical concepts when cultural games are infused into pedagogy (see Dewah & Van Wyk, 2014; Ekeh & Venketsamy, 2020; Essa, 2014). However, teachers' perception of cultural games serves as a major determinant of their effective use in teaching and learning mathematics since they are responsible for transferring knowledge to learners. As part of this study's purpose to investigate teachers' views on the use of cultural games in teaching mathematics to EGLs, the study identifies, explores, and analyses the most widely used cultural games in Zimbabwe through the lens of teachers. The study further seeks to establish whether teachers' attitude and knowledge has a bearing on the choice and use of cultural games in teaching mathematics. Specifically, this chapter sets the scene for the study by giving background information, study objectives, and its significance to the literature, policy, and practice.

1.2 BACKGROUND INFORMATION

Most scholars who argue from post-colonial viewpoints, for example, Shizha (2013), have asserted that the school curricula in post-independent African states experience challenges emanating from a legacy of colonial education. Arguably, the footprints of this legacy are still entrenched in their school curricula. Like many other African

countries, Zimbabwe still reflects the Eurocentric way of teaching their EGLs (Stronge et al., 2011). Chikodzi and Nyota (2010) have opined that Western teaching methodologies have overshadowed cultural development among Zimbabwean children. Resultantly, they are losing their cultural identity since teachers in Zimbabwe teach their learners with methods divorced from their cultural backgrounds. According to Neulip (2012), the curricula must integrate culture and education to reconstruct the identity and history of learners so that they can be proud of who they are.

In search of therapy, the Zimbabwean ECD curriculum for mathematics and science aims to acknowledge, promote, and recognise the country's identity of all learners so that they can embrace 21st-century skills (Ministry of Primary and Secondary Education [MPSE] , 2015). It is envisaged that 21st-century skills such as critical thinking, problem-solving, creativity, innovation, analysis, reasoning, and collaboration will be developed through this curriculum. It is also believed that these skills enhance ECD learners' confidence in developing their self-esteem. The curriculum is designed so that learners solve day-to-day problems with activities embedded in their culture; hence, ECD learners become aware of their heritage, history, culture, and traditions.

Scholars such as Nabie (2011) and Lucas (2016) have collectively supported such a structure by arguing that culture has always been central to ECD curricula, and learners understand and master mathematical concepts with ease when exposed to methodologies they can relate to. Some approaches that have been suggested include engaging EGLs in games that reflect their cultural heritage (Kane et al., 2011). Games that have been given as examples include pebble play games and hopscotch because they help learners appreciate concepts from known to unknown, that is, from specific to general.

There is a crop of scholars advocating for incorporating cultural activities in pedagogy, starting at the foundational level so that Zimbabwe can begin rebuilding the lost knowledge blocks (Chikodzi & Nyota, 2010; Mutema, 2014; Singh & Reyhner, 2013). These suggestions stem from the general observation that despite the clarity of the Zimbabwean ECD curriculum regarding preferred teaching methodologies, there is minimal integration of cultural activities, especially in mathematics teaching. Despite calls for ECD practices to be culturally and contextually relevant, young children are

not immersed in appropriate curricula that reflect their cultural background. That is, ECD teachers rarely apply cultural games as a teaching strategy for lesson delivery. Hence, this partly justifies the need for curriculum and pedagogical practices to be informed by indigenous knowledge embedded in cultural games.

Since ECD forms the foundation of the Zimbabwean education system, the MPSE (2015) pedagogical practices at this stage must be strongly underpinned by IKS and cultural norms. This is very important because young children learn best in circumstances that meet their specific contexts. The position of the MPSE that is premised on the significance of heritage-based education is supported by empirical sources such as Chikodzi and Nyota (2010), Shizha (2013), and Rupere et al. (2013). Since the Zimbabwean ECD curriculum is a highly regarded heritage-based curriculum, why do teachers rarely use cultural activities to impart mathematical knowledge to EGL? What are their views on using cultural games in teaching early-grade mathematics? Could it be partly attributed to the fact that the ECD curriculum emphasises the need for cultural games in teaching without specifying how it must be done? This study seeks to answer these questions to develop a framework for infusing cultural games into Mathematical pedagogical practices.

1.3 RATIONALE

My exposure and experience as a supervisor of ECD student teachers during their practicum in Zimbabwean schools ignited my interest in learning more about this subject. More often, student teachers conducted their mathematics lessons using teaching methods such as demonstration, role-play, excursions, question and answer, discussions, rhymes and poems, and computer games. Although these methods are relevant to foundational learning, little attention was paid to the cultural games played by learners during their free time. For example, during break time, I could see EGLs engaging in games such as pebble play and hopscotch. As an assessor, guided by the provisions of the ECD curriculum, some questions crossed my mind. Why is it that student teachers prefer the use of modern teaching methods to traditional methods hinged to cultural games? What are their perceptions towards the use of cultural games in teaching mathematics? What is the missing link between cultural games and pedagogical practices?

In an inquisitive attempt to answer some of these questions, I reflected on Lucas's (2016) opinion that ECD is a stage with its own identity, where learners acquire lessons while playing naturally. In the context of mathematics, Lucas argued that ECD learners must be engaged in a series of cultural activities. So, my desire to produce descriptions and explanations of what I observed in practice kindled my interest to read, research, and possibly write more. I wanted to know more about the current state of knowledge on the relationship between cultural games and teaching mathematics at a foundational level. During the literature survey, I discovered that the study by Ekonesi and Ekwueme (2011) in Nigeria revealed that students maintain a poor attitude towards mathematics but did not disclose teachers' perceptions of this reality. In another interesting discovery, Bahrami et al. (2012) engaged EGLs in selected games for each mathematics concept and then asked them to solve somewhat related problems. The outcomes of this experiment are instrumental in explaining the importance of cultural games in learning mathematics. However, such outcomes are devoid of teachers' perceptions and are responsible for using teaching methodologies. As such, one of my goals is to richly describe teachers' views on using cultural games in teaching mathematics since such a perspective has received little scholarly attention.

In a somewhat similar line of argument, numerous studies have concurred that EGLs engage in a series of games in an informal context and gain indispensable academic skills, implying that there is a close link between games, ECD, and future success (Bahrami et al., 2012; Ekeh & Venketsamy, 2020; Nabie, 2011). According to Wager (2012), children learn academic skills, become innovative, and fantasise without ceasing to be themselves through gamification. Despite this realisation, there seems to be a missing link between the cultural games children engage in and the pedagogical experiences they are exposed to. I also discovered that most developing African nations inherited a Eurocentric education system from colonisation (Mutema, 2014; Mweli, 2018). Thus, teachers introduce mathematical concepts without adequately linking them to a child's reality, that is, their culture. In this regard, it becomes challenging for most Indigenous children to acquire new concepts and engage meaningfully in the learning process (Mweli, 2018). So, despite growing evidence that cultural games can be used to enhance and create a connection between classroom activities and real-life contexts, very little attention is given to their

utility during the teaching and learning process. Details are still unclear as to why there is a low uptake of cultural games as a teaching methodology.

It has been concluded that if teachers allow children to learn mathematics by engaging in meaningful and enjoyable cultural games, they are more likely to appreciate and engage in quantitative education later (Linder et al., 2011). Research has stressed the importance of this type of early mathematics learning, with links being drawn between early mathematics and later achievement (McDonald & Carmichael, 2016; Watts et al., 2014). Given the pedagogical gap in teaching mathematics in most schools in Zimbabwe and the inherent opportunity of infusing cultural games into pedagogy, I was motivated to venture into this study area. Overall, I had a dual and sequential motivation to conduct this study. It was dual because my drive was fed from the practical gaps I observed as an assessor and the knowledge gaps I found in the literature. Then, it was sequential because the practical gap led me to identify the gap in the literature. So, this dual-sequential motivation partly justifies the purpose of this study.

1.4 PURPOSE OF THE STUDY

Overall, this study aims to determine how teachers view the use of cultural games in their instructional domain, in this case, early-grade mathematics. This would provide an insight into their orientation towards game-based mathematics pedagogy. Children's cultural games have long been regarded as a critical element of the early childhood curriculum and pedagogy (Frost, 2010). In addition to being recognised as a vehicle for learning, cultural games are described as contexts in which EGLs can demonstrate their knowledge and help scaffold the learning of others (Wood et al., 2010). The potential of cultural games to facilitate mathematics learning at the foundational level depends largely on their parents and teachers. Engaging in cultural games, in both home and school environments, strengthens collaboration between families and teachers as they help and guide learners in understanding some concepts.

However, mathematics learning in these explorations appears to be unnoticed by early-grade teachers, which creates a knowledge gap around whether teachers are aware of the value of games or look down upon the cultural heritage endowed and

experienced by children. For many years, there has been a longstanding history of marginalising and devaluing the contributions of Indigenous cultural activities to the edifice of mathematical learning (Nabie, 2011). Therefore, it is still unclear whether teachers value them when teaching ECD mathematics. Despite the merits of cultural games, early-grade teachers often struggle to explain how cultural games promote learning and how they can actively facilitate both games and learning (Ranz-Smith, 2013). This study's purpose has been expressed using three different domains: (1) statement of the research problem, (2) research objectives, and (3) research questions. In this case, the statement of the research problem is a narrative summary of the gap analysis that this study intends to fill, the objectives are statements of intent that this study aims to attain, and research questions are interrogations that form the core of the study such that when they are answered, the research problem would have been addressed and objectives attained.

1.4.1 Research Problem

In the Zimbabwean ECD mathematics curriculum, heritage and culture are central to curricular practice. Contrary to this provision, practical realities have shown that both qualified and student teachers mainly use the traditional teaching and learning strategy devoid of cultural games, yet mathematical concepts are deeply rooted in cultural games (Moloi, 2015; Nabie, 2011). Moloi (2015) has asserted that the exclusion and marginalisation of Indigenous knowledge associated with cultural games explain poor academic achievement in numerical problem-solving among learners. Using my reflexivity and positionality as a researcher, I remember playing "nhodo" (pebble play) at home and school as a young girl. In addition to the joy that this game gave me, it assisted me in improving my ability to count, add, and subtract. As far as it can be ascertained, foundational-level teachers have yet to fully embrace and capitalise on cultural games' capacity to edify pedagogical approaches (Shizha, 2013).

This reluctance could be partly explained by the fact that some teachers still find themselves trapped in the colonial pedagogic practice that undervalues the importance of using cultural activities in teaching and learning mathematics (Chikodzi & Nyota, 2010). Several studies (see Chikodzi & Nyota, 2010; Dziva et al., 2011; Nabie, 2011) explored the value of cultural games in teaching and learning in general, but there has been no engagement or discussion with teachers regarding

their views on their use for teaching and learning purposes. Without such studies, the effective development of numerical skills at the foundational level remains a significant task. It is envisioned that this study will bring awareness and appreciation to cultural games, which will help EGLs understand numerical concepts easily.

1.4.2 Objectives

The main objective of this study is to understand the views of early-grade teachers regarding the use of cultural games to develop a framework for infusing cultural games into teaching and learning early-grade mathematics. It specifically seeks to:

1. Examine the main tenets of the Cultural Historical Activity Theory (CHAT) to explain the approaches used to teach EGLs
2. Understand how early-grade teachers use cultural games in operationalising the updated heritage-based curriculum
3. Document the relationship between teachers' knowledge and attitude toward the use of cultural games
4. Determine which cultural games teachers observed EGLs engage in during free play
5. Classify the most important mathematical concepts children learned while playing cultural games from teachers' perspectives
6. Create a catalogue of the most well-used cultural games for reaching different numerical competencies
7. Construct an effective framework based on cultural games to develop EGL's mathematical skills

1.4.3 The Research Questions

Main research question:

- What are teachers' views regarding the use of cultural games in early-grade mathematics?

Sub-research questions:

1. How do the main tenets of the CHAT explain approaches used to teach EGLs?
2. How do early-grade teachers use cultural games in operationalising the updated ECD mathematics heritage-based curriculum?

3. How do teachers' knowledge, attitude, and perceptions influence their level of incorporation of cultural games in their pedagogical approaches?
4. Which cultural games did teachers observe EGLs engaging in during free play?
5. Which were the most important mathematical concepts children learnt while playing cultural games from teachers' perspectives?
6. How do teachers experience the use of cultural games as part of their pedagogical approaches?
7. What characterises an effective teaching strategy based on cultural games to develop EGL's mathematical skills?

1.5 CONTRIBUTION

This study provides a triple contribution to literature, policy, and practice. Firstly, it contributes to methodological literature on ECD education. Accessible literature relevant to this study provides substantive and procedural explanations of some factors behind the role and limited use of cultural games in teaching early-grade mathematics. So, many of the nuggets in literature have shown that everything rises and falls with teachers since teachers are responsible for operationalising what is provided by the ECD curriculum. However, teachers' views towards the same subjects are underreported. As such, this study provides empirical literature on teachers' views toward using cultural games in teaching early-grade mathematics. This approach goes a long way in designing a practical pedagogical approach informed by culture and heritage as perceived by those expected to use the strategy.

Secondly, the Zimbabwean ECD mathematics and science curriculum explicitly clarifies that teaching approaches must feed from cultural activities and games since children learn more as they play naturally. However, the same syllabus does not specify how such approaches must be packaged and used in practice. So, it answers the *what* question (by giving a general description of what is expected of teachers) and the *why* question (by giving reasons for doing so), but it does not answer the *how* question (by giving procedural steps that must be followed in using such approaches). As such, this thesis is one of the first to examine teachers' perspectives on the use of cultural games with the view of developing a procedural conceptual model for teaching early-grade mathematics using cultural games. The main tenets of the resultant model

can be used in the training of ECD teachers and packaged into manuals that can be used as policy prescriptions by the MPSE.

Thirdly, once the MPSE has made a policy pronouncement and teachers' colleges have updated their training curricula using some of the outcomes of this study, the chance is very high that the use of cultural methods in teaching EGLs will increase. It is envisioned that trickle-down effects will be experienced as time progresses. The spread chain can be viewed as follows: from study outcomes to policy pronouncement, from policy to revision of teacher training curricula, and from trained teachers to effective use in practice. So, this study sets the scene for a chain of ripple effects that have long-term gains. Overall, this study makes a triple contribution to literature, policy, and practice, considering its scope, both in terms of breadth and depth. The next section outlines the scope of this study.

1.6 SCOPE OF THE STUDY

In this case, scope refers to the broadness of the study in terms of geographical and conceptual coverage and the period of study in which focus is invested. This section outlines the spatial, temporal, and conceptual scope.

1.6.1 Conceptual Scope

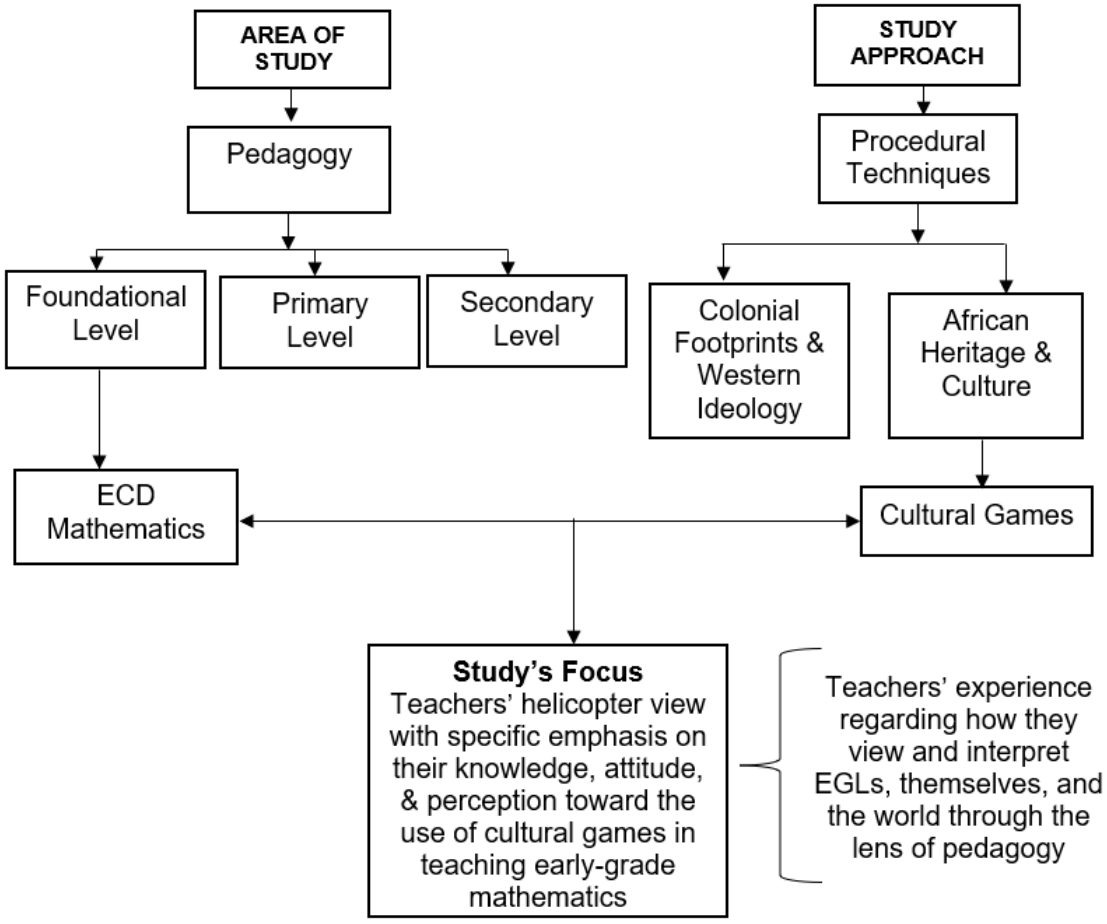
Conceptually, this thesis's area of study is pedagogy, which can be loosely taken to represent the method and practice of teaching. In Zimbabwe, the MPSE oversees and manages this practice according to three clusters: foundational, primary, and secondary levels. Interestingly, this study focuses on the foundational level. As expanded in the review chapter, the Zimbabwean ECD focuses on five areas: expressive arts, language arts, social sciences, technology, and mathematics and science (MPSE, 2015; Zimbabwe's 2015-2022 ECD). So, this study aimed to investigate methods of teaching numeracy skills. To practice ECD education, teachers are often confronted with Western and African ideologies.

Western ideologies are deeply entrenched in colonial footprints since European powers formerly colonised most African countries. For example, the Zimbabwean education system has been marred by British footprints since Britain formerly colonised it. Some scholars informed by post-colonial theory (e.g., Chikodzi, & Nyota,

2010; Ekeh & Venketsamy, 2020; Singh & Reyhner, 2013) argue for tweaking the current teaching approach to emphasise the African heritage and culture, as argued in the preceding paragraphs. So, cultural games have been suggested as one of the strategies that can be used to edify current teaching methods at the ECD level. Following this realisation, this study focuses on teachers' views on using cultural games in teaching foundational-level mathematics since teachers are responsible for translating all pedagogical thoughts into practice. Figure 1.1 provides a summary of the conceptual orientation of this study.

Figure 1.1

Summary of Conceptual Coverage



(Researcher's analysis, 2024)

1.6.2 Spatial Scope

Regarding spatial extent, the MPSE's ECD syllabus was designed to guide the method

and practice of teaching EGLs in Zimbabwe. As such, case data for developing an ECD teaching strategy informed by cultural games is drawn from Zimbabwe. Zimbabwe has ten administrative provinces: Matabeleland North, Matabeleland South, Bulawayo, Midlands, Masvingo, Manicaland, Mashonaland East, Mashonaland Central, Mashonaland West, and Harare. One province, Mashonaland East, was purposively selected to represent Zimbabwe, and within this province, three public schools from Seke Rural District served as case study schools. Chapter Three provides finer details on how and why Zimbabwe was chosen as the geographical area of study.

1.6.3 Temporal Scope

In terms of timeframe, this study used longitudinal data and experiences drawn from early-grade teachers in Zimbabwe during the study period (2021 to 2024). This study period was structured into three main phases: phase one was devoted to literature review and gap analysis, the second phase focused on data collection and analysis, and the final phase was set aside for report writing. These phases had varying timelines, ranging from half a year to two years. Finer details on the time horizons of the study are given and clarified in the methodology.

1.7 CONCEPT CLARIFICATION

To set the scene for forthcoming chapters, this section clarifies the conceptual area of study by defining the operational meanings of key terms used in this study. It must be noted that the meanings given in this section serve as proxies for their usage in forthcoming sections, particularly the review chapter (Chapter Two). Specifically, five key terms defined in Sections 1.7.1 to 1.7.5 have been singled out, not to overemphasise their importance, but to give readers a rough visual imprint of key issues discussed in the thesis.

1.7.1 Teachers

Teachers can be loosely defined as professionals who facilitate learning by guiding, instructing, and mentoring individuals or groups in acquiring knowledge, skills, and values. In line with this general view, Rajagopalan (2019) noted that teachers impart knowledge to learners in an organised and systematic way to attain a pre-determined goal. This view of a teacher aligns with Gupta's (2021) position, which defines a

teacher as someone who helps learners acquire knowledge, competence, and virtue. Furthermore, Gupta (2017) argued that teachers' roles extend beyond delivering content to nurturing critical thinking, fostering curiosity, and supporting learners' holistic development. As such, teachers act as role models, adapt teaching strategies to meet diverse needs, and often integrate cultural and social contexts into their instruction. In Vygotsky's (1934, 1978) concept of the expert-novice paradigm, teachers are the experts, and learners are novices. It can, therefore, be deduced that teachers collectively describe all instructors who guide, impart knowledge, and assess learners in each subject at a given level of study. For this study, teachers are classroom practitioners who impart numeracy competencies to EGLs. Furthermore, they possess strong communication, empathy, mathematics expertise, and a commitment to fostering an inclusive and supportive learning environment.

1.7.2 Views

The Merriam-Webster Online Dictionary (2019) defines a view as a way of looking at something. It collectively includes opinions, perspectives, or interpretations that people hold about a specific topic, experience, or phenomenon. Similarly, the Cambridge Online Dictionary (n.d.) describes views as opinions, beliefs, ideas, or ways of thinking about something. From these two definitions, it is aptly clear that views describe one's perception of something or perspective through which one interprets a given subject or object. According to Leont'ev (1981), individuals' views largely depend on the personal disposition of the interpreter since they are shaped by personal experiences, cultural background, education, values, and exposure to information. As such, views are subjective and vary widely between individuals, reflecting their unique interpretations of the world. This study adopts the position that views are teachers' opinions and beliefs on using cultural games as a mathematics teaching tool. One methodological source, Denzin and Lincoln (2018), underlined that in research, analysing participants' views provides insights into diverse attitudes and beliefs, helping to understand broader societal perspectives.

1.7.3 Cultural Games

One source underlined that cultural games are found in the folk culture and have characteristics such as satire and intelligence; they are with or without mobility, and played collectively during free time (Huizinga, 1950, as quoted in Carneiro de Sousa,

2014, p. 1). This view revolves around the idea that cultural games are traditional or contemporary activities rooted in the customs and practices of a particular group of people. Similarly, McInnes and Birdsey (2013) underscored that cultural games often serve as a medium for storytelling, social bonding, skill-building, and transmitting cultural knowledge across generations. As such, they prepare children physically and cognitively for life and help improve their creativity, develop their problem-solving skills, and enhance their feeling of freedom. Bringing a different perspective to cultural games, Kylasov (2014) defined them as ethnocultural activities that children engage in solely for the pleasure and entertainment they give to an identified folklore group. Putting these dimensions together, it can be deduced that cultural games are human intellectual activities deeply rooted in customs and social behaviour, designed for fun and engagement. In their totality, games serve as a unique identifier of a particular group. In educational contexts, cultural games are valuable tools for teaching social interaction, problem-solving, and fostering appreciation for cultural diversity. For this study, cultural games are activities that young children, sharing the same norms, voluntarily engage in for amusement or fun while developing numeracy competencies. These games may involve physical actions, songs, dances, riddles, or strategic thinking, reflecting the unique heritage and environment of the culture they represent.

1.7.4 Mathematics

Mathematics has been defined by Moursund and Sylvester (2017) as the science of numbers and their operations, interrelations, combinations, generalisations, and abstractions and of space configurations and their structure, measurement, transformations, and generalisations. It has been argued that it encompasses both abstractions and practical applications; abstraction includes concepts such as algebra and calculus, and practical applications include real-world issues such as measurement, statistics, and problem-solving (Moursund & Sylvester, 2017). In the same line of argument, Burton (2011, p.1) stated that *"mathematics involves the study of quantitative or spatial number size, order or form",* and Boyer and Merzbach (2011, p. 1) view mathematics as the *"science of numbers, magnitudes, and forms"*. For these definitions, it can be deduced that mathematics is characterised by logical reasoning, precision, and the use of symbols to represent ideas and relationships. It also serves as the underlying language for science, engineering, technology, and many other disciplines, enabling the modelling and understanding of complex systems.

The Zimbabwean ECD curriculum defines mathematics as a *"science of numbers, operations, measures, and relationships"* (Ministry of Primary and Secondary Education [MoPSE], 2015, p.9). Within this curriculum, there is a focus on mathematical play. Regardless of the proliferation of diverse definitions, it can be concluded that mathematics is a body of knowledge that uses numerical skills or quantitative techniques to examine real-life problems and proffer workable solutions to issues identified. This study is premised on the idea that mathematics concerns numbers, quantities, shapes, patterns, and relationships. It focuses on using cultural games in mathematics, which can be classified as mathematical play. In this instance, teachers play a significant role in ensuring that games are well-structured to achieve the desired learning outcomes.

1.7.5 Early-Grade Learners

Early grade learners are young children, typically in preschool through early elementary school (ages 3-8), getting their first level of formal exposure to education (Morrison, 2016). These learners are in their formative stage, developing critical skills such as literacy, numeracy, problem-solving, and social-emotional competencies. Their learning is characterised by curiosity, exploration, and discovery; they largely benefit from play-based or experiential methods (Essa, 2014). Against this background, Bahrami et al. (2012) argued that EGLs benefit from the environment tailored to their developmental needs, helping to establish the foundational knowledge and skills necessary for future academic success. In Zimbabwe, ECD is structured into two categories: ECD A and ECD B, which normally target children between the ages of 4 and 5. The concept of EGL in Zimbabwe was promulgated through the *Secretary's Circular 14 of 2004*, which stipulates that education is now compulsory for all children from the age of three. Morrison (2016) gave a wide age range of pupils who qualify to as EGLs; it has been noted that ECD programmes and strategies are geared toward children aged between three and eight years. So, for this study, EGLs are children whose ages range between three and six years and who are in ECD centres and infant classes.

1.8 PRELIMINARY LITERATURE REVIEW

This section provides a snippet of the literature survey about its composition, structure, and focus. The main concern of the literature survey is to situate this study with accessible literature on the relationship between cultural games and the teaching of early-grade mathematics. So, the review focuses on pedagogical literature's theoretical, conceptual, analytical, and methodological issues. Theoretically, this thesis leans on the CHAT to extract study variables, draw critical assumptions, and clarify research questions and study approaches. The theoretical review hinges on the three core ideas underlying the theory: (1) humans collaborate, learn by doing, and communicate with and via their actions; (2) humans make, employ, and adapt tools of all kinds to learn and communicate, and (3) community is central to the process of making and interpreting meaning. Within these three core tenets, the theory has six constructs described by Leont'ev (1981) as subject, object, community, tools, rules, and division of labour. Overall, the CHAT explains that teachers (subjects) use cultural games (tools) to impart knowledge (object) in a given setting (community) governed by specific policies (rules), and in so doing, sharing of tasks is inevitable since there are many players in a community (mimicking "division of labour").

Conceptually, Section 1.6.1 has revealed that early-grade mathematics and cultural games are two critical pillars of this study. Interestingly, these pillars interact in isolation, partly enabled by constructs such as teachers, the community (both school and home environments), and educational policies. So, these and other similar concepts are reviewed to examine their definitions, underlying structure, character, how they relate to each other, and glaring gaps in accessible literature. The building blocks of this study are examined from a global perspective through the lens of international bodies such as the United Nations (UN) to local education bodies in Zimbabwe, such as the MPSE. Then, empirically accessible studies on the link between cultural games and early-grade mathematics are examined to establish the current state of knowledge and the agenda for further research. Such an empirical review expands on the research problem and clarifies the gap this study intends to fill. I also reviewed common cultural games used in Zimbabwe in the setting of the scene to examine the teacher's view regarding them. I also assessed the Zimbabwean ECD

science and mathematics curriculum for its provisions around using cultural games in teaching.

Throughout the literature survey, I also paid attention to the review of relevant research methods. That is, tracing answers to questions such as what, why, and how similar studies were designed, approached, and concluded. My review of relevant research methods was guided by the seven-point advice described by Denzin and Lincoln (2018) as follows:

1. Identify best practices by examining how other researchers have conducted similar but not identical studies. This idea helped me adapt approaches and methods that have proven effective in yielding reliable results.
2. Avoid pitfalls that acted as traps to scholars who conducted similar studies in the past. It has been argued that reviewing previous research helps one learn from the challenges and limitations others have encountered, allowing them to anticipate potential obstacles and implement measures to mitigate them.
3. Choose the methodology compatible with the research questions set ahead of a study. My review helped me identify that qualitative approaches align best with this study's objectives.
4. Ensure validity and reliability by familiarising oneself with past methods regarding a study's design, and choice of data collection and analytic methods. This advice helped me choose the right sample size, data collection methods, and analysis techniques.
5. Contextualise your study by understanding how other studies were structured. I learned that most qualitative studies start and end with the same context. So, I started this study with an observation I made during my teacher supervision in Seke Rural District, Mashonaland East Province, Zimbabwe, and ended with the same context.
6. Adapt innovative techniques by reviewing recent methods; this may introduce novel tools or approaches, such as new data analysis software, that could improve a study's robustness. In this study, I used NVivo 12, a software tool for qualitative data analysis for the first time in my research experience.
7. Refine research questions by examining how similar questions have been framed and addressed in past studies by others. In my case, I refined and fine-tuned my research questions and objectives several times.

Overall, a thorough review of relevant research methods equipped me with the knowledge to design this methodologically sound and well-structured study. Furthermore, the methodological review partly enabled me to inform and justify the design and approach adopted for this study. Additional details on how a review of relevant research methods helped me structure this study are given in a snippet of the methodology and expanded in the methodology chapter (Chapter Four).

1.9 SNIPPET OF THE RESEARCH METHODOLOGY

Considering the nature of this study, examining teachers' views and experiences regarding the meaning they attach to cultural games as a teaching tool, I built this paper on the interpretivist philosophy. According to Denzin and Lincoln (2018), interpretivism, also known as constructivism, is premised on the belief that reality is subjectively produced, and the researcher's job is to interpret it from the perspectives of the social actors who help create it. This philosophical orientation enabled me to construct knowledge using how teachers interpret cultural games, issues around them, and the world in general. I used the multiple-embedded case study design to allow a wide range of views regarding the practical use of cultural games. It was multiple because I collected data from ECD teachers drawn from three different schools, and it was embedded because I only asked for data relating to mathematics teaching and the prospects and challenges of using cultural games.

Within this multiple-embedded case study, I gathered data using twelve in-depth interviews directed by an interview guide generated from multiple real-life situations to enable participants to comprehend ideas more clearly than merely presenting them with abstract principles. Furthermore, I used Focus Group Interviews (FGIs) to explore group views between and within the three case study schools. I also used a documentary review of the ECD curriculum to assess its provisions and inherent weaknesses. I applied observation and photography to capture activities in their naturally occurring state. I used conversation and textual analyses to examine interviews and textual data. To avoid making essentialist generalisations, I read the text and interpret experiences, typically in intensive ways, to identify assumptions and locate contradictions and similarities. In tracing participants' accounts and experiences, I was partly enabled by thematic analysis digitally driven by NVivo 12, a

software program for qualitative data analysis (see advice-point 6 in Section 1.8). Finer details on philosophical orientation, research design, sampling procedure, and data collection and analytic methods used in carrying out this study are given in the methodology chapter.

1.10 STUDY'S ASSUMPTIONS

According to Soedirgo and Glas (2020), an assumption in research is a fundamental belief or statement taken to be true without concrete evidence within the context of the study. It has been argued that they form the basis on which the research is designed and carried out, and they are necessary for moving forward with the research process but must be reasonable and justifiable (Creswell & Poth, 2018). This study used assumptions around the units of analysis (teachers), EGLs, and public schools in Zimbabwe. The assumptions made stem from the theoretical framework of this study (see Chapter Two), reviewed literature, and my experience as a teaching practice assessor. For ease of development of the research design, that is, translating research questions into a research project, I premised this study on the following assumptions:

- EGLs engage in cultural games when playing in their home and school environments;
- All ECD centres in Zimbabwe are following the MPSE's updated curriculum, which embraces heritage studies as a cross-cutting theme;
- ECD teachers are not fully trained on how to integrate cultural games into their teaching and learning activities, and
- The MPSE in Zimbabwe continuously supports teachers in implementing cultural games in their teaching practice.

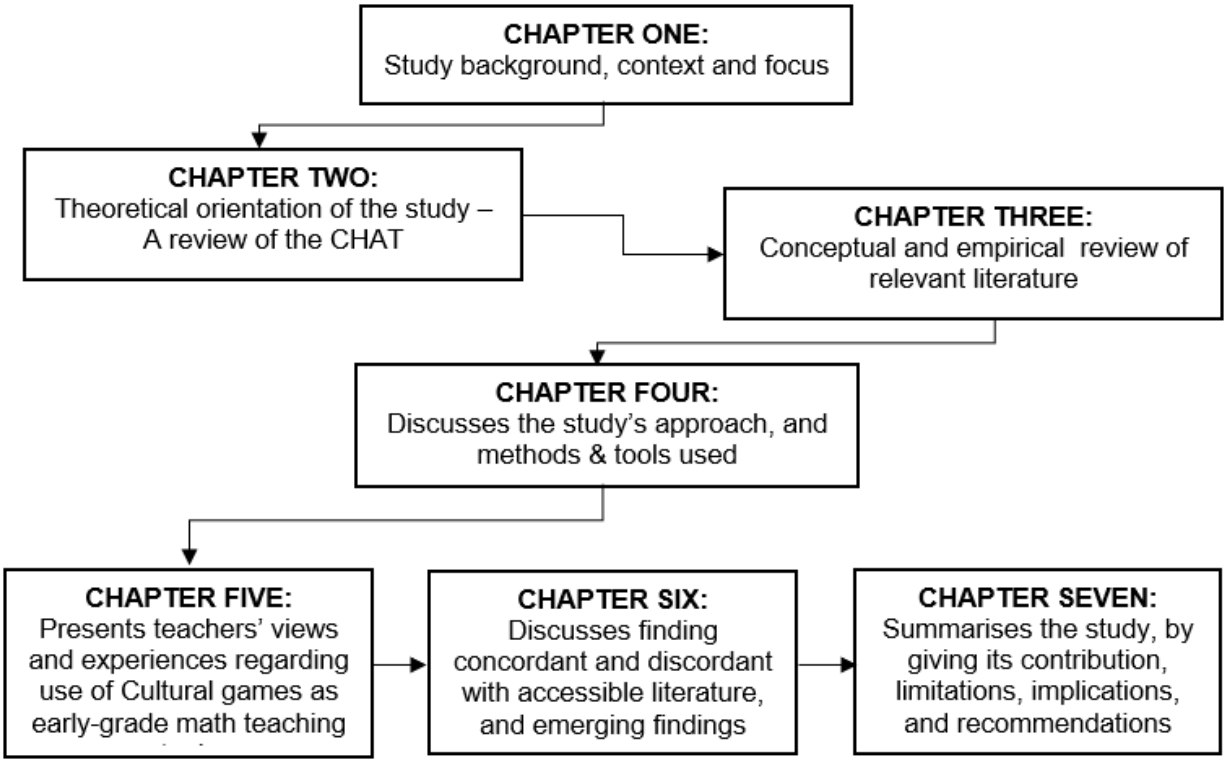
While these assumptions served as the foundation of this study and simplified complex realities, I am highly aware of their potential limitations that could impact findings. For example, some teachers might have received adequate training on using cultural games as a teaching tool. This alone affects or shapes their views and experiences and, subsequently, study outcomes.

1.11 OVERVIEW ORGANISATION OF THE STUDY

Figure 1.2 provides a diagrammatic summary of the study's structure.

Figure 1.2

Schematic View of the Study



(Researcher's construct, 2024)

The first chapter established the tone of the study by stating the research problem, the questions the study seeks to answer, and its general orientation. The second chapter reviews the theoretical framework underpinning this study. The third chapter, Literature Review, expands on the research problem by reviewing accessible and relevant literature and underlying theoretical issues. Chapter Four, Research Methodology, answers the six questions: what, why, where, how, who, and when data used to answer research questions was gathered and analysed. The fifth chapter presents study findings according to the themes emanating from teachers' sentiments. The sixth chapter discusses unexpected findings and the ones that are concordant and discordant with past findings. Then, the final chapter, Conclusions and

Recommendations, ties everything together by revisiting the research problem, making recommendations, and pointing to areas for future and further research.

1.12 CHAPTER SUMMARY

This chapter sets the scene for what follows by introducing the thesis and stating its purpose. This study aims to advance a conceptual model for teaching early-grade mathematics in Zimbabwe in a way that aligns with the country's heritage and culture. The ensuing chapter expands on the research problem by reviewing relevant theoretical, conceptual, analytical, and empirical issues in the literature. Developing the research problem is essential in exposing the research gap that this thesis plans to fill.

CHAPTER TWO: THEORETICAL PERSPECTIVES ON CULTURAL GAMES

2.1 INTRODUCTION

The previous chapter introduced this study by giving its background, context, and focus. It has been emphasised that the primary concern of this study is to develop a conceptual model for improving the method and practice of teaching early-grade mathematics by using cultural games as a point of entry. In line with this objective, this chapter expands on the research problem and clarifies its intent by reviewing the theoretical framework underpinning this study. Essentially, this chapter is premised on Grant and Osanloo's (2014) assertion that a theoretical framework is a *"blueprint"* for the entire study that serves as a guide on which to build and support an inquiry. It shapes and structures the researcher's work within the existing body of knowledge. As such, scholars such as Mentz and De Beer (2021) have argued that without a theoretical framework, the structure and vision of a study are unclear because it is the foundation from which knowledge is constructed. Thus, a theoretical framework provides direction to the research and helps the researcher to extract study variables, draw assumptions, clarify research questions, and inform choices made at different stages of the study.

Considering the key role of a theoretical framework, this study is underpinned by the Cultural Historical Activity Theory (CHAT), first coined by Lev Vygotsky (1978) and later developed by Leont'ev (1981). The chapter starts with a discussion on the evolution of the CHAT, followed by an examination of the six constructs underlying the theory. These discussions provide definitions that frame the study's foundation for an enhanced understanding of cultural games as a concept and a teaching tool. The chapter concludes with a discussion on the validity of the CHAT. This involves analysing studies that employed at least one of the six constructs of the CHAT, aiming to extract insights that can inform and shape this study.

2.2 EVOLUTION OF THE CHAT

The CHAT is based on the interaction between action and cognition within historical and cultural contexts. Developed in the early 20th century by Russian psychologists Lev Vygotsky, Aleksei Leont'ev, and Alexander Luria as a response to behaviourism and individualistic psychological theories, CHAT emphasises the role of social and

cultural circumstances in understanding human cognition (Engeström, 2023; Vygotsky, 1978). It aims to explain how human thought and behaviour are related, with an inclination towards culture and history. Later developments by scholars such as Cole and Engeström refined CHAT (Sannino & Engeström, 2018), making it a powerful framework for studying human behaviour, especially in educational settings.

Three key components form the foundation in CHAT:

1) The *subject* (the individual performing the activity),
2) The *object* (the activity's goal), and
3) The *artefacts* (the tools used to achieve that goal).

These elements interact within specific environments and are influenced by historical and cultural factors.

When examining teachers' use of cultural games in mathematics, CHAT reveals that teachers are not just educators, but active participants in a collective process to improve student learning. Cultural games, as artefacts, help make mathematical concepts more engaging and accessible, thus mediating the learning experience. However, institutional factors such as standardised curricula may limit teachers' willingness to adopt these innovative methods (Kaptelinin & Nardi, 2006; O'Donoghue & Harford, 2020).

The CHAT's epistemological foundations are based on the fusion of culture and history, commonly known as historicity (Sannino & Engeström, 2018). Historicity, according to Foot (2013), is the process by which people become enculturated, or how their cultural values influence how certain resources are used (such as the environment, the natural history of extinct species, and the contributions of indigenous scholars). Engeström (2023) argued that for three generations of development, the version of the CHAT currently in use has undergone revisions, each of which added more nodes and overlapping activity systems to improve understanding of the complexity of human activity. Since art reflects life, CHAT's development depicts how history changes with culture, leading to changes in human thought and behaviour. According to Foot (2013, p. 330), the term *"[human] activity"* refers to *"what people do together and is modified by both cultural and historical to convey its situatedness"*. As

a field of continuous research interest in humanities, social sciences, and education, the theory is used as a conceptual framework for comprehending and describing human action (see Ward, 2018). Sections 2.21 to 2.2.3 provide an overview of the three stages the CHAT has undergone in trying to explain human action.

2.2.1 First Generation: The Foundations of Vygotsky

Vygotsky's theories on mediated action, emphasising the critical role of social interactions and cultural artefacts in shaping cognitive processes, laid the foundation for CHAT. According to Vygotsky (1978), human cognition is not merely an individual process, but one deeply influenced by social context and its tools. Mentz and De Beer (2021) observed that Vygotsky introduced the Zone of Proximal Development (ZPD) concept to highlight the importance of the social environment in facilitating learning. This concept suggests that learners can develop higher cognitive skills through guided interaction with more knowledgeable others. Engeström (2023) further asserted that Vygotsky's work stresses that to understand how language and cultural tools shape cognitive development, one must consider the history and cultural contexts in which these resources are used.

Vygotsky's activity theory, which is central to CHAT, provides a framework for understanding how people use tools, be they physical objects or conceptual instruments, to accomplish goals (Engeström, 2023). This framework is based on three interrelated components: the subject, the object, and the artefacts, outlined in the preceding section. By exploring how these elements interact, Vygotsky offered insights into how individuals and groups interact with their environments to achieve objectives.

One key aspect of Vygotsky's activity theory is the notion of mediation. From a critical examination of activity theory, it can be deduced that mediation is not simply a process of using tools but a complex interaction between individuals and their cultural contexts. This theory challenges behaviourist perspectives that reduce human action to simple stimulus-response behaviours (Kaptelinin & Nardi, 2012). Instead, Vygotsky emphasised that social and cultural factors significantly influence cognition and behaviour. For instance, in an educational context, cultural games used by a teacher

to teach numerical concepts serve as mediating tools that help learners grasp abstract concepts by making them more concrete and relatable.

A central concept in the first generation of activity theory is internalisation; the process by which social interactions are adopted into cognitive processes. This concept is especially important in educational settings, as it underlines how EGLs learn by engaging with culturally relevant tools and methods (Nardi, 1996). The ZPD framework extends this idea by explaining the difference between what a learner can do independently and what they can achieve with guidance. This model encourages educators to create environments where EGLs can interact with peers and teachers, exploring mathematical ideas with the help of games.

Vygotsky's work also laid the groundwork for understanding how physical and social artefacts mediate individual behaviour and group experiences. The first generation of activity theory underscores how human behaviour is inherently social and context dependent. Institutional factors, such as standardised curricula, community norms, and teachers' motivations, influence how educators engage with teaching tools such as cultural games (Engeström, 2018). This perspective allows researchers to analyse how these external factors shape teachers' willingness to adopt innovative pedagogical strategies.

By emphasising the dynamic connections between subjects, objects, and artefacts, the early versions of activity theory provide a useful framework for examining human activities in educational contexts. In particular, it highlights how learning is a socially mediated process, where tools play an instrumental role in shaping outcomes. Understanding these dynamics can help teachers leverage cultural games more effectively, improving the learning experience for EGLs, especially in early-grade mathematics. By considering the social and contextual factors that influence their interactions with educational tools, teachers can overcome operational challenges and foster more effective learning environments.

2.2.2 Second Generation: The Growth of Leont'ev

Aleksei Leont'ev (1978) expanded upon Vygotsky's ideas by introducing the concept of activity systems, which emphasised the interconnectedness of individual actions

within larger group objectives. Leont'ev's work shifted the focus from individual activity to collective endeavours, providing a clearer understanding of how social change can be engineered by considering actions within a communal context. By positioning human actions within these collective goals, Leont'ev offered a framework that illustrated how social practices impact cognition, offering a deeper exploration into the interplay between the individual and their social environment.

Leont'ev's extension of Vygotsky's original theory gave rise to the second generation of the CHAT. While Vygotsky primarily concentrated on individual-mediated activity, Leont'ev brought attention to group dynamics and the cooperative nature of human behaviour. This shift is vital for understanding how individuals engage in collective activities, especially in educational settings, which is this thesis's primary focus. For example, when teachers use cultural games to teach mathematics to young children, these activities are not solely driven by individual effort but by the collective intentions of both the educator and the learners within their specific cultural context.

Leont'ev's model introduced several essential elements to enhance the analysis of human behaviour. These elements include the subject and the object, and the community, rules, and division of labour that structure and guide actions (Engeström, 2001). These additions provide a more comprehensive understanding of how social interactions, cultural norms, and institutional settings influence educational practices. For instance, in the context of using cultural games in mathematics lessons, teachers' actions are not isolated; they are influenced by their interactions with colleagues, institutional expectations, and the learning environment. Teachers are part of a larger system where cooperation and institutional dynamics shape how they approach their teaching methods.

One of the key insights of Leont'ev's theory is that actions are driven by group objectives and shaped by the social structures within which they occur. This perspective suggests that teachers' attitudes toward using cultural games in classrooms are influenced by their personal experiences and the collaborative culture of their schools. A study by Turner & Theilking (2019) has shown that teachers who collaborate, share experiences, and reflect on their practices can improve their understanding of incorporating games into their lessons effectively. This approach

aligns with Leont'ev's view that learning is a socially mediated process, creating and refining knowledge through interactions with others.

Leont'ev's framework also underlines the role of artefacts used to mediate activities. In educational contexts, cultural games act as such mediating artefacts, helping students connect abstract mathematical concepts to concrete, engaging experiences. It can be argued that teachers can create a more dynamic and participatory learning environment by infusing games into teaching practice. This supports Leont'ev's claim that artefacts play a crucial role in shaping human behaviour and influencing outcomes in educational settings.

Furthermore, Leont'ev's model highlights the importance of the division of labour within institutional settings. Teachers often work within structured environments where curriculum requirements and institutional policies define their roles and responsibilities. These external factors can constrain their ability to implement new pedagogical strategies in the classroom fully. For example, institutional barriers, such as standardised assessments and rigid curricula, may limit teachers' capacity to adopt innovative teaching methods (Kaptelinin & Nardi, 2017). Therefore, in exploring teachers' motivations and perspectives on cultural games, it is essential to consider the broader social and institutional context in which they operate.

The second generation of CHAT offers a robust framework for examining how educators view the use of cultural games in early mathematics lessons. This approach, arguably, sheds light on the complexities of teaching and learning since it emphasises the interplay between group activities, social interactions, and mediating artefacts. As such, it has the potential to highlight how teachers can navigate the challenges posed by institutional constraints and community expectations while using cultural games to enhance the learning experience for EGLs.

The central argument of this thesis revolves around Leont'ev's expansion of Vygotsky's activity theories, offering a comprehensive understanding of how social contexts shape human actions. His work underscores the importance of group objectives, social interactions, and the role of artefacts in influencing human behaviour, particularly in educational settings. Through this lens, I gain valuable

insights into how teachers can use cultural games effectively in early mathematics education while considering the larger social and institutional factors at play.

2.2.3 Third Generation: Engeström's Multi-Activity Systems

The third generation of the CHAT, introduced by Yrjö Engeström in the late 20th century, builds upon the foundational ideas set by Vygotsky and Leont'ev, emphasising the interconnectedness of multiple activity systems. Engeström's theory posits that understanding human behaviour requires examining how various activity systems interact and influence one another. This approach provides a framework for researchers to explore the conflicts and tensions within and between these systems, allowing for a deeper understanding of how such dynamics foster learning and development (Engeström, 2023). The core of Engeström's perspective is that learning does not occur in isolation but within a complex network of interconnected environments, each impacting the other in significant ways.

One of the primary strengths of the third generation of the CHAT is its interdisciplinary applicability. This framework can be employed in various fields, including information systems, psychology, sociology, and education (Hwang & Chang, 2024). Its focus on contextualised learning makes it particularly valuable for studying educational practices and self-directed learning initiatives. In education, for instance, CHAT has been used to examine how cultural contexts influence the self-directed learning of marginalised communities (Engeström, 2020; Mentz & De Beer, 2021). CHAT provides a more sophisticated understanding of how past experiences shape present practices and actions by recognising the historical connections between activities.

A key defining aspect of Engeström's model is its ability to analyse the contradictions and inconsistencies that emerge within and between activity systems. These contradictions can often serve as catalysts for growth and transformation, offering insight into the barriers and enablers that affect the outcomes of specific activities. According to Foot (2014), recognising these conflicts enables researchers to pinpoint challenges that prevent the realisation of desired results and identify elements that might promote progress. This analytical approach is more useful in complex contexts such as education because it involves numerous stakeholders with diverse perspectives and interests.

Furthermore, Engeström's third-generation CHAT extends Vygotsky's focus on individual activity and Leont'ev's emphasis on group actions by introducing the idea of multiple, interacting activity systems. This broader framework includes various components: the subject, the object, mediating artefacts, the community, the rules, the division of labour, and the outcome (the activity results). Engeström's model expands the outcome component by distinguishing between the object (the activity's immediate goal) and the broader outcome (long-term changes resulting from the activity system). The second-generation model concludes with the object, representing the direct output of an accomplished activity. In contrast, the third-generation model introduces the outcome, reflecting mid-to-long-term transformations. This distinction allows researchers to develop a deeper understanding of how different activity system components contribute to the educational process in both the short term and the long term.

In this study, the role of teachers as members of a community with shared objectives and practices is key. Rather than functioning as isolated practitioners, teachers work within a system that includes students, colleagues, institutional frameworks, and cultural practices. When teachers incorporate cultural games into their mathematics lessons, they engage EGLs in meaningful activities that connect mathematical concepts to their cultural backgrounds. These activities, which are designed to promote effective learning, rely on mediating artefacts, such as cultural games, to help learners grasp abstract mathematical concepts. By doing so, teachers foster a learning environment where learners can relate to and engage with the material in a culturally relevant and socially interactive way. This supports Engeström's view that learning is a broad process involving diverse stakeholders, perspectives, and interactions (Engeström, 2018).

Another critical feature of Engeström's theory is its emphasis on multi-voicedness, which recognises that every activity system consists of various viewpoints, interests, and practices. This multi-voicedness is particularly relevant in the study of teachers' perspectives on using cultural games. Educators come from different cultural, educational, and experiential backgrounds, and many factors shape their views on the value of cultural games. By acknowledging the diversity of perspectives within a school

community, researchers can better understand how collaborative discussions among educators can lead to enhanced practices in teaching mathematics to EGLs.

Historical context plays a pivotal role in understanding how activity systems evolve. The historical dimension of CHAT allows for exploring how shifts in educational policies, societal values, or norms related to culturally relevant pedagogy influence teachers' attitudes and practices. For example, changes in educational policy or societal recognition of the importance of culturally responsive teaching could affect how teachers incorporate cultural games into their classrooms. By examining these historical shifts alongside current practices, educators can adapt their methods better to serve the needs of a diverse learner population.

In the context of this study, focusing on the interconnectedness of multiple activity systems can offer valuable insights into how teachers manage their teaching practices within complex social and educational settings. The interaction between subjects, objects, mediating artefacts, community norms, rules, division of labour, and outcomes provides a comprehensive view of how educational processes unfold. By analysing these dynamics, researchers can gain a deeper understanding of how teachers navigate institutional constraints, such as standardised curricula and assessment requirements, while still attempting to meet the needs of their EGLs through innovative approaches such as cultural games.

Moreover, the analysis of conflicts within activity systems, such as tensions between institutional expectations and teachers' professional judgments, can reveal growth opportunities. For example, institutional constraints, such as rigid curricula or assessment standards, might prevent teachers from fully integrating cultural games into their lessons. However, these contradictions may also lead to creative problem-solving and the development of new approaches that align with educational goals and learners' diverse needs.

The third generation of CHAT, as developed by Engeström, offers a rich and dynamic framework for understanding human behaviour, particularly in complex educational settings. Its emphasis on the interconnectedness of multiple activity systems, multi-voicedness, and historical context provides valuable insights into how social, cultural,

and institutional factors influence educational practices. By focusing on these elements, researchers and educators can better understand how teaching methods, such as cultural games, are shaped by the broader activity systems in which they occur, and how conflicts within these systems can foster growth and transformation in educational practices.

2.2.4 Insights from the Evolution of the CHAT

According to Engeström (2020), the CHAT has evolved through three generations of research, namely, the first, second, and third generations. It has been clarified that the first generation is anchored on the notion of mediated action from the individual's perspective (intra-action); the second generation revolves around the notion of the activity system, with emphasis on collective action (inter-action within a group); and third-generation builds on the idea of multiple interacting activity systems focused on a partially shared object (inter-action between groups). This study primarily builds on the second-generation model developed by Leont'ev in 1981, as it does not focus on the outcome component introduced in the third generation. However, it selectively incorporates elements of the third-generation model to clarify specific aspects, such as how educators' diverse cultural, educational, and experiential backgrounds influence their perspectives on the value of cultural games as a tool for teaching math.

Proponents of the second school of thought have argued that learning and development occur through collective practice, *'learning by doing'* within a specific group. In the context of this study, EGLs are regarded as a group of people sharing similar attributes. Effective communication and interaction between people in a socio-cultural context are required. Thus, CHAT emphasises that learning occurs through active and co-construction of knowledge in a natural setting. In this regard, cultural games allow EGLs to acquire and master concepts through practice and social interaction. Arguably, learners' participation in cultural games presents opportunities to construct knowledge in their contexts.

The use of cultural activities in EGLs' mathematics lessons fits in nicely with CHAT's focus on contextualised learning. Arguably, numerical ideas can become more approachable and significant when EGLs play games that are native to them. In addition to promoting cognitive growth, this method helps pupils feel like they belong

(Fleer & Veresov). Furthermore, the opinions of educators regarding the use of cultural games in the classroom might shed light on possible difficulties and opportunities that come with this approach. For instance, some teachers might know the advantages of using games to encourage mathematical thinking. However, they might also encounter issues with curriculum requirements or a lack of resources. A detailed examination of how educators deal with these issues while attempting to establish inclusive learning environments is made possible by comprehending these dynamics using the CHAT. The six constructs of the CHAT identified by Leont'ev (1981) as tools, subject, object, community, division of labour, and rules form the topics of Sections 2.3 to 2.8.

2.3 TOOLS

Leont'ev (1981) agreed with Vygotsky's (1978) idea that mediating tools are critical in the impartation and acquisition of knowledge and skills. According to Sumbera (2023), mediating tools are tangible or intangible cultural artefacts used by individuals (subjects) to interact with the object of an activity system. They include artefacts such as symbols, signs, cultural games, media, language, ideas, teaching methods, and social relationships (Hwang & Chang, 2024). The CHAT offers a thorough framework for comprehending how social circumstances, technologies, and human action interact. According to this theory, whether tools are conceptual or material, they act as intermediaries to help people engage with their surroundings. This study examines how CHAT's tools work, especially in light of early-grade teachers' views regarding using cultural games in early mathematics instruction.

Any artefact that mediates human behaviour is considered a tool in the context of CHAT. This includes conceptual resources like language and mathematical frameworks, and tangible items like manipulatives and instructional games (Foot, 2013). Tools, according to Vygotsky (1978), are more than just instruments, because they also affect how we connect with the outside world and mould our cognitive processes. This was further developed by Engeström (2023) who saw tools as essential parts of an activity system that also consists of subjects (actors), objects (goals), and the society in which the activity takes place. Tools consist of material products including instructional games, manipulatives, and online materials. Cultural games can be useful educational resources that help EGLs learn mathematical ideas through play in their early years.

For example, traditional counting activities from a child's culture might help make abstract mathematical concepts more relevant and tangible. Conceptual tools include frameworks, techniques, and tactics that direct problem-solving and thought processes. For instance, teachers may facilitate mathematics instruction using pedagogical tactics influenced by cultural customs. Effective teaching requires an understanding of how to combine these intellectual tools with tangible ones. These tools have a mediating effect on how learners and teachers interact. Early-grade teachers can use cultural games as pedagogical tools that promote learning rather than just offering amusement when incorporating them into their mathematics lessons. This supports CHAT's claim that social interactions mediated by culturally appropriate artefacts are how learning happens (Mentz & De Beer, 2021). Teachers' views regarding using cultural games in mathematics lessons for EGLs might explain how they view the use of tools in the classroom. These games can foster a more inclusive learning environment by relating mathematical ideas to EGLs' cultural backgrounds. Teachers may be aware that cultural games foster social problem-solving and critical thinking abilities, enhancing cognitive development (Fleer & Veresov). Vygotsky's focus on the value of social interaction in learning is consistent with this thinking.

On the other hand, some teachers can be reluctant to incorporate cultural games because of curriculum limitations or a lack of knowledge about using these resources in their lessons. By viewing these difficulties through a CHAT lens, inconsistencies in the activity system that can impede successful execution can be found (Engeström, 2023). One of the fundamental tenets of CHAT is expanding learning, which is the process by which people and groups confront conflicts in their activity systems to create new methods of working and thinking (Engeström, 2023). Cultural games catalyse learning by allowing teachers and learners to co-investigate mathematical concepts. For instance, teachers might provide an environment where children can apply mathematical thinking in practical situations by implementing cultural games that involve counting or measuring objects from their cultural backgrounds. In addition to improving comprehension, this inspires EGLs to make links between the academic material and their cultural experiences. This study provides an opportunity to improve understanding of how cultural games impact EGLs learning outcomes and teaching practices by looking at instructors' perspectives on their use as instructional materials.

Finally, understanding the importance of CHAT's conceptual and material tools can improve how we teach mathematics in classrooms with a variety of cultural backgrounds. According to Leont'ev (1981), tools have five defining characteristics that are critical in shaping activities. These characteristics are outlined in Sections 2.3.1 to 2.3.5.

2.3.1 Material and Symbolic Tools

The CHAT offers a comprehensive framework for understanding the interaction between material and symbolic tools in human activity. Material tools encompass physical objects such as machines, equipment, and technology, while symbolic tools include intangible resources like language, concepts, and methods. Leont'ev (1981) advanced that this distinction is essential for analysing how individuals engage with their environment, particularly in educational settings. Material tools provide tangible means for action, whereas symbolic tools shape cognitive processes and communication. Together, these elements influence how individuals interact with the world, facilitate learning, and contribute to knowledge creation. This character is particularly important to this study considering its focus on teachers' views regarding teaching early-grade maths using cultural games. As such, it is key to outline the difference between material and symbolic tools, and how they interact in realising the desired objective of imparting numerical skills to EGLs, in this case.

2.3.1.1 Material Tools: The Aspect of Physicality

Reflecting on Leont'ev's (1981) line of argument, Garraway and Van Graan (2024) recently noted that material tools play a key role in mediating human actions by serving as tangible resources that aid task completion and goal achievement. In a classroom setting, these tools range from basic items like pencils and paper to advanced technologies such as computers and interactive whiteboards. By providing concrete ways for students to engage with peers and explore mathematical concepts, material tools enhance learning experiences. Furthermore, Garraway's et al. (2024) study discussed how integrating technology into classrooms transforms teaching dynamics. They argue that effectively using tangible resources fosters critical thinking and collaborative problem-solving among learners, aligning with CHAT's principles that emphasise the mediating role of tools in human interactions.

2.3.1.2 Symbolic Instruments: The Intangible Aspect

Symbolic tools, unlike material ones, are intangible resources that shape human thought and communication. Language, the most prominent symbolic tool, enables individuals to share ideas, exchange knowledge, and negotiate meaning in social contexts. Other examples include concepts, theories, and procedures that structure practices across various disciplines. The role of symbolic tools in education is profound, as they provide the cognitive frameworks learners use to interpret experiences and build understanding. For example, Roth et al. (2012) underscored that, in mathematics education, both objectification and subjectification processes rely on symbolic tools. They argued that language and mathematical symbols are mediators, allowing learners to engage meaningfully with numerical concepts. This underscores the necessity of integrating symbolic and material tools to enhance teaching strategies and promote deeper learning experiences.

2.3.1.3 The Interaction of Symbolic and Material Tools

The previous two sub-sections have demonstrated that understanding how activities are mediated in an educational setting requires recognising the relationship between material and symbolic tools. According to the main tenets of the CHAT, these tools work together to shape human behaviour and outcomes rather than functioning independently. For instance, when educators use cultural games in early-grade mathematics instruction, they combine material tools (such as game pieces or digital platforms) with symbolic tools (such as game rules and mathematical language). Engeström (2018) underlined that this interaction is crucial for creating expansive learning spaces where young learners explore concepts through abstract reasoning and hands-on engagement. By integrating cultural games into their teaching strategies, educators can enhance learners' participation and deepen their understanding of mathematical concepts.

2.3.1.4 Implications of Materials for Early-Grade Mathematics Instruction

When I wrote my thesis on teachers' views regarding teaching early-grade mathematics using cultural games, I essentially considered the impact of both material and symbolic instruments on instructional practices. It has been argued that educators who recognise the value of integrating these tools can create dynamic classrooms that

foster engagement and collaboration among EGLs (Engeström, 2018; Garraway & Van Graan, 2024; Roth et al., 2012).

For example, incorporating cultural games that reflect local cultural references or narratives provides learners a tangible way to engage with mathematics while leveraging familiar language and concepts. This aligns with Vygotsky's theory that learning is inherently social and culturally situated (Vygotsky, 1978). Teachers can enhance motivation and comprehension by bridging learners' cultural backgrounds with mathematical instruction through both material and symbolic tools.

I have discovered that the CHAT's framework on material and symbolic tools offers valuable insights into adapting teaching strategies for effective learning outcomes. Understanding how these tools interact enables teachers to mediate learning processes in meaningful and beneficial ways to EGLs. This study highlights the importance of integrating both elements to create engaging and effective learning environments. Perhaps expanding the mediating role of tools sheds more light on how both material and symbolic tools are central to knowledge transfer.

2.3.2 Mediating Role of Tools

Tools are central in mediating the relationship between the subject and the object, shaping how the object is approached and transformed. Mediation is a fundamental concept in the CHAT, as it helps explain how human actions are structured and supported. Tools are integral in facilitating interactions between the subject and the object, whether material or symbolic. As such, in addition to influencing how the object is accessed, tools also shape the transformative processes that occur as individuals engage with their environment. Sections 2.3.2.1 to 2.3.2.4 explore the mediating role of tools within the CHAT.

2.3.2.1 Comprehending Mediation

It has been noted that the process by which tools facilitate interactions between individuals and objects is known as mediation (Leont'ev, 1981). In the same line of argument, Engeström (2018) underscored that technologies serve as intermediaries, shaping how individuals perceive and engage with their objectives. Similarly, this aligns with Vygotsky's (1978) assertion that cultural artefacts such as language,

symbols, and tangible tools are fundamental mediators of human cognition. By leveraging these tools, individuals can solve problems, achieve specific goals, and navigate complex tasks.

This consensus in accessible sources regarding comprehending intermediation suggests that the mediating role of tools is particularly significant in educational settings. For example, when educators integrate cultural games into early-grade mathematics instruction, they use both material and symbolic resources to enhance learning. The games serve as tangible tools that learners can manipulate, while the embedded rules and mathematical concepts provide a structured framework for understanding mathematical relationships.

2.3.2.2 Limiting and Facilitating Methods for Objects

It has been argued that how tools mediate the relationship between subjects and objects can either facilitate or constrain how individuals approach and transform their goals (Garraway & Van Graan, 2024). For example, in the context of this study, the effective use of cultural games can empower EGLs to engage actively with mathematical concepts. These games provide a structured way for them to explore numbers, patterns, and problem-solving techniques, enhancing motivation and fostering more profound understanding.

A recent publication by Garraway and Van Graan (2024) has suggested that incorporating culturally relevant games into mathematics lessons allows learners to connect mathematical concepts with their lived experiences. In addition to making learning more meaningful, this connection also encourages collaboration as EGLs work together to tackle challenges within the games. However, ineffective tools, whether poorly designed or misaligned with learning objectives, can hinder comprehension. For instance, a game lacking clear mathematical connections or failing to capture learners' interest may not effectively mediate understanding. In such cases, EGLs may struggle to see the relevance of the activity, leading to disengagement or frustration.

2.3.2.3 Teachers' Function as Mediators

From the discussion in preceding sections, it is aptly clear that teachers play a pivotal mediating role in shaping how tools are used in early-grade mathematics instruction. They are not just facilitators, but active agents who influence how tools are integrated into learning. As such, their perceptions of the value of cultural games directly impact how they implement them and guide EGLs' engagement with them. For example, it can be argued that teachers who regard cultural games as effective instructional tools are more likely to design lessons that maximise their benefits. They may provide clear guidance on using the games and encourage EGLs to articulate their reasoning and problem-solving strategies. By fostering discussions on game mechanics and mathematical concepts, teachers help EGLs collaboratively construct meaning, aligning with Roth et al. (2012) emphasis on the role of discourse in mathematics education.

2.3.2.4 Application of Mediation to Early-Grade Mathematics Instruction

It can be deduced from the discussion on mediation that the tools' mediating function underlines how crucial intentionality is to instructional strategies. Effective pedagogy requires an awareness of how instruments mediate learning experiences. Educators need to be aware of the symbolic and tangible aspects of the tools they use. This implies that teachers may create rich learning environments encouraging participation by carefully choosing and executing cultural games that speak to EGLs' experiences and cultures. Furthermore, creating an atmosphere where EGLs are at ease working together and sharing their mathematical ideas can strengthen the mediating function of tools in accomplishing learning goals.

I have also discovered that comprehending how subjects engage with objects in educational situations requires a knowledge of the mediating role of tools in the CHAT. While influencing the methods by which knowledge is generated, tools help people engage with the objectives they want to achieve. In this study, I stressed the significance of understanding how both material and symbolic tools mediate learning experiences. I also explored how teachers can develop more effective teaching methods that improve EGLs' engagement and comprehension by using ideas on the role of mediation. The next sub-section expands on how this mediation role is firmly planted in historical knowledge.

2.3.3 Tools as Socially and Historically Constructed Mediators

The long-running theme in the CHAT is that tools represent a society's accumulated cultural and historical knowledge that continuously evolves within the contexts in which they are used. Engeström (2018) keenly observed that, in the CHAT, tools are not merely physical objects or abstract symbols but reflections of a society's collective experiences and practices. Their dynamic nature means they are shaped by and, in turn, shape human activities. Understanding this evolution is crucial in examining how tools mediate actions, particularly in education. These sections (2.3.3.1 to 2.3.3.3) explore how tools are socially and historically constructed and their inherent potential role in shaping the use of cultural games to teach early-grade mathematics.

2.3.3.1 Tools as Cultural Artefacts

In the CHAT context, tools are cultural objects that represent a society's values, beliefs, and customs (Vygotsky, 1978). They are central to comprehending how people interact with their surroundings because they bear the historical weight of collective human experiences and knowledge. According to Engeström (2018), tools are more than just a means of accomplishing objectives. It has been argued that they also represent the cultural norms and social connections that shape how they can be used. So, considering the diverse cultural backgrounds of learners and educators, the choice of resources used in the classroom is significantly shaped by these differences. To this effect, it can be argued that cultural games are both instructional tools and symbols of cultural narratives and values used for knowledge transfer. This thinking supports Vygotsky's claim that education is socially and culturally placed by nature (Vygotsky, 1978). Teachers can, therefore, establish the links between mathematical ideas and EGLs' real-world experiences by using culturally appropriate resources to contextualise learning.

2.3.3.2 The Development and Role of Tools in Social Contexts

Since the evolution of tools is shaped by the historical and social contexts in which they are used, it can be argued that as societies change, so do the instruments that reflect their needs and goals. For example, educational resources have progressed from static chalkboards to interactive digital platforms, adapting to advancements in technology and shifts in pedagogical approaches. Recent scholarly work (e.g., Garraway & Van Graan, 2024) has suggested that when educators integrate new tools

or methodologies into their teaching, they are driven by historical trends and contemporary educational demands. This adaptability ensures that instructional strategies remain relevant and effective in meeting the diverse needs of learners. Similarly, cultural games must evolve to maintain their educational value. As such, educators who understand their historical and cultural origins can adapt these games for modern classrooms while preserving their significance, making them both engaging and accessible for today's learners.

The effectiveness of tools as learning mediators is also deeply influenced by the social contexts in which they are applied. Rather than functioning in isolation, tools interact with the social dynamics present in educational settings. When incorporating cultural games into the classroom, teachers must consider how learners from diverse backgrounds engage with these games (Garraway & Van Graan, 2024). As such, it can be deduced that social interactions during gameplay are just as vital as the game's design in shaping learning outcomes. For example, Roth et al. (2012) underlined social engagement's key role in shaping how learners use symbolic tools such as language and mathematical notation to grasp numerical concepts. Therefore, it is aptly clear that through collaborative gameplay, EGLs construct shared meanings around mathematical ideas while drawing on their cultural backgrounds. This cooperative approach highlights how tools facilitate social learning experiences rooted in historical and cultural contexts.

2.3.3.3 Connecting Historical Developments to Early-Grade Mathematics Instruction

Teaching early-grade mathematics using cultural games has important implications when considering how tools are socially and historically produced. As such, educators should be deliberate in their choice and application of culturally appropriate resources. By doing this, they can design educational activities that speak to the identities and experiences of the EGLs. Furthermore, teachers should also be encouraged to consider the historical relevance of the teaching aids they employ. They can better understand how these tools have changed over time and how to modify them to fit modern learning objectives with the aid of this reflection. One widespread piece of advice by Engeström (2018) encouraged teachers to increase EGLs' engagement and advance deeper understanding by cultivating an awareness of the cultural narratives

woven across these resources. These suggestions attest to the flexibility of CHAT's tools and offer insights into prospects for modifying teaching methods to promote effective learning outcomes. Since a society's acquired knowledge is embodied in its tools, teachers can establish rich learning environments that respect EGLs' backgrounds and encourage meaningful engagement by using cultural games that reflect learners' cultural backgrounds. This partly explains why the CHAT regards tools as shapers of activity.

2.3.4 Tools as Shapers of Activity

Building on Engeström's (2018) assertion on the transformative role of tools, the present study advances the idea that tools influence not only the efficiency of an activity but also how the subject perceives and engages with the object. This implies that tools have the inherent potential to transform both the subject and the object. Such a transformative role is essential for facilitating activities and influencing how people view and interact with their objectives. In the present study, I used this dual effect to assess and demonstrate the transforming power of tools, and how teachers view it in the context of cultural games. Sections 2.3.4.1 to 2.3.4.4 expand on this dual role, setting the scene for its assessment in forthcoming chapters.

2.3.4.1 The Impact of Equipment on Activity Effectiveness

This concept hinges on the adage that tools are necessary for increasing the effectiveness of a task. This is so because they give subjects the abstract thought or physical ability to influence or manipulate an activity for improved implementation. For example, in the context of this study, manipulatives such as blocks or counters enable EGLs to see and physically engage with mathematical concepts, thereby enhancing their understanding of real-world problems. This view is supported by Engeström's (2018) assertion that tools mediate human behaviour and increase an activity's overall efficacy.

Hinging on this line of thinking, it can be argued that teachers use resources (cultural games in this case) that help expedite learning processes. As such, activities partly enabled by equipment frequently give EGLs organised chances to practice numerical concepts while working together to solve problems. Studies by scholars such as Garraway and Van Graan (2024) have shown that EGLs are more likely to feel

motivated and have better learning results when they play well-designed cultural games. This illustrates how tools can improve the efficacy and efficiency of educational activities. Perhaps expanding on the prospects of developing both subject and object perceptions provides light on improving learning interventions that leverage cultural games as mediating tools.

2.3.4.2 Developing Subject and Object Perceptions

In addition to increasing productivity, tools also influence how subjects view and interact with their objects. This perspective fully aligns with the present study's core focus: assessing teachers' views on using cultural games in teaching early-grade mathematics. Furthermore, EGLs' attitudes toward learning and their comprehension of numerical concepts might be influenced by the type of tools they are exposed to. Cultural games, for instance, can help EGLS feel more connected to the content being taught when they are made to represent their cultural experiences and origins. Arguably, a more pleasant interaction with mathematical ideas may result from this relationship. According to Roth et al. (2012), Early grade learners' views are greatly influenced by the symbolic nature of tools such as language, numerical symbols, and cultural narratives. During gameplay, EGLs interact with these symbolic tools, creating meanings that impact their mathematical comprehension. In this process, teachers can help EGLs understand mathematics as a subject that is both important and applicable to their lives. This presentation of mathematical assignments in culturally relevant contexts forms the basis for transformation.

2.3.4.3 Subject and Object Transformation

It can be argued that EGLs experience social and cognitive changes as they engage with games because they affect how they learn. For example, Vygotsky (1978) underscored that one's engagement in games involving cooperation or strategic thinking has connotations of improving critical thinking abilities and encouraging peer socialisation. This idea, enshrined in Vygotsky's activity theories, revolves around the belief that social interaction is the primary means of learning. Furthermore, tools can be used to change the object itself, which is the mathematical idea being taught, in the context of the present study. Early grade learners (EGLs) may gain a fresh understanding of mathematics when they interact with it through cultural activities. For example, O'Donoghue and Harford (2020) argued that a game that integrates cultural

components can enhance learners' understanding by helping them relate abstract mathematical concepts to their actual circumstances. This change demonstrates how tools not only mediate but also reshape the material being taught as well as learners' comprehension.

2.3.4.4 Applications of the Shaping Role in Early-Grade Mathematics Instruction

My thesis is premised on the idea that successful pedagogy depends on an awareness of how tools influence activity. In this case, teachers can choose more deliberately how to incorporate cultural games into their lessons if they are aware of the transforming power of these resources. For example, teachers can design learning experiences that have a lasting impact on learners by choosing games that correspond with their interests and cultural backgrounds. This deliberateness creates an atmosphere where EGLs feel appreciated and involved, eventually improving learning outcomes. Furthermore, teachers can also think about how to help EGLs express their thoughts and reasoning by facilitating debates around these games. Thus, in addition to their mediation role, tools are effective activity shapers in CHAT because they affect how subjects view and interact with their objects. Therefore, it can be deduced that tools' transformative power challenges teachers to recognise how tools can improve engagement and understanding of mathematics in continuously evolving contexts.

2.3.5 Dynamic and Evolving Nature of Tools

A recent study by O'Donoghue and Harford (2020) argued that as new challenges arise within an activity system, tools may be adapted, replaced, or innovated to meet changing needs. The CHAT explains that tools are dynamic and ever evolving to accommodate activity systems' shifting requirements. For example, in the wake of technical advancement, understanding how technologies affect human behaviour and how they might be changed or reinvented to meet new issues requires this flexibility. Sections 2.3.5.1 to 2.3.5.4 expand on how this evolution affects educational practices and how educators can facilitate these changes in their teaching practice.

2.3.5.1 Development Tools

Tools are believed to be shaped by the historical and cultural settings in which they are employed. Since historical processes are not static, but evolving, tools may be modified, swapped out, or created as new activity system problems emerge to meet

user needs better. This submission was best explained by Engeström (2001), who claimed that activity systems are distinguished by their capacity to change over time in response to internal and external forces in the operating environment. This implies that educational tools must be altered to stay effective when pedagogical ideas or technological breakthroughs impact educational practices. Interestingly, this idea of tools' development partly shaped this study in assessing teachers' views and experiences regarding how cultural games are adapted or altered to fit the needs of EGLs. For example, a teacher can modify the rules of a traditional game to align it with the curriculum or include aspects of the local culture. This flexibility makes the games more relevant and shows how tools may change to accommodate the shifting needs of educational settings.

2.3.5.2 Teachers' Function as Innovators

The idea of tool development has shown that teachers can also serve as agents of change because they can modify or alter a game's rules to suit a particular context, narrative, or alignment. A recent accessible source (Garraway & Van Graan, 2024) has noted that teachers may explore prospects for tool adaptation by reflecting on their teaching strategies and learners' outcomes. With this reflective approach, educators can devise ways to adapt or enhance current resources to suit the changing learning environment. This suggests that since teachers work closely with EGLs and curricula, they have a unique perspective on what works and what does not, thereby influencing how tools are developed and applied in their classes. For example, when teachers see that children enjoy playing particular ethnic games, they could decide to add more mathematical ideas or cooperative components to these activities. As such, this study also sought to tap into teachers' experiences around how they thrive on innovation and adaptation to building learning environments that meet the needs of EGLs.

2.3.5.3 Inevitability of Opportunities and Difficulties

This idea stresses that although tools' dynamic nature offers chances for creativity, it also creates difficulties. Continuous professional development (CPD) may be required as tools change to give teachers the know-how to apply the changes successfully. For example, when a new digital tool is added to a mathematics curriculum, teachers must be trained to incorporate it into their teaching methods. Engeström (2018) noted that teachers who are used to conventional approaches or are not confident in using new

tools may resist change. Engeström (2018) further argued that contradictions within activity systems frequently hinder the adoption of new technologies. As such, educational leaders must assist teachers in overcoming these obstacles by implementing CPD programmes that promote experimentation and the exchange of best practices. The following questions remain: How do teachers view or perceive CPD? What are some of their experiences with such programmes?

2.3.5.4 Tools' Dynamism and Early-Grade Mathematics Instruction

The preceding sections have shown that teaching using cultural activities is significantly impacted by an understanding that instruments are dynamic and changing. As such, educators must embrace flexibility and adaptability in their instructional practices. They can design more interesting and pertinent learning experiences by altering cultural games to fit EGLs' interests and backgrounds. Richer teaching methods might also result from creating an atmosphere where teachers are free to experiment with resources. This idea of having an enabling environment and supportive leadership speaks to the multiple activity systems enshrined in the CHAT's third generation. Furthermore, such an environment must promote cooperation among teachers, enabling them to exchange experiences on effective adaptations.

It has also been revealed that tools can be modified or swapped out to accommodate evolving requirements as new challenges in activity systems emerge. By encouraging flexibility and collaboration among educators, teaching strategies can be improved. In an educational setting, a material tool could be a computer, or a whiteboard used by a teacher to deliver lessons, or a symbolic tool could be the language or pedagogical framework employed to communicate and facilitate learning. The tools mediate the activity of teaching aimed at enhancing EGLs' understanding, ultimately producing learning outcomes. This thinking was recently reinforced by Koszalka et al. (2021), who asserted that learners acquire knowledge from the environment through mediating tools. It can, therefore, be deduced that cultural games, by their nature as mediating tools, can enhance EGLs' mastery of numerical skills through the central role of teachers who connect learners with the learning material.

2.4 SUBJECT(S)

It has been argued that the other critical component of CHAT is the subject(s), the person or people directly participating in a given activity system (Engeström, 2020; Koszalka et al., 2021). In this case, the subjects are teachers who use cultural games as mediating tools to teach EGLs. As such, seeking teachers' perceptions regarding using cultural games as teaching tools syncs well with the view that the subject is the entity whose actions are the focus of the analysis within the activity system.

The idea of the "subject" is essential to this framework's analysis of how people or groups interact with their surroundings to accomplish particular objectives. Examining the subject improves one's understanding of how individuals' experiences, motives, and social circumstances affect teaching methods by examining their influence in practice. In CHAT, the person or group participating in an activity system is also called the topic. Considering this view, a teacher, an early-grade learner, or a group of educators collaborating toward a common educational objective could be an example of this topic (Engeström, 2023). It is critical to note that the subject uses tools and cultural artefacts to mediate their activities, which are driven by individual and group goals. The way that people connect with their surroundings is not just transactional; historical and cultural elements impact how people view and participate in their activities (Roth et al., 2007).

For example, instructors' personal educational experiences and cultural backgrounds shape their opinions regarding the value of cultural games in teaching mathematics. It has been argued that the subject's historical and cultural background significantly influences their viewpoint (Engeström, 2020; 2023). As such, teachers' opinions on using cultural games in mathematics instruction, for instance, are influenced by their backgrounds, education, life experiences, and cultural heritage. Lektorsky (1984) asserted that creating an item inside an activity is impacted by both individual experiences and the larger cultural-historical background. This implies that based on their own favourable experiences with cultural games or their comprehension of how well they encourage EGLs participation, educators may see them as useful teaching resources. Therefore, teachers take on the role of subjects, navigating a variety of influences inside their activity systems when teaching early-grade mathematics using

cultural games. Their viewpoints are influenced by various elements, including the ones outlined in Sections 2.4.1 to 2.4.3.

2.4.1 Incentives

According to Mentz and De Beer (2021), teachers might be inspired to include cultural activities in their lessons to increase EGLs' engagement and make learning more relevant. This initiative has been regarded as important because the urge to relate mathematical ideas to EGLs' real-world experiences is a source of motivation. This section examines the role of incentives and the challenges around their usage in teaching practice.

2.4.1.1 Influences on Teachers' Perspectives

Teachers' views regarding the value of cultural games in teaching mathematics are often shaped by their educational experiences, cultural heritage, and historical context. Engeström (2020; 2023) argued that these factors significantly influence educators' beliefs about the performance of various teaching strategies. For example, a teacher who had positive experiences with cultural games during their education may be more inclined to implement similar strategies in their classroom, and vice versa. The classical scholar Lektorsky (1984) asserted that both personal experiences and the broader cultural-historical context influence the creation of an item within an activity. This perspective implies that teachers' opinions on using cultural games are not merely personal preferences but are deeply rooted in their understanding of how these games can foster participation and engagement among EGLs. As teachers navigate their activity systems, they must consider how their backgrounds inform their instructional choices.

2.4.1.2 Incentives for Incorporating Cultural Activities

According to Mentz and De Beer (2021), one of the primary incentives for teachers to include cultural activities in their lessons is the desire to enhance EGLs' engagement and make learning more relevant. The motivation to connect mathematical concepts to EGLs' real-world experiences is a powerful driver for teachers. In the context of this study, it can be argued that when teachers recognise that cultural games can bridge the gap between abstract mathematical ideas and EGLs' lived experiences, they are more likely to view these tools as valuable resources. Incorporating cultural games can also help create a more inclusive learning environment. By valuing EGLs' cultural

backgrounds and integrating them into the curriculum, teachers can foster a sense of belonging and relevance for learners. This aligns with Vygotsky's (1978) emphasis on the social nature of learning, where engagement is enhanced when EGLs see connections between classroom activities and their own lives.

2.4.1.3 The Impact of Incentives on Teaching Practice

The incentives that motivate teachers to use cultural games significantly affect their instructional practices. When teachers perceive cultural activities as beneficial for EGLs' engagement, they are more likely to invest time in effectively planning and implementing these strategies. Outcomes of one recent study have indicated that when educators feel supported in their efforts to integrate culturally relevant pedagogy, they experience increased job satisfaction and professional growth (Garraway & Van Graan, 2024). This positive feedback loop reinforces their commitment to using cultural games as part of their teaching toolkit. Moreover, the presence of institutional support, such as professional development opportunities focused on culturally responsive teaching, can enhance teachers' motivation to adopt innovative practices. For example, Mentz and De Beer (2021) argued that when schools provide resources and training that highlight the importance of cultural relevance in education, teachers are more likely to embrace these approaches as essential components of their instructional strategies.

2.4.1.4 Challenges in Implementing Incentives

Challenges are inevitable despite the numerous benefits of incorporating cultural games into mathematics instruction. Teachers may encounter institutional barriers such as rigid curricula or assessment pressures that discourage experimentation with new teaching methods. Engeström (2018) noted that contradictions within activity systems can hinder educators from fully realising their pedagogical goals. For example, if a school prioritises standardised testing outcomes over culturally relevant teaching practices, teachers may feel compelled to focus solely on test preparation rather than engaging EGLs through innovative methods such as cultural games. Additionally, some educators may lack confidence in implementing these strategies due to insufficient training or support. This highlights the need for ongoing professional development that equips teachers with the skills necessary to navigate these challenges while fostering a culturally responsive classroom environment.

Thus, subjects within CHAT (in this case, teachers) are profoundly influenced by their personal educational experiences and cultural backgrounds when implementing teaching strategies such as cultural games in mathematics instruction. The incentives driving educators to incorporate these activities are rooted in their desire to enhance EGLs' engagement and make learning relevant for them. Throughout the study period, I emphasised the importance of recognising how incentives shape teachers' perspectives and practices within their activity systems. Arguably, by fostering supportive environments that encourage innovation and culturally responsive pedagogy, educational outcomes for all EGLs can be enhanced.

2.4.2 Career Advancement

Teachers' opinions on the use of cultural games are partly influenced by the training and professional development opportunities available to them (Kamisli, 2019; Kurniawan, 2022). Teachers are more likely to incorporate these activities into their lessons if they have background training in culturally responsive pedagogy (). For example, Cole (1996) pointed out that instructors might be empowered to successfully use local knowledge through professional development that prioritises culturally relevant practices. As such, teachers play a crucial role in influencing educational practices, such as using cultural activities in mathematics classes. The following paragraphs expand on the role of career development in shaping teachers' perceptions and attitudes toward using cultural games in teaching early-grade mathematics.

2.4.2.1 Training and Professional Development's Impact

Teachers' training and professional development experiences are frequently associated with their propensity to integrate cultural activities into their courses. According to Kamisli (2019), teachers who receive focused training in culturally responsive pedagogy are more likely to see the benefits of incorporating cultural activities into their lesson plans. Through this training, they get the prerequisite knowledge and abilities for relating mathematical ideas to EGLS' cultural backgrounds, which improves relevance and engagement.

Similarly, Kurniawan et al. (2022) underlined that teachers are empowered to use local knowledge in the classroom when they have access to professional development opportunities that emphasise the use of culturally appropriate techniques. Through culturally relevant learning opportunities, this empowerment is essential to creating a classroom atmosphere where EGLs feel appreciated and included. Engeström (2023) underlined that expanded learning, one of the fundamental principles of CHAT, is the process by which participants confront conflicts in their activity systems to cultivate novel thought and behavioural patterns. In addition to helping EGLs learn, teachers who try out cultural activities in mathematics classes also broaden their professional practice. For example, by experimenting with these games, educators inevitably create methods to engage learners or modify existing methods to fit curriculum objectives (Gedera & Williams, 2016). Core findings from the literature on this idea reveal that both individual professional and collective knowledge development within educational communities are facilitated by reflection and adaptation. According to Roth and Lee (2007), when EGLs work together to solve problems in their activity systems, expanded learning occurs and teaching practice undergoes evolutionary transformations.

2.4.2.2 Empowerment via Culturally Appropriate Methods

According to Cole (1996), teachers can effectively use indigenous knowledge when professional development prioritises culturally appropriate techniques. For example, teachers can help EGLs make links between formal mathematics education and their lived experiences when they are instructed to identify the numerical concepts embedded in cultural activities. It has been argued that in addition to improving learners' comprehension of numerical competencies, teachers who actively integrate cultural activities into their mathematics lessons help learners feel like they belong (Garraway & Van Graan, 2024). Therefore, it can be deduced that teachers can design more impactful learning experiences that connect with EGLs' identities by using native cultural knowledge.

2.4.2.3 Motivation and Career Advancement

Proponents of culturally oriented pedagogy (e.g., Engeström, 2023; Gedera & Williams, 2016; Kurniawan, 2022) encourage teachers to participate in professional development linked to culturally sensitive education through the possibility of career

progression. This implies that teachers looking for prospects of advancing their professions might be more likely to take courses that improve their capacity to include cultural games in their lessons. Mentz and De Beer (2021) contended that teachers are more inclined to experiment with cutting-edge teaching techniques, such as cultural games, when driven by the desire to further their careers. This investigation enhances EGLs' educational experiences while simultaneously advancing their professional development. Teachers become champions for incorporating cultural games into mathematics instruction as they become more assured of their capacity to apply culturally appropriate methods.

2.4.2.4 Obstacles in the Field of Professional Development

It is critical to note that despite its numerous advantages, there are difficulties associated with training in culturally sensitive pedagogy. It is possible that many educators do not have access to excellent professional development programmes that concentrate on incorporating cultural activities into mathematics lessons. Furthermore, some educators could run against institutional challenges that do not tolerate the use of non-conventional teaching approaches. Engeström (2018) succinctly summarised these challenges by noting that contradictions within activity systems, such as varying opinions on acceptable teaching methods, can prevent teachers from reaching their full pedagogical potential. Teachers could feel under pressure to follow conventional methods rather than experimenting with culturally relevant techniques such as games. For example, this is often seen in schools that prioritise standardised testing over creative teaching methods.

2.4.2.5 Linking Professional Development to Early-Grade Mathematics Instruction

The preceding paragraphs have demonstrated that teaching mathematics in the early grades is partly influenced by teachers' career advancement and its impact on their use of cultural games. As such, this thesis is premised on the belief that early childhood centres should prioritise providing educators with professional development opportunities focused on culturally responsive teaching. School administrators can foster an environment where creative teaching methods thrive by investing in training that equips teachers to integrate cultural games into their lessons. Moreover, besides

enhancing teachers' effectiveness, supporting their career growth also improves EGLs' engagement and understanding of mathematical concepts.

Therefore, teachers' perceptions of using cultural games in early-grade mathematics instruction are closely tied to their career development opportunities. Training and professional development centred on culturally responsive pedagogy help teachers recognise the value of these resources in enhancing learning outcomes and student engagement. This study sought to assess teachers' views regarding having targeted professional development programs that encourage creativity and culturally relevant approaches in mathematics instruction.

2.4.3 Cooperation and Community

Teachers' views are also greatly influenced by the community around them, which includes parents, co-workers, and educational institutions. Teachers can develop common understandings and behaviours that improve mathematics instruction by working together to examine the advantages and difficulties of using cultural games (Engeström, 2023). According to Engeström, collaboration within subjects within a community can encourage creative teaching methods.

The CHAT acknowledges that participants frequently encounter inconsistencies in their systems of activities, which may affect how they interact with resources such as cultural games (Lektorsky, 1984). For example, instructors may be aware of the potential advantages of playing cultural games. However, their capacity to successfully apply these practices may be limited by institutional constraints like standardised curricula or assessment pressures (Kaptelinin & Nardi, 2017). These inconsistencies demonstrate how dynamic CHAT's teaching methods are. While attempting to provide inclusive learning environments that respect EGLs' cultural backgrounds, educators must manage these conflicts.

Engeström (2023) underlined that expanded learning, one of the fundamental principles of CHAT, is the process by which participants confront conflicts in their activity systems to cultivate novel thought and behavioural patterns. In addition to helping EGLs learn, teachers who try out cultural activities in mathematics classes also broaden their professional practice. For instance, by experimenting with these

games, educators inevitably create methods to engage kids or modify them to fit curriculum objectives better (Gedera & Williams, 2016). Both individual professional development and the development of collective knowledge within educational communities are facilitated by this process of reflection and adaptation. According to Roth and Lee (2007), when EGLs work together to solve problems in their activity systems, expanded learning takes place and practice undergoes revolutionary transformations.

Ideologically, the CHAT advances that subjects play a crucial role in helping us comprehend how people use tools and negotiate social situations to achieve learning goals (Lektorsky, 1984). It can be argued that historical experiences, motivations, and community influences change teachers' practices when we look at their opinions on using cultural games in early-grade arithmetic instruction. Understanding the intricacies of subjects enables a more thorough examination of CHAT's instructional strategies. To this effect, Engeström (2009) identified four defining points of a subject detailed in Sections 2.4.3.1 to 2.4.3.4.

2.4.3.1 Purpose-Driven Subject in the CHAT

The subject is driven by a motive or purpose, which is often tied to the object of the activity. For instance, in a classroom set-up, either EGLs or a teacher imparting knowledge could be the subject. For this reason, the concept of the subject is central to understanding how educational activities are structured and executed. Engeström (2009) identified that subjects are purpose-driven, meaning they are motivated by specific goals or objectives that guide their actions within an activity system. This discussion explores the significance of being purpose-driven in the context of teachers using cultural games for mathematics instruction.

The notion of being purpose-driven implies that subjects engage in activities with a clear intention. In a classroom setting, both teachers and EGLS can be considered subjects, each with their own objectives. For instance, a teacher may aim to enhance EGLs' engagement and understanding of mathematical concepts using cultural games, while EGLs may seek to grasp these concepts in a way that connects to their cultural backgrounds and real-life experiences. According to Kaptelinin and Nardi (2006), activities are inherently object-oriented and directed toward achieving a

specific outcome. This focus on the object motivates the subjects to engage actively with the tools at their disposal. In the case of cultural games, these tools serve as mediators that facilitate the transformation of abstract mathematical ideas into tangible learning experiences for EGLs.

It can be deduced that the motivation behind using cultural games is often tied to the desire to make learning more relevant and engaging for EGLs. Specifically, Mentz and De Beer (2021) argued that teachers may be inspired to incorporate cultural activities into their lessons to increase EGLs' engagement. This motivation is crucial, as it drives educators to seek innovative teaching strategies that resonate with their EGLs' backgrounds. When teachers perceive games as valuable resources for achieving their instructional goals, they are more likely to invest time and effort into planning and implementing these activities. Engeström (2020) underlined that the subjects' historical and cultural background significantly influences their viewpoints. This suggests that teachers with positive experiences with culturally relevant pedagogy are more inclined to adopt similar approaches in their classrooms.

Furthermore, teachers' purpose-driven nature influences their instructional choices regarding cultural games. This aligns with Vygotsky's (1978) classical assertion that learning is a social process structured around peers' engagement for enhanced understanding. For example, educators who recognise the potential of cultural games to foster collaboration and critical thinking among EGLs may prioritise their use in mathematics instruction. Furthermore, when teachers set clear objectives for using particular tools, such as improving problem-solving skills or enhancing mathematical reasoning, they create a focused learning environment where EGLs can thrive. The clarity of purpose helps teachers and EGLs navigate the complexities of learning while ensuring that educational activities remain aligned with desired outcomes.

Despite the benefits of being purpose-driven, challenges may arise in maintaining this focus within early childhood contexts. Teachers may encounter external pressures such as standardised testing requirements or rigid curricula that limit their ability to incorporate culturally relevant strategies effectively. Engeström (2018) noted that contradictions within activity systems, such as differing beliefs about effective teaching practices, can impede educators from fully realising their pedagogical goals.

Additionally, some educators may struggle with integrating cultural games into their instruction due to a lack of familiarity or training in culturally responsive pedagogy. Kamisli (2019) highlighted the importance of professional development opportunities that empower teachers to recognise the value of these tools in enhancing EGLs' engagement and learning outcomes.

Therefore, understanding the purpose-driven nature of subjects has significant implications for teaching early-grade mathematics using cultural games. The purpose-driven nature of subjects within the CHAT highlights the importance of motivation and intention in shaping educational practices. It has been revealed that teachers who are clear about the objective of connecting mathematical concepts to real-life contexts can create engaging learning experiences for EGLs. This study emphasises understanding teachers' views and experiences on purposeful engagement while navigating the complexities of teaching early-grade mathematics.

2.4.3.2 Contextualised Within an Activity System

The subject interacts with other elements of the activity system (tools, community, rules, division of labour) in achieving a specific goal or transforming an object. Understanding the function of subjects in the CHAT necessitates looking at how they engage with other components of the activity system. This contextual examination of subjects is essential when examining how people move around their surroundings to accomplish particular objectives or change items. The following paragraphs discuss how subjects interact with each of the tools, community, rules, and division of labour to attain a specific objective.

Tools act as intermediaries that aid the accomplishment of set and intended objectives. For example, teachers can use cultural games to engage EGLs and help them understand mathematical concepts in a relatable way when they integrate them into their mathematics classes. How well these tools fit the teacher's established learning goals determines their effectiveness. According to Engeström (2009), tools must be suitable for the context in which they are used; otherwise, they could impede rather than promote learning. For example, a cultural game may not successfully engage EGLs if it does not have a clear connection to the mathematical ideas being taught. On the other hand, teachers improve learning outcomes and provide a more

impactful educational experience when they choose culturally relevant games that speak to EGLs' backgrounds. Inasmuch as teachers interact with many stakeholders, they play a key role in evaluating the suitability of a game to effectively introduce a specific mathematical concept before implementing it in practice.

All parties engaged in the educational process (for example, instructors, EGLs, parents, and school administrators) are included in the community of an activity system. Due to the presence of many stakeholders, educational systems and methods are significantly shaped by the relationships between EGLs and their communities. Since there are numerous stakeholders, Garraway and Van Graan (2024) underscored the importance of indomitable activities within the cluster of teachers. They noted that teachers who work together to create and execute cultural activities can gain from one another's knowledge and experiences, and fashion effective teaching methods. Furthermore, through EGLs' interactions with teachers and classmates, they actively participate in the learning process rather than being passive recipients of knowledge. As such, EGLs negotiate meanings and work together to solve problems when games are used in the classroom. Mentz and De Beer (2021) succinctly summarised that this social engagement builds a sense of community that improves learners' comprehension of numerical concepts within a regulated school environment.

In an activity system, rules are loosely defined as the conventions, expectations, and guidelines that control how subjects engage with one another and other stakeholders (Engeström, 2009). These guidelines inevitably impact how educators use cultural games in the classroom. Teachers could feel under pressure to put test preparation ahead of creative teaching strategies, such as cultural games, if a school views standardised testing as the main indicator of success. Engeström (2018) further noted that rules sometimes create contradictions within an activity system that limit teachers' creativity using cultural games. As such, teachers may find it challenging to balance between institutional demands and the use of culturally appropriate teaching methods. This implies that an understanding of these relationships enables teachers to navigate the challenges of teaching while keeping an emphasis on learner-centred approaches.

Bringing a new dimension to the role of rules, Engeström (2018) asserted that they clarify the distribution of duties and responsibilities among participants since there are many stakeholders in an activity system. Such a distribution has been referred to as the division of labour, and it covers not just the responsibilities that teachers and EGLs play in a classroom setting, but also how they work together when participating in cultural activities. Teachers frequently serve as co-learners, facilitators, and guides. They can effectively support EGLs while promoting independence, interdependence, and critical thinking. It has been argued that teachers organise group dynamics while using cultural games so that every EGL can actively participate (Kamisli, 2019). It has been further noted that assigning distinct roles in a game, for example, can guarantee that every EGL participates in the activity and advances their mathematical abilities (Engeström, 2009, 2018; Kamisli, 2019).

2.4.3.3 Role of Agency and Development in the CHAT

The foregoing paragraphs have shown that the subject is not just a passive participant but actively shapes and is shaped by the activity. The subject's actions, influenced by their cultural and historical context, contribute to the evolution of the activity system. Understanding how subjects, including teachers and EGLs, actively participate in and influence early childhood contexts is a key component of the CHAT. Engeström (2018) asserted that subjects actively participate in the activity system rather than passively absorbing information; they shape and are, in turn, shaped by their interactions with tools, other members of the community, regulations, and the division of work.

When viewed in the context of active participation, agency defines the ability of people to take independent action and make decisions that affect their situations (Engeström, 2018). In the context of this study, teachers exert agency in the classroom by choosing teaching methods, such as using cultural games to improve EGLs' comprehension and participation. They actively modify their methods to create a more inclusive learning environment when they see how these activities can help EGLs relate mathematical ideas to their cultural backgrounds. According to Kaptelinin and Nardi (2006), people can change their environments through their behaviour in addition to being influenced by them. For example, a teacher who has had good experiences with cultural games can support their usage in the classroom or work with other educators

to create a culturally appropriate curriculum. This proactive strategy demonstrates how agency enables teachers to traverse and impact the activity system.

Engeström (2020) underlined that examining how agency functions within activity systems requires an understanding of the cultural and historical backgrounds of the involved subjects. Teachers' opinions regarding the worth of cultural games are frequently influenced by their professional experiences, education, and the cultural narratives they have come across. For example, a teacher from a culturally diverse background might be more likely to integrate cultural activities in their mathematics lessons since they understand how important it is for the curriculum to represent EGLs' identities. On the other hand, a teacher who has not been exposed to culturally responsive pedagogy might be reluctant to use it. This demonstrates how a person's background can affect their agency and instructional decisions.

In a recent study, Mentz and De Beer (2021) claimed that in addition to their agency, subjects also aid the development of the activity system as a whole. Teachers can alter teaching and learning methods by introducing new dynamics into their classrooms using cultural activities. For example, when EGLs play games together, they can develop fresh perspectives on mathematical ideas that go against conventional wisdom. According to Mentz and De Beer (2021), when teachers include culturally appropriate activities in their practice, they set the scene for EGLs to relate mathematical concepts to real-world situations. The activity system alters due to these modifications, mirroring the continuous interaction between the educational setting and the subjects' behaviour. The CHAT's use of agency stresses that participants are active agents who negotiate their interactions with tools, community members, rules, and the division of labour. This notion raises the issue of collective versus individual representation.

2.4.3.4 Collective Versus Individual Representation

In the CHAT, the subject can represent either an individual such as a specific teacher, or a team or group of teachers working together within a school. Kamisli (2019) noted that representation is essential to comprehending how subjects, whether individuals or groups, interact with their educational environments. The difference between individual and collective representation draws attention to ways teachers and EGLs

can work together to accomplish their objectives. The following few paragraphs explore the impact of individual and collective representation, emphasising how they influence instructional strategies and the participation of EGLs.

In the CHAT, *'individual representation'* refers to the behaviours and viewpoints of a particular teacher (Mentz and De Beer, 2021). This viewpoint hinges on the belief that teachers approach teaching and learning differently because of their individual experiences, convictions, and cultural backgrounds. For example, a teacher may be more likely to incorporate cultural activities into their mathematics lessons if they have had a good experience with them. It is also critical to note that how they use cultural games to increase EGLs' participation depends on their personal motives and educational beliefs. According to Kamisli (2019), a teacher's background has a bearing on the lessons they choose to teach. This suggests that teachers are more likely to use cultural activities when they see them adding value to their delivery skills. Arguably, individualism emphasises the role of teachers as active agents who mould their teaching methods in response to their own experiences and insights.

Contrary to this view, Mentz and De Beer (2021) noted that *'collective representation'* entails a group(s) of people cooperating in a learning environment. This can involve teaching teams working together to create curricula or communities of practice where educators exchange materials and tactics for using culturally responsive teaching. Collective representation highlights how teaching and learning are social processes and how teamwork can improve the efficacy of instructional strategies. According to Engeström (2020), group activities that incorporate a variety of viewpoints and areas of expertise frequently result in more comprehensive learning experiences. For example, a team of educators can combine their experiences and expertise to co-design teaching methods. In addition to helping individual instructors, this cooperative effort improves schools' overall learning environment.

It can be deduced that knowledge of the interaction between individual and group representations enhances one's understanding of how people navigate their activity systems. Even while every teacher brings something unique to the classroom, group efforts can enhance these insights by creating a welcoming environment where teachers feel encouraged to try new things. For example, during professional

development sessions, teachers can share experiences and exchange notes on infusing cultural games into teaching practice. This sharing has the potential to encourage other teachers to follow suit, which would increase the use of cultural games throughout the school. According to Garraway and Van Graan (2024), these collaborations shape common standards that can be uniformly applied.

Even though both individual and group representations have advantages, trying to strike a balance between them might bring difficulties. Teachers may encounter institutional barriers that prevent them from sharing creative techniques or working together productively. For instance, teachers may be deterred from asking for help or sharing resources if the school culture places more emphasis on individual accountability than teamwork (Mentz & De Beer, 2021). Furthermore, if a few teachers promote culturally relevant instruction, progress in group representation is diluted. Engeström (2018) highlighted that contradictions within activity systems, such as varying opinions on acceptable teaching methods, can make it more difficult for teachers to work together.

Understanding the subject's role involves examining their goals, background, and the tools they use to achieve their objectives within the system. This perspective is rooted in Vygotsky's (1978) socio-cultural theory and expanded upon by later theorists such as Engeström (2009, 2018, 2020, 2023) in developing the activity system model. The CHAT is relevant to this study because cultural games, as mediating tools, recognise children's cultural identity (Gedera & Williams, 2016), leading to the generation of context-specific knowledge relevant to the learners' daily lives. Thus, the desire to generate context-specific knowledge motivates the teachers to use mediating tools to impart mathematical concepts (objective) to learners in the activity system.

2.5 OBJECT

A key idea in the CHAT is the "object", which acts as the activity's focal point and motivates respondents' behaviour (Vygotsky, 1978). The conversation in this section examines the object's function in the CHAT, specifically as it relates to educators' opinions regarding using cultural games in early mathematics instruction. Through analysing the object's impact on teaching methods, one can learn more about the reasons behind and results of including cultural games in mathematics classes. The

object is the objective or reason behind an activity (Engeström, 2020). It can be interpreted in three interconnected ways: as an object-to-be-acted-upon or raw material; as an objectified motive that reflects the purpose of an action; and as a desired result that arises from interacting with the object (Engeström, 2023; Kaptelinin & Nardi, 2017).

Understanding how activities are organised and how individuals interact with their surroundings depends on the complexity of the object (Hwang & Chang, 2024). Its ability to guide and differentiate one activity from another gives the object its significance. For instance, cultural games can be used as both tools and objects to help teachers steer their instructional practices when teaching mathematics. These activities' goals, like improving EGLs' mathematical comprehension in culturally appropriate situations, influence how teachers plan their classes and interact with learners (Foot, 2013). Teachers' perceptions of how cultural games fit into their teaching methods affect their feelings about using them to teach mathematics. Teachers could believe that cultural games are useful for accomplishing particular learning goals, such as increasing EGLs' engagement or encouraging a deeper comprehension of numerical ideas. Mentz and De Beer (2021) underscored that the goal is to teach mathematics in a way that speaks to the cultural backgrounds of the EGLs.

Overall, the games' cultural value is also included in the object. On the one hand, Kaptelinin and Nardi (2017) noted that educators who understand how cultural games might connect learning at home and school could be more inclined to incorporate them into their curricula. Kaptelinin and Nardi's note is in sync with Vygotsky's (1978) claim that learning is most successful when connected to EGLs' living experiences. On the other hand, Kaptelinin and Nardi (2023) noted that teachers may experience difficulties because of their perception of the topic of their lessons. Teachers may be limited in using cultural games by institutional demands like strict curricula or standardised assessment requirements. According to Engeström (2001), this draws attention to a possible conflict between the intended educational outcomes (the object) and outside expectations. Subjects interact with objects in ways that produce particular results, both intended and unintended. Understanding how activities develop over time in the CHAT requires this transition (Kaptelinin & Nardi, 2017). For example, when educators

successfully incorporate cultural activities into their mathematics lessons, they may see the desired results, such as more learners' engagement and enhanced numerical reasoning abilities. Unintended repercussions may arise, such as pupils forming preconceptions on whether cultural games align with curriculum objectives.

Teachers can evaluate their methods and modify their strategies in light of intended and unintended educational outcomes (Fleer & Veresov, 2018). When EGLs face inconsistencies in their activity systems and look for other approaches to accomplish their goals, they engage in expansive learning (Engeström, 2023). Teachers can experience broad learning while incorporating cultural games into their early-grade mathematics lessons by investigating creative ways to include these resources in their lessons. For example, by working with colleagues to study cultural games and their best practices, educators might create fresh approaches that improve learners' learning experience while still meeting curriculum requirements. Their professional development is enhanced by this approach, which also advances knowledge of successful teaching strategies in schools with diverse cultural backgrounds (Roth & Lee, 2007).

In the CHAT, the object is key in explaining how human activities are organised and focused on reaching particular objectives. One can observe how objects influence educational outcomes and shape instructional practices when they assess instructors' opinions about using cultural games to teach early-grade mathematics. A deeper examination of the CHAT's teaching methods is made possible by recognising the intricacies surrounding objects, which also informs ways for assisting teachers in developing culturally appropriate learning environments. Therefore, it can be deduced that, in the CHAT, the object of an activity may be material or intangible (Koszalka et al., 2021). It has been clarified that the object, or the intended outcome, is why people participate in an activity. Thus, the main aim of the CHAT is to produce an outcome co-constructed in an activity. According to Leont'ev (1981), the object is a central concept that refers to the focus or goal of an activity system. It represents the purpose that motivates and organises the collective efforts of individuals and groups within a particular activity. As such, it provides direction and meaning to the activity and acts as a bridge between the subject (the individual or group involved in the activity) and

the outcomes of that activity. Key features of the object identified by Engeström (2023) in the CHAT are outlined and exemplified in Sections 2.5.1 to 2.5.4.

2.5.1 Object's Dynamic Nature in the CHAT

The object evolves as participants interact with it and the activity develops over time. It is shaped by the historical, cultural, and social context in which the activity occurs. As a key idea that symbolises the purpose or emphasis of an activity system, Leont'ev (1981) asserted that the object gives the activity direction and significance in addition to organising and inspiring the combined efforts of people and organisations. One of the object's primary characteristics, according to Engeström (2023), is its dynamic nature, which changes as individuals engage with it and as the activity progresses.

This dynamic character indicates that an object is not a static entity, but changes due to continuous interactions between community members, tools, and subjects. Participants' perceptions and understanding of the object may evolve as they interact with it, changing the object and the overall activity system. For example, educators may initially consider cultural games as merely engagement tools when incorporating them into their mathematics curricula. However, their comprehension of the educational value of these games may grow as they watch EGLs engage with them, leading them to modify their teaching methods accordingly. According to Engeström (2020), the historical, cultural, and social settings influence this progression. This implies that the object is impacted by past encounters and information gathered within a community. For example, teachers may be more likely to apply comparable techniques if they have seen firsthand how cultural activities can enhance EGLs' involvement and comprehension in other contexts. This perspective highlights how past experiences shape and influence present decisions and actions.

Furthermore, it can be deduced that the dynamic quality of objects highlights how subjects shape their development. Teachers and EGLs work together to develop a common understanding of mathematics concepts through their participation in cultural activities. Through this collaborative approach, multiple interpretations of the object are possible, reflecting a range of viewpoints in the classroom. For example, depending on their unique experiences and cultural backgrounds, EGLs may approach the object (the mathematics concept) from various perspectives when

playing a cultural game that requires them to solve mathematical problems. As EGLs collaborate to generate information and negotiate meanings, Mentz and De Beer (2021) keenly observed that this contact smoothens the learning process. Thus, the object's changing character reflects both individual and community understandings acquired through social interaction.

As alluded to in Sections 2.3 and 2.4, tools are essential for moderating interactions between subjects and objects. So, it is aptly clear that people's interactions with objects are influenced by the dynamic character of tools over time. For example, edifying cultural games using digital platforms can change EGLs' views about mathematical ideas. According to Kaptelinin and Nardi (2017), tools are more than just instruments because they can determine human behaviour. Both tools and learners evolve when educators modify or create new resources in response to their observations over time. This versatility demonstrates how technologies can change teaching methods and encourage deeper engagement with mathematical concepts.

Although objects' dynamic nature offers opportunities for unique learning experiences, handling these changing components in an educational setting can be difficult. It can be challenging for teachers to match their learning objectives with learners' developing conceptual understanding of mathematics (Engeström, 2018). The requirement to constantly modify their teaching methods in response to shifting early grade learners' needs and perceptions may also overwhelm some teachers. This inherent challenge stresses how crucial it is to give teachers continual assistance and professional development centred on culturally responsive teaching (Kamisli, 2019). This kind of assistance can enable teachers to successfully handle these challenges while creating a setting that encourages group learning. Another challenge worth exploring is the object's dual role, considering its potential to distort meaning and intention.

2.5.2 Dual Role of the Object

The object serves both as a material entity (something tangible, like a product being created) and a conceptual entity (an idea, goal, or problem to be solved). Leont'ev (1981) presented these roles as mental and material beings. In the context of this study, the object is conceptual focusing on imparting numerical competencies to EGLs. It has been argued that understanding how people engage with objects within

an activity system, especially in educational settings, requires a grasp of this duality (Engeström, 2020).

Concerning the first dimension, the object can have physical forms that people can directly manipulate or interact with. Manipulatives, cultural game pieces, or other tangible aids that support learning could be used in teaching mathematics. These material components act as tangible representations of the mathematical ideas being taught, for example, when educators use cultural activities that require EGLs to arrange blocks or count tokens to solve mathematics puzzles. This dimension hinges on the belief that material elements are essential to assist EGLs in visualising and interacting with abstract numerical concepts. According to Mentz and De Beer (2021), practical exercises improve learners' comprehension of mathematics by giving them tangible experiences of what they are learning or would have learned. In line with this thinking, teachers can establish captivating learning environments that facilitate the development of numerical competencies by using tangible items in their lessons.

Concerning the second dimension, the object can be a conceptual entity in addition to its material components. This refers to the concepts, objectives, or issues that motivate the activity and provide the interactions between the subjects' context. The conceptual object of this study is centred on teaching EGLs numerical competencies. This entails connecting particular mathematical abilities to actual or real-world circumstances. Engeström (2020) highlighted how historical and cultural factors impact how people view and interact with conceptual objects. For example, teachers might assist EGLs relate numerical ideas to their everyday lives by framing cultural games around real-life events such as using local currencies or community contexts. This link strengthens EGLs' comprehension of numerical competencies while increasing their motivation and engagement.

It is evident from this outline that the material and intellectual aspects of the object are inseparable. Both elements are necessary for meaningful learning experiences because they work hand-in-glove to co-create knowledge. For example, a teacher can help EGLs grasp more general mathematical ideas like addition and subtraction using a concrete cultural instrument for participation. According to Kaptelinin and Nardi (2006), this interaction makes it easier for EGLs to navigate through challenging

learning settings. This study is focused on exploring teachers' views and experiences in using tangible tools and abstract concepts in teaching practice.

Although the object's dual function has several advantages for teaching early-grade mathematics, striking a balance between these two dimensions can be challenging. Arguably, teachers may be more inclined to either the conceptual or the material to the detriment of the other. In such cases, EGLS could find it challenging to understand the relevance or gist of learning content and outcomes. For example, imagine a case where teachers merely focus on physically manipulating game pieces without relating those activities to more general mathematical ideas. Kamisli (2019) clarified that these other challenges result from a lack of training or support in culturally responsive pedagogy. This draws stakeholders' attention to the importance of teachers' professional development programs for building a shared understanding.

2.5.3 An Object as a Symbol for Shared Understanding

In collective activity, which is the focus of this study, the object is socially constructed and shared among participants, guiding collaborative actions and mediating interactions. Leont'ev (1981) has argued that in the CHAT, the concept of the object goes beyond individual activities but widens to include collective activities. Leont'ev's perspective is based on the idea that objects are formed through the interactions and contributions of all participants involved. Engeström (2020) recently highlighted that the object is not simply an individual goal but a shared focus that emerges through social processes. For example, when teachers and EGLs engage with cultural games in a mathematics lesson, they collectively construct an understanding of what the object represents. This can be mathematical concepts, such as addition and subtraction, or broader goals, such as problem-solving skills. Considering the collective nature of an object, it is aptly clear that it is influenced by participants' diverse backgrounds, experiences, and perspectives.

Interestingly, the shared understanding of the object serves as a guiding force for collaborative actions within an activity system. Participants working toward a common goal are more likely to coordinate their efforts effectively. For example, during a cultural game that requires teamwork to solve mathematics problems, learners inevitably communicate, negotiate strategies, and work together to achieve their

objectives. Clarifying the inevitability of teamwork in shared understanding, Mentz and De Beer (2021) noted that when teachers facilitate collaborative activities centred around cultural games, they create opportunities for learners to engage in meaningful discussions about mathematical concepts. This collaboration enhances EGLs' understanding and promotes critical thinking and social skills as they learn to articulate their ideas and listen to others.

Furthermore, the shared understanding of the object also mediates interactions among participants. In this context, it acts as a focal point that shapes how subjects engage with one another and with the tools at their disposal. For example, when teachers introduce cultural games into their mathematics instruction, they provide a framework for learners to explore numerical concepts jointly. As EGLs interact during gameplay, they negotiate meanings related to the object, whether it is understanding how to count points or strategising how to solve a problem presented by the game. Kaptelinin and Nardi (2017) argued that this mediation is essential for fostering a rich learning environment where learners can develop mathematical skills and collaborate effectively.

Among themselves, teachers create an environment that encourages collaboration and dialogue. Resultantly, educators can help learners construct a common understanding of the object. For example, before starting a cultural game, teachers can outline the rules and objectives, ensuring that all the participants fully understand the game. Additionally, teachers can model collaborative behaviour by actively participating in gameplay alongside their EGLs. This involvement demonstrates a commitment to collective learning and allows educators to guide discussions and clarify misunderstandings as they arise (Garraway & Van Graan, 2024). By fostering an atmosphere of open discussion, teachers can enhance EGLs' willingness to share their thoughts and contribute to a shared understanding of mathematics concepts.

Despite the benefits presented by collective activities, fostering shared understanding is marred by inherent challenges. Differences in prior knowledge, cultural backgrounds, or learning styles among participants may lead to misunderstandings or misinterpretations of the object. Engeström (2018) noted that contradictions within activity systems can complicate efforts to establish a common focus. Moreover, some

educators may struggle with facilitating collaboration if they lack experience or training in culturally responsive pedagogy. Therefore, Kamisli (2019) highlighted the importance of providing professional development opportunities that equip teachers with strategies for reducing and managing tensions and contradictions. In addition to contradictions among participants, the next section expands on this issue to include the tension between the object and other constructs of the CHAT.

2.5.4 Contradictions and Tensions in the Object

The object often embodies tensions or contradictions within the activity system, which drives innovation and change. For example, discrepancies between the object and the tools or rules within the system can transform the object or the system itself. In the context of an activity system, contradictions loosely refer to discrepancies between constructs of the CHAT (such as the object, tools, rules, and community dynamics). Engeström (2018) claimed that these contradictions can arise from various sources, including misalignments between the goals of an activity and the tools available to achieve those goals. For example, a contradiction emerges when a teacher finds that the available tools do not effectively support the goal of using a particular cultural activity. These tensions are not necessarily negative but may serve as catalysts for change within the activity system. When subjects encounter contradictions, they are prompted to reflect on their practices and seek innovative solutions. This process can lead to a transformation of both the object and the overall system.

One common source of contradiction arises from discrepancies between the object (the goal of imparting numerical competencies) and the tools used to achieve that goal (cultural games, in this study). For example, if a game is perceived as engaging but does not effectively reinforce mathematical concepts, teachers may experience tension regarding its value in mathematics instruction. This discrepancy can lead the teacher to adapt the game or seek alternative tools that better align with their instructional objectives. Kamisli (2019) argued that when teachers recognise such contradictions, they reflect on their teaching practices. This reflection can prompt them to innovate by modifying existing tools or creating new activities that more effectively bridge the gap between engagement and learning outcomes. For example, a teacher might adapt a cultural game to include specific mathematical challenges that align with

curricular goals, thus resolving the tension between engagement and educational effectiveness.

Another area where contradictions may arise is between the object and the rules governing an activity system. Rules, as expanded in Section 2.8, encompass the norms, expectations, and regulations that shape how subjects interact within the system. If institutional policies prioritise standardised testing over culturally responsive teaching practices, teachers are left to navigate conflicting expectations. Engeström (2020) noted that such contradictions can lead educators to challenge existing norms and advocate for changes that better support progressive learning. For example, a teacher who believes in the importance of using cultural games for teaching mathematics may push back against rigid curricular requirements by demonstrating how these games can enhance EGLs' engagement and understanding. This advocacy contributes to teachers' development and influences broader institutional practices.

When viewed through the lens of advocacy, contradictions within an activity system can drive innovation as participants seek to resolve tensions. When teachers encounter challenges related to integrating cultural games into their teaching practice, they may collaborate with colleagues to brainstorm solutions or share successful strategies from their own experiences. Garraway and Van Graan (2024) highlighted that collaborative problem-solving can lead to new insights and practices that enhance teaching effectiveness. For example, teachers may discover new ways to integrate additional resources that align more closely with their instructional goals when they discuss with peers. This collaborative approach fosters a culture of innovation within educational settings.

In a classroom setting, which is the context of this study, the object is EGLs' learning outcomes. The teacher uses tools (such as artefacts, technology, or games) to engage EGLs in activities that achieve the outcome (enhanced knowledge and skills). However, the object is shaped by the rules of the educational institution (MPSE in this study), the division of labour among teachers and EGLs, and the broader cultural values surrounding education. Contextualising the object, this study's main focus is to explore teachers' views on using cultural games as a mediating tool in EGLS' acquisition and mastery of numerical concepts. Since teachers work in a community

with other actors, it is crucial to explore the role of the community in cracking this puzzle.

2.6 COMMUNITY

Leont'ev (1981) explained that the object is realised in the community context with shared values to situate the object in a given setting. A community is a social and cultural group that subjects are a part of. In this social setting, explicit rules or norms regulate and influence behaviour. According to the underlying assumptions of the CHAT, the community is essential to comprehending human behaviour and the learning process (Engeström, 2018). Essentially, the CHAT is premised on the idea that the community is a setting where people use tools and things to accomplish common objectives. The importance of community in the CHAT is discussed in this conversation, with an inclination toward teachers' views about using cultural activities to teach early-grade mathematics. One can learn more about the cooperative dynamics that influence teaching and learning by looking at how the community affects educational practices.

In the recent past, Engeström (2023) underlined that a community is a group of people who work together over time to accomplish shared objectives and share a similar activity. To Wenger (1998), communities are dynamic entities that promote reciprocal involvement, shared practices, and the co-creation of knowledge; they are not just collections of individuals. These two definitions suggest that community members' experiences and perceptions of their collective efforts are shaped by and, in turn, shape their interactions. As such, the community has a role in educational environments where EGLs collaborate to learn. For example, teachers who collaborate to include cultural activities in their mathematics lessons create a professional network that can improve their methods. It has been argued that this partnership provides a platform for exchanging concepts, materials, and tactics, thereby improving teaching techniques (Mentz & De Beer, 2021). Community circumstances significantly impact teachers' opinions regarding using cultural games in mathematics classes. This influence is demonstrated by three factors outlined in Sections 2.6.1 to 2.6.3.

2.6.1 Communities as Platforms for Exchanging Experiences

Teachers can exchange effective methods for incorporating cultural activities into their teaching in a friendly professional community. This partnership promotes creativity in teaching methods and a feeling of community (Fleer & Veresov, 2018). According to A. Taylor (2014), communities of practice give teachers a forum to discuss their experiences, which results in improved teaching strategies.

2.6.2 Cultural Significance

By being members of a community, teachers' opinions of cultural games are significantly influenced by their community's cultural background. Vygotsky (1978) asserted that cultural games are more likely to be seen as useful resources for relating numerical ideas to EGLs' real-world experiences by educators who value culturally relevant education. This thinking supports the notion that learning is most successful when it is based on the cultural surroundings of the learners.

2.6.3 Assistance and Opposition

Communities can foster creative teaching methods, but they can also pose difficulties. For example, administrators or coworkers who value uniform curricula over culturally sensitive teaching strategies may oppose teachers. According to Engeström (2001), conflicting viewpoints within a community frequently give birth to tensions among activity systems, which might affect how educators use cultural games in the classroom. Two decades later, Engeström (2023) followed up on the issue of tensions resulting from the community and clarified that when learners confront contradictions in their activity systems, they can think and act in new ways, which expands learning. Therefore, communities can act as learning catalysts. For example, when educators work together to tackle the challenges of incorporating cultural games into their curricula, they can find creative answers that improve learners' comprehension and engagement.

In addition to helping individual instructors, this cooperative approach to problem-solving advances community knowledge (Roth & Lee, 2007). Teachers can change the way they teach mathematics by exchanging experiences and discussing practice with one another. Examining teachers' perspectives on incorporating cultural activities in early-grade mathematics instruction reveals how the community influences teaching

methods and fosters collaborative learning. A deeper examination of educational practices within the CHAT is made possible by acknowledging the complexity of community dynamics, which also informs ways for assisting teachers in developing culturally relevant learning opportunities. In this case, EGLs and teachers' behaviour influence teaching and learning. In line with this view, the play behaviours of EGLs influence teaching methods. As such, early childhood learners' curriculum is driven through play-based methods (Fleer & Van Oers, 2018). Since the community is a group of individuals or social entities who share a common interest in the same activity system as the subject, it is characterised by five attributes defined by Engeström (2009) as follows:

1. **Shared Object**

   Community members are connected by their shared involvement with the purpose of an activity. For instance, within a school system, the community may consist of teachers, EGLs, parents, and administrators.

2. **Social Context**

   The community reflects the broader social and cultural environment influencing an activity. This includes norms, practices, and expectations that shape how the activity is carried out.

3. **Interaction and Collaboration**

   Community members often collaborate, support, or influence the subject's actions. Community interactions can be direct, in the form of teamwork, or indirect, in the form of societal norms.

4. **Role in the Division of Labour**

   Within the activity system, the community is part of a framework that allocates responsibilities and tasks among its members, influencing how the activity is structured, and outcomes are achieved.

5. **Dynamic Nature**

   The community is not static; its composition and influence can change over time as the activity system evolves or external factors exert some influence.

It has been argued that by analysing the community in the CHAT, researchers gain insight into the social relationships, collective influences, and cultural dynamics that shape the activity (Cole et al., 2010). This element is central to understanding the interplay between individual actions and the broader social structures within an activity system. Thus, the CHAT helps determine how views are shaped by the socio-cultural context and how the socio-cultural context is shaped by the beliefs of an identified group of people, which has been dubbed the “community” in the CHAT. Considering the community perspective of the CHAT, division of labour is inevitable.

2.7 DIVISION OF LABOUR

The preceding paragraphs have shown that the CHAT offers a thorough framework for comprehending human behaviour in the context of social and cultural circumstances. A key construct of this paradigm is the notion of “division of labour”, which describes how roles, duties, and tasks are allocated among community members participating in an activity. This section discusses the function of division of labour in the CHAT with an inclination toward teachers’ views and experiences about using cultural games to teach mathematics in the early grades.

The CHAT conceptualises division of labour as a social stratification that is both vertical and horizontal, defining various jobs, statuses, and obligations among members of the society (Engeström, 2023). This idea is premised on the belief that community members work together to accomplish shared objectives rather than acting independently from one another. Power dynamics and the knowledge that each person brings to their position are also reflected in the division of labour, which goes beyond simple work distribution (Kaptelinin & Nardi, 2017). For example, teachers may play different roles, including facilitator, guide, or assessor, while learners actively participate in cultural games as a learning exercise. As such, teachers’ opinions about using cultural games in mathematics classes are greatly influenced by division of labour in their educational communities. Three factors outlined in Sections 2.7.1 to 2.7.3 demonstrate this impact.

2.7.1 Cooperative Methods

Teachers may feel more encouraged to include cultural games in their lessons at

schools where teacher collaboration is accentuated. According to Mentz and De Beer (2021), collaborative planning sessions can result in the development of shared techniques and resources that improve the application of culturally relevant pedagogy. Such communities of practice encourage educators to interact with one another and share learning experiences (Wenger, 1998).

2.7.2 Role Explicitness

The division of labour clarifies roles in the classroom. For example, clarifying the role of teachers as facilitators who assist learners in exploring through cultural games might boost their self-assurance and efficacy when carrying out such activities. Hesitancy or inconsistent teaching methods, on the other hand, can result from role ambiguity (Engeström, 2023).

2.7.3 Infrastructures of Support

Teachers' support systems are also impacted by division of labour within the community. According to Fleer and Veresov (2018), instructors may be more inclined to look for advice and resources on incorporating cultural games into their mathematics education if the school has mentors or specialists in culturally responsive teaching methods. Engeström (2023) states extended learning can be accelerated by the division of labour. This normally happens when learners confront conflicts in their activity systems to cultivate new thought and behaviour patterns. For example, teachers working together may find creative answers to problems relating to incorporating cultural games into their curricula. According to Roth and Lee (2007), this cooperative approach to problem-solving helps individual teachers and advances community knowledge.

Under such arrangements, teachers can change how they teach mathematics by exchanging experiences and collaboratively reflecting on their work. Although division of labour can improve teamwork in learning environments, there may be drawbacks. For example, McAvinia (2016) noted that inflexible hierarchies may hinder communication between educators and administrators or among co-workers. Such challenges may thwart creativity and limit the application of cultural games in the classroom. Additionally, participants in an activity system may have different experiential levels with culturally responsive pedagogy, resulting in inconsistent

classroom implementation. So, gaining insight into these dynamics enables researchers and educators to pinpoint areas needing intervention to improve teachers' performance when using cultural games as a teaching tool.

Arguably, understanding how social interactions shape educational practices requires recognising the significance of the division of labour within the CHAT. One can observe how division of labour affects teaching methods and promotes collaborative learning settings by looking at teachers' opinions about using cultural games to teach mathematics to EGLs. In addition to enabling a more thorough examination of educational practices within the CHAT, an understanding of the challenges of division of labour informs techniques for assisting teachers in developing culturally relevant learning opportunities. Interestingly, Ryder and Yamagata-Lynch (2014) noted that the interaction among individuals within the community creates a division of labour. Tasks and responsibilities are shared among system participants as they engage in an activity (Cole et al., 2010). Therefore, it can be deduced that division of labour describes how tasks, responsibilities, and power are distributed among individuals and groups within the activity system. It has both the horizontal and vertical allocation of roles that contribute to achieving the shared object of the activity, among other defining characteristics (see Ryder & Yamagata-Lynch, 2014).

1. **Horizontal Division**

   This refers to the distribution of tasks among participants. It involves who does what within the activity system. For example, in the context of this study, the teacher instructs, learners learn, and administrators manage.

2. **Vertical Division**

   Involves the distribution of power, authority, and decision-making roles. It examines how hierarchies and power dynamics influence the activity. For example, the school head may oversee teachers and make decisions in a school setting.

3. **Mediates Social Relationships**

   Division of labour structures interactions among the subject, community, and other constructs of an activity system. It defines roles, expectations, and

relationships, influencing collaboration and conflict within the system.

4. **Historically and Culturally Shaped**
   How labour is divided in an activity system reflects broader societal norms, historical practices, and cultural values. For example, traditional family roles often inform how labour is divided at home.

5. **Dynamic and Transformative**
   The division of labour construct is not fixed; it can change as the activity evolves, as tools and mediating artefacts are developed, or as societal expectations shift.

6. **Influences Developments and Outcomes**
   The division of labour construct shapes roles and responsibilities and directly impacts the efficiency, equity, and outcomes of activity systems. It can facilitate cooperation but often leads to tensions if roles or power are perceived as unfairly distributed.

Ryder and Yamagata-Lynch (2014) used an example of a hospital activity system to clarify the division of labour construct. It has been argued that horizontally, doctors diagnose and treat, nurses provide care, technicians operate medical equipment, and administrators handle logistics, while vertically, doctors may hold more authority in medical decisions, while nurses have less decision-making power but are essential for operational care. Contextualising this classical example, head teachers and general duty teachers have different levels of authority, but they complement each other in imparting knowledge to learners. Thus, understanding the division of labour in the CHAT helps analysing how social structures and individual roles interact to shape collective activity. On the one hand, EGLs engage in cultural games solely for the pleasure they derive from them. Then, on the other hand, teachers capitalise on these games and help learners understand mathematical concepts through them. Thus, the CHAT is premised on the belief that learning occurs when individuals participate in meaningful cultural activities and receive scaffolding in their ZPD to achieve transformative learning (the object). Interestingly, rules in an activity system are meant to keep all actors in check and enforce vertical and horizontal divisions.

2.8 RULES

The CHAT offers a framework for comprehending human actions within social and cultural contexts. Within such contexts, rules control conduct inside an activity system. Rules loosely define standards, laws, policies, and legal frameworks guiding human interaction. According to Engeström (1987), rules in the CHAT are explicit and tacit principles that influence how people interact within an activity system. Social norms, cultural expectations, and institutional policies are a few examples of these rules that specify how tasks must be carried out. Then, Kapelinin and Nardi (2006) noted that rules are meant to control behaviours, set limits, and give participants a framework for working together. For example, rules around participation, respect for different viewpoints, and teaching techniques regulate how instructors and learners interact during classes. This implies that rules affect how an activity system behaves, either helping or impeding the incorporation of resources into instructional strategies. As such, norms outlined in the educational communities influence teachers' views on using cultural games as a teaching tool. Sections 2.8.1 to 2.8.3 outline three factors on how rules shape activity systems.

2.8.1 Policies of Institutions

Policies at educational institutions frequently specify curriculum requirements and evaluation techniques. These guidelines may make teachers feel limited when thinking about integrating cultural activities into their lessons. For example, Mentz and De Beer (2021) argued that teachers who prioritise culturally relevant techniques might be reluctant to use games that do not fit conventional testing procedures.

2.8.2 Social Standards

In addition to policy instruments, teachers' inclination to use cultural games might also be influenced by the social norms prevalent in a community. Teachers may feel more confident in using culturally relevant tactics in settings that promote and encourage creative teaching techniques. On the other hand, teachers might be less likely to embrace novel ideas if there is a strong commitment to conventional teaching techniques (Fleer & Veresov, 2018). Similarly, Vygotsky (1978) argued that social interactions and collective experiences influence learning.

2.8.3 Guidelines for Collaboration

Guidelines for teacher collaboration can impact how educators exchange cultural game-related materials and tactics. Teachers are more likely to have fruitful conversations about incorporating cultural games into their mathematics lessons when schools promote collaborative cultures with explicit rules for cooperation and professional growth (Engeström, 2023). This suggests that a collaborative setting enhances teachers' confidence in using alternative teaching methods.

According to Engeström (2023), when educators confront contradictions in their activity systems, they can think and act in new ways, which leads to expanding learning. In such cases, the defined rules can act as accelerators for learning. For example, educators could look for creative ways to compromise when they face conflicts between their desire to use games to implement culturally relevant practices and institutional restrictions. Resolving conflicts can result in revolutionary adjustments to instructional strategies and advance knowledge of successful pedagogy in multicultural classrooms (Roth & Lee, 2007).

Rules can support good teaching methods, but can also create obstacles that prevent creativity. For example, strict adherence to regulations can hinder teachers' capacity to be creative and modify their teaching strategies to suit the requirements of their learners (McAvinia, 2016). Furthermore, different teachers' interpretations of the rules may result in different classroom implementations of cultural games. Researchers and educators can find areas for intervention that can improve instructors' ability to use cultural games as a teaching tool.

One can observe how established norms impact teaching strategies and promote cooperative learning environments by examining instructors' views on using cultural games to teach early-grade mathematics. Understanding the nuances of rules enables a more thorough examination of the CHAT's instructional methods and guides the development of tactics to assist educators in producing culturally appropriate learning opportunities. In any system, formal or informal, rules arise spontaneously as people associate (Engeström, 2020). These rules mediate the actions of individuals and groups, ensuring that their activities align with societal, cultural, or institutional

expectations. According to Ryder and Yamagata-Lynch (2014), rules can be defined by the following six dimensions:

1. **Explicit Rules**

   These are formally established guidelines, such as laws, policies, or organisational procedures. For example, a school may have rules about attendance, homework submission, or classroom behaviour.

2. **Implicit Rules**

   These are unwritten, informal norms and cultural practices that influence behaviour. For example, social expectations on addressing a superior at work or sharing resources in a team.

3. **Regulate Behaviour**

   Rules set boundaries for what is acceptable within the activity system, helping to organise individuals' and communities' actions. By providing a framework for interaction, they ensure coordination and reduce conflicts.

4. **Mediation of Activities**

   Rules act as mediators between the subject and the community. They shape how individuals engage with each other and the object of an activity. For example, safety protocols in a laboratory guide how a researcher (subject) interacts with the equipment and colleagues.

5. **Cultural and Historical Dimensions**

   Rules reflect the cultural and historical context in which the activity system operates. Over time, rules may evolve as the activity system and its social context change. For example, workplace policies may adapt to changing societal attitudes toward remote work.

6. **Potential Source of Tension**

   Rules can be a source of conflict, especially if perceived as unfair, outdated, or restrictive. Tensions between formal and informal rules can disrupt the activity

system. For example, an employee might struggle to balance strict company policies and informal team practices.

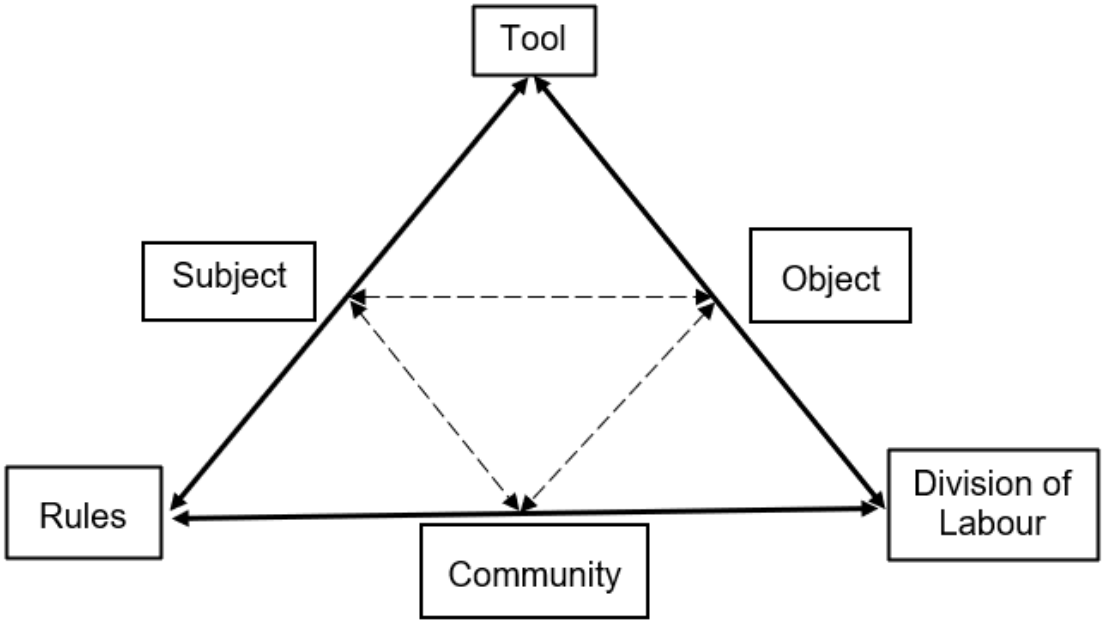
So, analysing rules within an activity system helps to understand the constraints and enablers of actions. It also sheds light on the power dynamics, cultural influences, and potential areas for systemic change or innovation. In this study, professionals' rules refer to the philosophical and professional guidelines that inform the teaching and learning of EGLs. In early-grade classes, some policies stipulate rules. For example, in Zimbabwe, the MPSE mandates teachers to use the native language (mother tongue) as the medium of instruction and play-based pedagogies in teaching EGLs. As such, these policies (rules) affect the subjects' activities.

2.9 VALIDITY OF THE REVIEWED THEORY

Overall, the CHAT illustrates how teachers (subjects) use cultural games (tools) to impart knowledge (object) within a specific setting (community) governed by established policies (rules). In this process, task-sharing becomes inevitable due to multiple stakeholders within the community (division of labour), as summarised in Figure 2.1.

Figure 2.1

The Dialogic Nature of Interactions



(Engeström, 2020)

The diagrammatic summary shown in Figure 2.1 suggests that six constructs form the underlying infrastructure of the CHAT. These six constructs can be analysed in their totality (using the entire triangle) or in smaller triangular sets (using four inner triangles), depending on the argument the analyst seeks to bring to light. In the context of this study, all six constructs have been adopted to give a fuller picture of the driving and restraining forces to the usage of Cultural games in teaching early-grade mathematics. Johnson and Golombek (2011 p. 9) justified the approach adopted in this study, who cited that using all six constructs provides *"a framework that maps the social influences and relationships involved in networks of human activity"*.

The validity of the CHAT lies in its ability to provide a robust framework for understanding human activities in their social, cultural, and historical contexts. Its strength and applicability stem from several theoretical and practical foundations. Firstly, it is rooted in long-established theories grounded in the works of Lev Vygotsky (1978) and Leont'iev (1981), whose ideas on the sociocultural nature of human development have been validated through extensive research in education, psychology, and sociology. Due to its mass application across disciplines, it integrates concepts from psychology, anthropology, sociology, and systems theory, making it widely applicable across disciplines.

Secondly, the CHAT is a flexible theoretical frame that can be contextually applied to different situations. Hennig and Kirova (2012) underlined that the CHAT prioritises understanding human behaviour within the real-world context of social, cultural, and historical factors, avoiding reductionist approaches. This contextual emphasis aligns well with modern scientific and practical needs, making the theory relevant for studying dynamic, complex systems such as workplaces, schools, and communities.

Thirdly, the activity system model enshrined in the CHAT (subject, tools, object, rules, community, and division of labour) allows for a comprehensive examination of the interrelations and tensions within a system (Johnson & Golombek, 2011). According to Engeström (2009), its holistic approach enables researchers to address questions of transformation, contradictions, and systemic evolution, which are key to understanding human and organisational development.

Fourthly, the CHAT's focus on historical development and contradictions makes it a valuable tool for studying change and innovation within systems (Leont'ev, 1981). Several sources have concurred that its adaptability to evolving contexts and openness to integrating new insights ensure its continued relevance in analysing contemporary issues, such as technological impacts or shifts in cultural norms (Engeström, 2020; Johnson & Golombek, 2011; Leont'ev, 1981).

Fifthly, CHAT has demonstrated practical validity through successful applications in various fields such as education, workplace studies, healthcare, and technical design (Koszalka et al., 2021). In a publication titled *"Making a Case for Cultural Historical Activity Theory: Examples of CHAT in Practice"*, R. Miles (2020) revealed that the theory was used in: in education to analyse and improve teaching and learning processes, focusing on collaboration, tools, and institutional norms; workplace studies to explore the dynamics of teams, decision-making processes, and the impact of tools and rules in organisational systems; healthcare to examine how healthcare professionals interact with tools, rules, and communities to improve patient outcomes; and technology design to offer insights into user-tool interactions, enabling better design of user-centred technologies.

The CHAT is subject to ongoing critique and refinement, enhancing its validity. For example, it was first coined by Lev Vygotsky (1978), refined by Leont'ev (1981), and later by Engeström (2009). It is a true testimony that scholars have debated and extended its concepts, particularly around power, agency, and inequality within activity systems (Koszalka et al., 2021). This reflexive nature ensures that the theory evolves in response to new challenges and findings.

Johnson and Golombek (2011) have acknowledged that while CHAT is a valid and widely applicable framework, it has certain limitations and critiques. They highlight that its systemic approach can make it difficult to apply in highly focused or straightforward studies. Additionally, concepts such as contradictions may be subject to varying interpretations by researchers. Furthermore, CHAT relies heavily on extensive data collection for effective analysis of activity systems. Despite these limitations, several studies have successfully used constructs from CHAT as conceptual frameworks, as illustrated in Table 2.1.

Table 2.1

Specific studies that used constructs from the CHAT

CHAT's Construct	Source	Objective and Key Findings	Remarks
Tools	Venketsamy (2024).	This study explored how traditional games function as learning tools within the CHAT framework. Findings revealed that games facilitated interactions between teachers, learners, and mathematical concepts and held cultural significance. Teachers used them to make abstract mathematical ideas more tangible and relatable for EGLs.	Studies by Venketsamy (2024) and Feza (2018) highlight the role of cultural games as key tools in mediating teaching and learning. This aligns with the current study's focus on teachers' perspectives, exploring how they perceive and use these tools to achieve educational goals. Understanding how tools function within CHAT helps to analyse teachers' views on integrating cultural games into early-grade mathematics instruction. The current study also examines how conflicts or synergies between cultural games and community expectations shape teachers' opinions and practices regarding early-grade mathematics education, emphasising the potential of games to connect academic content with real-life contexts.
	Feza (2018)	Feza's study explored indigenous games as learning tools within the CHAT framework, merging traditional practices with modern education. These games embedded mathematics concepts within culturally significant events, enhancing learning through cultural relevance. Findings showed that games helped early-grade teachers structure lessons, improving learners' understanding of numerical concepts while fostering an appreciation of their cultural heritage.	

Subject	Douglas (2018).	This study explored how pre-service teacher education programs shape the continuous professional development of teachers across different subject clusters, focusing on their interactions within educational settings. Findings revealed that teachers' knowledge and school-based interactions significantly influenced their professional growth and teaching methodologies. The study highlighted the impact of collaboration among secondary educators in deepening their understanding of methodologies and content. Teachers were seen as active participants whose collaboration and networking efforts positively affected their learning processes and informed their instructional approaches within their respective schools.	Both studies offer valuable insights into how teachers (the subjects) use tools and their environments to facilitate learning. Understanding teachers' perceptions of cultural games as instructional tools within the CHAT framework highlights the significance of their experiences in shaping teaching strategies. Recognising the need to incorporate culturally relevant tools into their practice enables them to enhance student engagement and improve learning outcomes. The present study explores how teachers' experiences and interactions within the educational system shape their perspectives on using cultural games in teaching early-grade math, demonstrating how these tools influence instructional approaches and student comprehension.
	Grimalt-Álvaro and Ametller (2021).	This study explored science education through the lens of CHAT, emphasising teachers' role in using tools to facilitate learning. It highlighted the importance of considering teachers' perspectives in designing effective instructional strategies that meet learners' needs. Both teachers and learners were seen as active participants whose knowledge, interactions, and viewpoints shape the educational process and influence learning outcomes.	

Object	Grimalt-Álvaro and Ametller (2021)	This project aimed to explore the use of CHAT in analysing science education, focusing on how interactions among teachers, learners, and tools shape scientific understanding. It highlighted how scientific knowledge emerges through the interplay of subjects, instructional tools, and the broader social environment. The study emphasised that aligning learning materials with students' cultural and contextual realities enhances outcomes. It also examined how the evolving goal of learning—mastery of scientific concepts—develops through mediated activities, reinforcing the dynamic nature of knowledge acquisition in science education.	These studies reveal that learning objectives are shaped by interactions between teachers, students, tools (such as cultural games), and social environments. Understanding this relationship helps assess how effectively cultural games support educational goals. Past studies by Sumbera (2020) and Grimalt-Álvaro and Ametller (2021) partly shaped the present study to explore how teachers design learning experiences using cultural games to enhance early-grade mathematics instruction. This is important in bringing to the fore the evolving nature of learning objects through dynamic interactions among educators, learners, and instructional tools. By examining how early-grade teachers integrate cultural games into their teaching strategies, the present study provides insights into their effectiveness in achieving specific pedagogical objectives. This analysis helps evaluate the role of cultural games in fostering engagement, conceptual understanding, and culturally responsive teaching practices in early-grade mathematics education.
	Sumbera (2020).	Sumbera's study analysed how educational management and leadership programs address social justice using CHAT. It explored how social justice goals evolve through management and leadership training activities. The study found that the focus on social justice management developed as participants engaged with tools and their socio-historical backgrounds. It emphasised that aligning education with social justice requires ongoing adaptation. The goal of cultivating justice-centred leaders was examined regarding how it shaped activities and was influenced by contradictions within the broader activity system.	

Community	Waitoller and Kozleski (2013)	This paper examined how a multi-sectoral approach and community networking can help address challenges to inclusivity in schools. It was found that collaboration between parents, businesses, and educational institutions plays a crucial role in fostering inclusion. While contradictions within communities may create challenges, they also present opportunities for innovation. Communities were seen as mediators, facilitating cooperation among teachers, parents, guardians, and service providers. The study emphasised how shared goals and existing tensions within communities shape the effectiveness of inclusive educational initiatives.	Both studies emphasise the significant role communities play in shaping teaching methods. It has been revealed that in any given context, communities can either encourage or hinder the use of certain teaching approaches. Teachers' views are influenced by their interaction with parents, cultural institutions, and local customs, which shape their willingness to integrate traditional games into their teaching. These studies also highlight how conflicts within teacher communities, such as differing priorities or expectations, can either support or obstruct the adoption of cultural games in education. Additionally, the research explored how broader socio-cultural environments impact teachers' perceptions and implementation of cultural games in mathematics instruction. Understanding these interactions is crucial, as they determine how effectively cultural tools are used to enhance learning. Inspired by these past experiences, the present study underscores the importance of aligning teaching strategies with cultural contexts to improve educational outcomes.
	A. Taylor (2014)	This research paper explored how community service-learning in tertiary education can be understood through the CHAT framework. It highlighted that integrating theoretical knowledge with practical application relies on active community engagement. The study found that contradictions within activity systems, such as differing priorities between higher institutions and communities, can either hinder or enhance learning outcomes, depending on how they are managed. Communities were identified as key players, shaping both the process and outcomes of service-learning. The study emphasised that communities provide the essential socio-cultural context for meaningful learning experiences.	

Division of labour	Engeström and Sannino (2016)	This paper explored how the division of labour in workplaces shapes learning processes and group problem-solving. Using CHAT, it examined how tasks and responsibilities are distributed within complex activity systems. The study found that effective delegation fosters networking and creativity, while challenges in task allocation often drive innovative problem-solving. Division of labour was identified as essential for teamwork, helping individuals refine their roles and collaborate toward organisational goals. However, misunderstandings or disagreements over task distribution could either hinder or enhance group initiatives such as learning and problem-solving.	Both studies provide valuable insight into how the division of labour influences group projects. In the context of the present study, the division of labour can be examined through how early-grade teachers, administrators, and community members allocate responsibilities related to conducting cultural games in schools. It is essential to answer questions such as: are there contradictions in task distribution, such as unclear roles for teachers or insufficient support from administration? Answers to these questions have a practical bearing because they determine the successful integration of cultural games into early-grade teaching and learning. These issues emphasise the need for clear, coordinated roles to promote effective educational practices and enhance learning outcomes.
	Daniels et al. (2013)	This study examined how the division of labour impacts multi-professional networking within local authorities using developmental work research. It revealed that clear and adaptable divisions of labour among professionals led to effective networking and intervention strategies. However, discrepancies and issues in task allocation often necessitate collaboration and adjustments to sustain productivity. Overall, the study analysed the division of labour as a dynamic process within multi-professional teams, where roles and responsibilities were regularly reviewed to address emerging challenges.	

Rules	Sumbera (2020)	This paper used the CHAT to explore how educational leadership programs address social justice issues by analysing the policies governing educational practices. The study found that educational policies can perpetuate inequality and hinder the development of socially just leadership approaches. These policies, both formal and informal, shape leaders' ability to promote social justice. The research examined how these guidelines influence leadership candidates and their capacity to drive meaningful change in educational environments, highlighting the impact of both official and unofficial norms.	The conclusions reached by these studies align with the idea that integrating cultural games can make mathematics more relevant and engaging for students. Teachers' perspectives on this connection are vital, as they may see cultural games as a tool to bridge the gap between home and school knowledge, thereby enhancing students' comprehension of mathematical concepts. When using cultural games, teachers' understanding of the rules governing their use plays a key role in their willingness and capacity to incorporate them into lessons. Exploring how teachers navigate these rules can uncover both the challenges and opportunities they face in implementing culturally relevant teaching methods, providing insights into potential barriers to success or areas of opportunity in their practices.
	Tuck and Tuck (2019)	This study explored how rules shape discussions and influence the teaching and learning process in collaborative environments. It found that both formal and informal regulations heavily influence teachers' collaboration and decision-making. Teachers who understand current policies are better equipped to navigate them, promoting effective group learning, which is vital for academic success. The study emphasised how the construction of rules is a key component in educational activity systems, enabling teachers to design more successful group projects and enhance overall learning outcomes.	

CHAT, with its six key constructs—Subject, Object, Tools, Community, Rules, and Division of Labour—provides a comprehensive framework for understanding the complexities of educational processes. Scholars such as Engeström (1987, 2001) have significantly advanced this field by exploring how these concepts interact within activity systems. It has been argued that Engeström emphasised how regulations in educational settings can either facilitate or hinder the incorporation of innovative practices (Sumbera, 2020). Sumbera's research, for example, examines how educational leaders navigate policies to promote social justice, much like how teachers might engage with cultural games in their classrooms. Similarly, Tuck and Tuck (2019) explored how formal and informal rules impact collaboration among teachers, suggesting that policies within educational communities greatly influence teachers' willingness to adopt cultural games. Additionally, Qureshi (2021) discussed how tensions within activity systems require teachers to negotiate conflicts, highlighting the importance of understanding these dynamics to integrate cultural games into early-grade mathematics instruction effectively. By analysing these six constructs, researchers can gain valuable insights into how teachers' interactions with educational regulations and community norms shape their attitudes and decisions, ultimately impacting their teaching strategies and the learning opportunities available to their students.

Overall, the validity of CHAT is supported by its solid theoretical foundation, practical applications, and ability to address complex, real-world systems. While not without challenges, its holistic and context-sensitive approach makes it a powerful tool for understanding and transforming human activities. Its continued evolution and adaptability further cement its relevance in both research and practice. Overtones of the CHAT have some footprints in global blueprints such as the Sustainable Development Goals (SDGs), particularly SDG4, on commitment to inclusive and equitable quality education. Such footprints are expanded and clarified in strategies such as ESD that provide a framework for attaining SDG4. Reviewing how the CHAT relates to SDGs and its associated strategy is prudent because Zimbabwe subscribes to SDGs.

2.10 CHAPTER SUMMARY

The essential elements of CHAT have been discussed in this chapter, along with how educators feel about incorporating cultural games into mathematics lessons for young early-grade learners. Cultural games are useful, tangible instruments that engage pupils and promote cognitive growth, underscoring the function of tools, defined as things that mediate human behaviour. The discussion topics were how teachers' motives, professional development experiences, and historical and cultural contexts impact their viewpoints, highlighting their challenges within their activity systems. cultural games are an example of an educational object that motivates instructional practices in the face of institutional constraints. The idea of the object was investigated as the motivating objective of activities. The chapter also discussed the importance of community in influencing educational practices, pointing out that cooperative settings encourage teachers to share their learning experiences, which can improve the application of culturally sensitive pedagogy. Lastly, it underlined how crucial the division of labour is in educational environments, where allocating responsibilities affects teachers' viewpoints and cooperative methods. The connections between these elements of CHAT offer insightful information on how educators manage their teaching methods and emphasise tactics for creating inclusive, successful mathematics education that speaks to EGLS cultural backgrounds.

CHAPTER THREE: LITERATURE REVIEW

3.1 INTRODUCTION

The previous chapter partly expanded the research problem by reviewing theoretical issues in the literature, and clarifying how the CHAT has shaped this study's assumptions, choice of variables, and research questions. It has been emphasised that the CHAT is relevant to this study considering its focus on the history and cultural contexts as primary determinants of engineering social change. In the same line of argument, this chapter expands on the research problem by reviewing conceptual, analytical, and methodological issues in existing pedagogical literature. It begins by discussing global perspectives on indigenising knowledge systems through reviewing the method and teaching practice advocated by the central tenets of the Education for Sustainable Development (ESD). Discussion on ESD sets the scene for discussing the link between mathematics and early-grade learning and the introduction of cultural games. Some contextualisation is given by examining the ECD curriculum for science and mathematics in Zimbabwe to assess its provisions and gaps to foreground this study. Finally, the chapter analyses the most widely used cultural games in Zimbabwe and their ability to enhance the teaching of numerical concepts to EGLs.

Following the core findings from the theoretical review, the validity of the CHAT is supported by its solid theoretical foundation, practical applications, and ability to address complex, real-world systems. While not without challenges, its holistic and context-sensitive approach makes it a powerful tool for understanding and transforming human activities. Its continued evolution and adaptability further cement its relevance in both research and practice. Overtones of the CHAT have some footprints in global blueprints such as the Sustainable Development Goals (SDGs), particularly SDG4, on commitment to inclusive and equitable quality education. Such footprints are expanded and clarified in strategies such as ESD that provide a framework for attaining SDG4. Reviewing how the CHAT relates to SDGs and its associated strategy is prudent because Zimbabwe (the case study country) subscribes to SDGs.

3.2 EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

Sustainable development is a multifaceted concept that cuts across disciplines, including education. It has the connotations of enhancing the well-being of people within the limits of the planet so that current consumption does not compromise that of future generations. In the United Nations Economic Commission for Europe (UNECE) strategy for ESD, sustainable development is described as:

> *[Being] underpinned by an ethic of solidarity, equality, and mutual respect among people, countries,* ***cultures, and generations****; it is development in harmony with nature, meeting the needs of the present generation without compromising the ability of future generations to meet their own needs.* (UNECE, 2011, p. 1)

It has been argued that education is central to the concept of sustainability because it helps to develop the capacity for critical reflection and future thinking and motivates actions that promote SDGs within the confines of cultural diversity and generations. As such, SDGs, in their totality, revolve around achieving growth with unity in cultural diversity.

Out of the 17 SDGs, SDG4 is committed to *"ensure inclusive and equitable quality education and promote lifelong learning opportunities for all".* This goal is partly enabled by ten targets, two of which are in sync with the main concern of this study: to improve pedagogical approaches and develop numerical skills of EGLs using cultural games. Firstly, Target 4.2 in the SDG asserts that children must *"have access to quality ECD, care and pre-primary education so they are ready for primary education"*. Secondly, Target 4. c asserts that there must be a substantial *"increase in the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing states"*. These two targets collectively affirm the key role of teachers in ensuring that all children receive quality foundational education that prepares them for the primary level. It is critical to note that ESD acknowledges that in as much as there is a consensus on the need for sustainable development, details are still unclear on how best it can be achieved since strategies differ between and within communities due to cultural variations. As such, it sets ambitious competencies for educators to

deliver context-specific and culturally-sensitive quality education. The UNECE (2011) made it clear that the competencies described in the ESD strategy are suggestive and provide a firm foundation for supporting a cultural mosaic and differences in national realities, capacities, and levels of development. However, this requires individual countries to adapt these strategies to suit national policies and priorities.

The strategy has been designed to equip people with knowledge, skills, understanding, attitudes, and values compatible with sustainable development. In line with this objective, it provides parameters for *"**professional development** in education, governing and managing of institutions, **curriculum development** and **monitoring** and **assessment**"* UNECE (2011, p. 3). In the context of this study, these competencies are instrumental in shaping how educators can approach issues and deliver value to learners using tools and contexts that learners can easily relate to. Concerning professional development, the strategy is premised on the belief that educators can catalyse and engineer change in a desired direction because they influence and shape learners' understanding of the world. To this effect, initial teacher education must be structured to instil ESD competencies in teachers, and continuous professional development programmes must be designed to upskill educators in key competencies. Then, concerning curriculum development, the educational curriculum must be continuously refined and improved to reflect the ESD competencies. Interestingly, in Zimbabwe, the ECD curriculum reflects on some of the core ideas of the ESD, particularly centring learning on culture and heritage. This must be reinforced with the development of supporting learning material and step-by-step approaches to how such practices can be actualised.

The educators' competencies advocated by the ESD strategy are anchored on three key pillars: (1) a holistic approach, which seeks integrative thinking and practice; (2) envisioning change, which explores alternative futures, learns from the past and inspires engagement in the present, and (3) achieving transformation, which serves to change the way people learn and in the systems that support learning. The fulfilment of these pillars is hinged on four vignettes encapsulated in the intention to learn (that is, learning to know, do, live, and be). *Learning to know* refers to understanding the challenges facing society both locally and globally and the potential role of educators and learners, and *learning to do* refers to developing practical skills and action

competence about education for sustainable development. Then, *learning to live* together contributes to the development of partnerships and an appreciation of interdependence, pluralism, mutual understanding and peace, and, lastly, *learning to be* addresses the development of one's personal attributes and ability to act with greater autonomy, judgement and personal responsibility about sustainable development. It can be deduced that the ESD framework seeks to go beyond *learning to know* to *learning to do*.

Similarly, the United Nations Educational, Scientific and Cultural Organisation (UNESCO), as a specialised agency of the UN responsible for the promotion of international cooperation in education, arts, sciences, and culture, developed a framework that is somewhat similar to ESD for the sole purpose of achieving SDG4. Anchored on the main mandate of UNESCO, to preserve regional and cultural history and promote cultural diversity, the Education 2030 Framework for Action (E2030FA) guides implementing SDG4. The E2030FA outlines how to translate Targets 4.2 and 4.c, among others, into practice nationally. So, in terms of content and provisions, E2030FA sings a similar tune to ESD. So, both frameworks intend to develop competencies that teachers will later transfer to learners so that learners are not only familiar with the correct answers but also *how* to obtain them. So, UNESCO provides funding to the national government in support of technical training and education of educators. The overall aim is to bridge the gap between *theory* and *practice* to emphasise their individual importance while recognising the interdependence of the two without prioritising one over the other. But how does thinking translate to the teaching of early-grade mathematics?

3.3 MATHEMATICS AND EARLY-GRADE LEARNERS

Early childhood is a crucial stage in a child's development because it collectively encompasses their cognitive, emotional, social, and physical growth. According to Alsina and Salgado (2022), giving children numerical skills plays an important role in shaping their development by fostering their creative, critical, and analytical abilities. Perhaps clarifying why mathematics is regarded as instrumental in ECD shows how it directly drives the cognitive aspect and indirectly drives other growth aspects. Overall, mathematics is a body of knowledge that uses numerical techniques to examine real-life problems and subsequently prescribe solutions to the issues identified. Several

sources have concluded that a mathematical mind is rational and calculative in nature, visionary and strategic, and flexible and adaptable (Alsina & Salgado, 2022; Björklund et al., 2020; Clements & Sarama, 2020; Ginsburg et al., 2019).

Interestingly, the key attributes of mathematics (for example, the visionary, calculative, and adaptable aspects) form the core pillars of ESD. As such, it is important to ensure that the development of numerical skills is prioritised during the early grades to build a desired future. It has been further argued that early-grade mathematics and numeracy skills are crucial for later academic success (Fuson et al., 2015). Scholars such as Clerkin and Gilligan (2018), Harris and Petersen (2017), and Aunio et al. (2015) have concurred that early-grade mathematics introduces children to skills such as counting, comparing, classifying and sorting, seriating, and problem-solving; all of which have latent potential to contribute positively to their academic success later.

Therefore, proper orientation to mathematics is instrumental in developing mathematical proficiency in EGLs (Gifford, 2015) and instilling positive attitudes towards the subject (Van Oers, 2013). A study by Burns et al. (2001) provided evidence on how early grades mathematics is essential for children living in the 21st century characterised and driven by global technological advancement. For example, it helps to enhance verbal, spatial, and memory skills in early childhood learners, which are critical in all areas of life (Chesloff, 2013).

By imparting numeracy skills to early childhood learners, they enter their first formal grade with a foundation of skills to build on for more advanced mathematics (Raman & Eason, 2015). In extending the same line of argument, Chesloff (2013) noted that foundational mathematical skills are essential for later levels and gains in mathematics during elementary school. Early childhood learners who have difficulty in counting tend to have problems later in understanding mathematical concepts (Clements & Sarama, 2020). So, foundational concepts, such as knowledge of numbers, allow for a deeper understanding of more complex mathematical problems involving systems and iterative thinking (Clements & Sarama, 2020).

However, Van Oers (2013) argued that the future of mathematical thinking in early-grade learners relies heavily on the quality of early-grade teachers. Teachers must

recognise mathematical actions in children and see the mathematics in play activities, which is seeing beyond an ordinary eye. They must also guide children into the future, where they can participate independently and creatively in mathematical communications. Nabie (2011) found that a lack of motivation is one of the main reasons for poor performance in mathematics. Arguably, incorporating cultural games and recreational activities into the mathematics curriculum can be another strategy for capturing early childhood learners' interest and setting a strong foundation.

Historically, mathematics was considered unsuitable for early education, with EGLs seen as incapable of coping with the intellectual demands associated with mathematical thinking (Ginsburg et al., 2019). Against this background, formal numerical instruction was often delayed until the first grade, according to Starkey (2014). However, the 21st century has seen a shift towards providing compelling evidence that children possess significant mathematical abilities from birth and that their cognitive development during early education influences their capacity for abstraction later (Alsina & Salgado, 2022). The focus of developmental psychologists has notably shifted from what young children cannot do to what they can do (Hachey, 2013). Consequently, modern research on early childhood mathematics focuses on children from birth until they transition to the primary level (Björklund et al., 2020). Psychologists' attitudes towards teaching mathematics to children have evolved, leading to new strategies to enhance mathematical knowledge from birth (Sarama & Clements, 2020). The adage *"all work (and no play) makes Jack a dull boy"* is often used when it comes to the need to let children play instead of learning in school all day. This calls for a balance between playing and learning among EGLs.

At least one decade ago, the importance of early childhood numerical education gained international recognition (Tsamir et al., 2011) and is now seen as crucial for meeting the demands of a knowledge-based society (Clements & Sarama, 2020). The growing emphasis on the importance of mathematics education underscores that teaching it to EGLs has extensive benefits for children both immediately and in future. It has also been argued that high-quality mathematics education is particularly important for young children as it is the strongest predictor of future mathematics achievement (Watts et al., 2014). Since some sections of literature have shown that EGLs do not learn formally and do not have long concentration spans listening to a

teacher instructing mathematics concepts, immersing them in play-based mathematics experiences would be a winning strategy (Ekeh & Venketsamy, 2020; Feza, 2018). When EGLs engage in play activities such as cultural games, their retention rate is higher than the one they have when they are taught using formal methods of learning. It has been further argued that acquiring mathematics skills at an early age can enhance school performance (Anders & Rossbach, 2015) and improve career prospects in adulthood (Lee, 2017). Therefore, fostering children's mathematical abilities at an early age is essential for ensuring long-term academic success (Watts et al., 2014).

Mathematics education at the foundational level necessitates teachers' awareness, pedagogies, and approaches to improve their impartation (Murphy et al., 2019; MacDonald et al., 2018). As such, solid pedagogical content knowledge is a fundamental aspect of effective teaching of early-grade mathematics (Aldemir & Kermani, 2017). For example, Wood and Hedges (2016) have asserted that educators must understand the interplay between mathematics and children's developmental patterns. Specifically, having an awareness of their curiosity, ability, and playfulness can be used to edify the development of their creativity, critical thinking, and problem-solving skills. Having a deep knowledge of these developmental attributes can be aligned with curriculum objectives and modern teaching methods. So, pedagogical knowledge encompasses current information on mathematics content, concepts, and the instructional strategies and methods used to impart knowledge. Therefore, pedagogical content knowledge is crucial for stimulating a child's interest in learning and for translating advanced instructional strategies into learner comprehension (Bose and Bäckman, 2020). In this case, EGLs can easily comprehend when they are taught using cultural games, and they can easily relate to them.

3.4 A CRITICAL REVIEW OF CULTURAL GAMES

In this study, the term *'cultural game'* refers to a competition or recreational or play pursuit in which community people have participated for many years (Nabie, 2011). It is critical to note that cultural games are located in activities that are clearly performed for enjoyment but may also serve as a platform for learning problem-solving skills, mathematical concepts, linguistic skills, or even health and life skills. Such richness

comes from the structured nature ingrained in a group's culture over many generations. I try to intentionally and consistently employ the term “cultural game” throughout the study, but it must be noted that the terms “traditional games”, “indigenous games”, and “cultural games” are interchangeable. According to Moloi (2015), cultural games are part of IKS, which has been recognised in the recent past as a global priority for empowering traditional and local communities in their pursuit of sustainable development (see Section 3.2, ESD). However, the marginalisation of the contributions of indigenous communities to the development of mathematical and scientific knowledge remains a threat to the teaching and learning of these subjects. Harmonising indigenous cultural knowledge with contemporary ideas in formal education has been considered the best approach for teaching mathematics (Machaba, 2013; Moloi et al., 2021).

Many developing countries have indigenous resources that could be used to teach mathematics, but there is little literature on how to conceptualise, concretise, and indigenise mathematical concepts using these resources (Pereira & Venâncio, 2021). Games, as indigenous cultural resources, are often viewed narrowly as just a form of entertainment. However, Moloi (2015) outlined how indigenous games can create meaningful and practical situations for acquiring mathematical skills and, in turn, applying them. Since most children enjoy playing games, they could develop an intrinsic motivation for mathematics through these indigenous games. For example, a play-based curriculum may reinforce and promote these experiences across the board in the classroom. Through games, children group objects with comparable properties, which denotes classification. Although classification may appear straightforward, Henniger (2013) claimed that EGLs must understand it. Thus, it can be argued that play effectively shapes one’s mathematical experience. Sections 3.4.1 and 3.4.2 detail the importance of cultural games in mathematics education and global and regional experiences of their usage, respectively.

3.4.1 Value of Cultural Games in Mathematics

Games can potentially demystify mathematics as an abstract and challenging subject (Nabie, 2011) and make children enjoy the subject (Bonne & Higgins, 2022). They also address concerns about making mathematics a classroom activity that is too abstract and disconnected from children’s experiences (Mutema, 2014). For effective

teaching and learning, efforts should be made to reintroduce and reincorporate culturally informed mathematics (ethno-math) into educational curricula. This can be boosted by modern technological knowledge derived from Indigenous knowledge systems (indigenous games) (Dewah & Van Wyk, 2014). This technological knowledge has been transformed into digital knowledge for online teaching and learning (Akayuure, 2021), making it more fun and enjoyable (Kazima, 2013; Moloi, 2013; Tangkur et al., 2022).

Firstly, cultural games are good at hitting two birds with one stone, playing and learning simultaneously. According to Hussain et al. (2014), incorporating cultural games into mathematics education can enhance young students' comprehension of mathematical concepts and their applications. This approach can also help address some parents' misconceptions, as Bulotsky-Shearer et al. (2016) noted, that play is unimportant and a waste of time. Many researchers (for example, Ashari et al., 2013) have collectively argued that using cultural games can significantly improve children's performance in mathematics. Chen and McNamee (2011) asserted that cultural games effectively boost performance, as children who engage in play have clearer objectives and can better connect game materials with other problem-solving techniques. This allows children to exercise their imaginations while playing.

Cultural games in children are a powerful tool and predictor of optimal early learning and future success in life (Grand Fun Alley Learning Center [GFALC], 2014). Children of all ages love to play cultural games, which allows them to explore the world, interact with others, express and control emotions, develop their symbolic abilities, be self-regulated, and practice emerging skills. Hands-on activities and problem-solving situations can arouse children's curiosity through cultural games (National Association for the Education of Young Children [NAEYC], 2009). Cultural games are closely related to childhood and provide children with opportunities to be creative and build up abstract thinking. Sailer and Homner (2020) proposed that a combination of systematic instruction methods and game-based learning can increase the effectiveness of the curriculum, as it is not only an active learning method but also a cooperative and community-based method, which refers to methods of instruction where students work in groups to complete tasks collectively towards academic goals.

Secondly, it is believed that teaching using cultural games is more effective due to their familiarity with both educators and learners. The introduction of cultural games in teaching early-grade mathematics was done to situate the subject in the social domain of the child (Nabie, 2011). Cultural games make teaching numeracy skills relevant to children's lives and are key to experiential learning. Teaching mathematics without immersing EGLs in their cultural context is ineffective and dangerous to learners, society, mathematics itself, and future generations (Fouze & Amit, 2018). Similarly, teachers can also apply reflexivity when teaching since they have background exposure to the most widely used cultural games. Arguably, reflecting on their past experiences and blending them with modern pedagogical approaches enables them to impart mathematics concepts effectively to learners. So, by combining learners' play tendencies and educators' past experiences, cultural games assist in developing creativity and imagination, turning learning into an interesting, exciting experience (Nabie, 2011). Numerous global experiences attest to this reality, as shown in the next section.

Meaningful learning occurs when people link their present information with their prior knowledge. Many teaching methods, sadly, ignore the subconscious information of the early grade learners, sometimes called their "funds of knowledge." The outcome is a gap between school and home knowledge, societal injustice against children whose parents lack formal education, and learner dissatisfaction (Owusu & Obuo Addo, 2023). Making mathematics meaningful to early grade learners involves showing ideas in a way that fits their culture (d'Ambrosio, 2016). To make sense of mathematical ideas, learners create a mental image of what they have heard from their teacher by drawing on and linking their daily experiences (Owusu & Obuo Addo, 2023). Therefore, daily activities significantly influence the knowledge of mathematics. In many African villages, cultural games are mathematically conceived (Bhuda & Marumo, 2021). Children love games. Through cultural games, children learn mathematics; so, in play, they practise mathematical concepts. Children will like mathematical teaching and do well if teachers purposefully link cultural games to it. Furthermore, the repetitive character of games allows youngsters to participate in continuous practice, which is essential for the ongoing knowledge of mathematical ideas. Meanwhile, few researchers have looked at the ongoing use of cultural activities

to grasp mathematics. To understand mathematical ideas, children require many mathematical examples and exercises (Fouze & Amit, 2017).

In Ghanaian schools, the mother tongue has been used for two main reasons: to nurture cultural identity and to help knowledge transmission. From ECD A to Grade 2, the present working policy calls for employing the local language (L1) as a medium of instruction under the Zimbabwean curricular Framework, 2015–2022.

Although teachers have taught arithmetic for many years using their teaching techniques, cultural games have been absent from the pedagogical practice. Children's grasp of mathematical ideas will be better if teachers use cultural games together with culturally pertinent tactics to teach them. Learners who find learning fun can effectively understand the material information teachers offer via exploration learning (Fletcher, 2018).

Children no longer value playing indigenous games because of the impact of Western influences, information and communication technology (ICT), and globalisation. The writers contend that digital technology and games, usually mostly played for pleasure without any major Afrocentric developmental advantage for the child, often receive resources and time focused on them. Results from a study on conventional primary school games, however, indicated that learners' successes were strongly affected by their intrinsic and external motivational elements as well as their perceived experience gained from game play (Trajkovik et al., 2018). Games, therefore, seem to improve children's memory, retention and skills development. Based on cultural life, mathematics education is a method d'Ambrosio (2016) called Ethnomathematics. D'Ambrosio contends that every culture has a certain method of interpreting and generating new information; hence, he advocates using these particular methods for social progress. Therefore, cultural games are beneficial in strengthening learners' understanding of mathematical ideas and raising teacher pedagogy by concurrently applying conventional methods of teaching mathematics with cultural games. For example, average Ghanaian parents use estimates during cooking and mathematical ideas like ratios and proportions. Thus, it is up to early grade teachers to enable significant learning by applying constructivist teaching methods, including ethnomathematics.

3.4.2 Cultural Games and Holistic Development of Children

According to Parten (1933), interactive play shows a striking rise within the age range of 2 to 5 years, which dominates and defines this time. Parten (1933) contended that social development starts with non-social activity—unoccupied, observer behaviour and solo play—and then follows a three-step pattern. Later, parallel play, a restricted kind of social participation when proximity to other early grade learners is preserved utilising the same resources but with little impact on each other's behaviour shifts (Rubin, 1977). The highest degree is two kinds of actual social connection. For example, associative play involves participation in distinct activities. However, there is mutual respect and toy sharing. The last shape includes cooperative play, a more complex kind of interaction in which early grade learners cooperate toward a shared objective, such following the same make-believe theme (Berk, 2017; Williams, 2015). Early grade learners use fine and gross motor skills in various games in both indoor and outdoor environments where play takes place.

Cultural games are a fascinating and enjoyable method to express oneself. Children's communication and interaction abilities get better slowly as they grow self-awareness and respect for the ideas and emotions of others (Berk, 2017). Building learners' self-confidence and closing the gap between quick and slow learners depends on games (Lowenstein et al., 2001). Playing cultural games helps young children interact socially and quickly link to one another. Games make up more of children's daily play activities. Children who play cultural games think with others, grow intellectually, and utilise language speaking to themselves and occasionally to others. Early grade teachers understand how crucial children's play is in everyday activities. Sadly, they sometimes miss the chances play offers for watching children's growth and learning (Shamoon, 2017). Teachers can find out about children's social relationships and their cognitive, physical, emotional, and language development by watching them during play.

Vygotsky's elementary and higher mental designation (Bruce, 2018) might clarify cultural impacts on childhood development. In settings with concrete things, cognitivists like Vygotsky, Rogoff, and Piaget have said that young children learn best through play and enjoyment (Biehler & Snowman, 2017). Children in early childhood development (ECD) environments are thought to have a brief focus span, so they

require engaging activities to maintain their focus and stay motivated. Thus, play is a way for children to learn the tools of adult labour, and their teacher should try to guide the children's desires and joys through using entertainment to reach their final goal in life. According to Bruce (2018), Vygotsky's theory has not required much adjustment since the 1920s, as his perspective that children engage more in their culture and acquire knowledge deemed necessary for them to know via social interactions with others, particularly adults, is still viewed as valid. Cited in Bruce (2018), Vygotsky (1978, p. 101) views play as generating a ZPD whereby children run at their maximum level of pre-school development. The children kids advance via play activities (Vygotsky, 1978, pp. 102-103).

Clements and Sarama (2020) claim that drawing knowledge from the students' languages and culturally rich information when educating them produces good, nurturing learning environments. Such environments will produce spaces where mathematical knowledge creation belongs to all, and the underprivileged groups of students will actively participate in such creation and generate various rich discoveries in mathematics.

Children naturally develop these mathematical intuitions; they begin playing games using mathematical skills (Feza, 2016). When cultural capital becomes a vehicle in accessing knowledge, that knowledge is owned, and the respect of the individual is raised (Caledòn-Pattichis, Pape & Clements, 2018). The present world problems call for citizenry that applies logical reasoning to generate creative solutions for the developing particular problems of the planet. These games cover all early grade curriculum expectations and beyond. Involving concepts and approaches to learning and teaching mathematics will help us to move forward. Early grade learners' cultural capital should be used in their study of mathematical experiences (Caledòn-Pattichis, Pape & Clements, 2018).

Learning mathematics calls for entire body active involvement. Cultural games, like pada (Hopscotch), call for active involvement at the same time teaching mathematics. It includes participants' emotions, cognitive, and psychomotor (Addo, 2013). Games are enjoyable, which gives them an edge over mathematics. Indigenous games carry indigenous knowledge and experiences. Research indicates that teaching

mathematics using indigenous methods increases competencies, performance, and relevance of mathematical ideas (Bhuda & Marumo, 2021). Including games in teaching helps properly involve students and improve their learning experiences in mathematics education. Games like “nhodo” (pebble play) can help teachers to create a more fun learning environment and promote a good attitude toward mathematics. Cultural games in the classroom help to demystify mathematics, hence enhancing mathematical knowledge, performance, and relevance of mathematical ideas (Anyidoho, 2018; Seudib et al., 2020).

3.4.3 Global and Regional Experiences

Games are a cultural aspect enjoyed by adults and children worldwide, including Zimbabwe (Kazima, 2013). While games are often seen as just entertainment, there is more to them than that. Many mathematical concepts can be found in games, but children usually do not think about the mathematics involved when playing. It is the job of mathematics teachers to use children’s daily activities to help them make connections with their prior knowledge and facilitate meaningful learning of numerical competencies. This section presents case data on experiences in fostering early mathematics skills by playing traditional indigenous games in different regions worldwide.

Recently, Gasteiger and Moeller (2021) used case data drawn from 95 children from five kindergartens in Germany to carry out seven 30-minute training sessions over four weeks targeting 4-to-6-year-old children. The intervention sought to test if there is a statistically significant difference in understanding mathematics concepts between children who play conventional board games with traditional number dice and those who engage in games without numerical symbols. The intervention was designed using pre-test and post-test assessments to measure the effectiveness of the two approaches in fostering mastery of early numerical concepts in natural play situations. Beyond the four weeks of intervention, a follow-up study was conducted one year later. The study revealed that children who play board games with traditional dot dice are better off in counting, recognising and using structures, implying that such games are more effective in teaching early-grade mathematics skills. The study by Gasteiger and Moeller was adapted to the unique cultural characteristics of Germany, differentiating it from previous interventions based on theoretical considerations to assess the

development of numerical competencies among EGLs. Despite making this important contribution, the study was child-centred, without factoring in the role of teachers in facilitating the playing of such games rich in numeracy skills development.

Fouze and Amit (2018) did a prescriptive analysis of ethnomathematical games native to the Negev Bedouin people of Israel in the Middle East. The authors used three plays ("ta'ab", the stick game; "mozkat-5", the stone game, and the "seega" game) to distinguish between an activity and a game and propose parameters for developing an ethnomathematical curriculum. In their prescriptive analysis, Fouze and Amit (2018) described each game regarding the context it can be played, its underlying rules, and its alignment with mathematical principles. Countries seeking to develop an ethnomathematical curriculum or refine existing curricula to integrate cultural values can draw lessons from Fouze and Amit's study and contextualise it to their local context. For example, Zimbabwe has numerous native cultural games (see Section 3.6), and its ECD curriculum recognises the use of play in imparting early numerical competencies. Educators have been identified as instrumental players in shaping the learning process and refining the curricula to incorporate cultural elements.

In a study entitled *"Black students' rich mathematical experiences: Mathematics concepts and Xhosa cultural games for reception class",* Feza (2018) argued for the decolonisation of early-grade mathematics education, citing the inequalities brought about by colonisation and apartheid in South Africa. It has been argued that the skewness of poor performance in mathematics towards black children has pushed the narrative that mathematics is for the elite and belongs to the West, ignoring one's prior knowledge and experiences. Premised on the belief that the development of numerical competencies is embedded in one's cultural artefacts, but learners are not given that orientation from an early age due to a mathematical exclusionary characterised by language, racial, and economic exclusion, all brought by colonisation and inherited at independence. To this effect, Feza explores four cultural games played by Xhosa children, bringing to light their inherent potential to be integrated into pedagogy. Specifically, the study provided thick descriptions of how the "upuca", "black toti", "umarabaraba", and "itreyini" games are played and the mathematical concepts embedded in them. Feza's study recognises the role of teachers in the absorption of relevant cultural values in mainstream pedagogy.

According to d'Ambrosio (2016), it is important to present mathematical concepts in a way that is relevant to the culture of the learners. When EGLs are unable to connect mathematical concepts to their everyday lives, they may perceive them as abstract and insignificant. Several African communities have cultural games that incorporate mathematical concepts (Bhuda & Marumo, 2021; Mereku, 2013; Chikodzi & Nyota, 2010). For instance, Mereku (2013) showed how Ghanaian cultural games could be used to introduce children to the concepts of probability, problem-solving strategies, pattern recognition, hypothesis testing, reasoning, disproving, and common multiple problems. However, much work still has to be done in demonstrating how cultural games can be used effectively in mathematics instruction in Ghana

.

A study by Botse and Seetso (2016) in Botswana was twofold: first, to determine the preschool teachers' understanding of mathematics and scientific ideas; second, to provide support material to equip them with tools and knowledge to teach these ideas in preschools. The results showed that while the teachers lacked topic understanding, they fell slightly short in pedagogical knowledge. Using teaching tools, the preschool instructor taught the material using traditional approaches. They never understood that the games/rhymes, in which children participate every day, could be used to educate scientific and mathematical ideas ingrained in them. Lacking in pedagogical understanding, they needed additional resources to understand that the use of play/rhymes, the creative approach to teaching rather than the traditional ones, to convey challenging topics of science and mathematics effectively to preschoolers. This supported allocating a resource book to enable preschool teachers to acquire new information, skills, and competencies. Their understanding of connecting the subject and pedagogical knowledge helped them create a resource book with 33 local games/rhymes, bundled with embedded science and mathematics ideas, drawings, procedures, rules and probing questions.

It has been argued that ethnomathematics is a process that builds mathematics learning on cultural life (D'Ambrosio, 2016; Fouze & Amit, 2018). This implies that the ethnomathematical approach is contextual, as was argued by D'Ambrosio (2016), who asserted that each culture has its own unique way of understanding and creating new knowledge, and these unique ways should be exploited for societal advancement.

Cultural games enhance students' learning of mathematical concepts and improve teacher pedagogy by combining established teaching methods with cultural games. For example, a study by Owuso and Obuyo Addo (2023) in Ghana showed that the average Ghanaian parents use mathematical concepts such as ratios, proportions, and estimations while cooking. Teachers can use constructivist teaching strategies like ethnomathematics to facilitate meaningful learning. The institutional environment must accommodate teachers' use of adaptive skills to use cultural games as teaching tools, as predetermined curricula guide teachers. The question arises about what the Zimbabwean ECD curriculum provides regarding ethno-mathematical practice.

Traditional children's games improve early learners' development of basic abilities. An initiative in Indonesia called Traditional Games Returns (TGR) motivates children to "forget their gadgets" and play traditional Indonesian games outside instead (Arlinkasari et al., 2020). Children in Afghanistan continue to play traditional games amid the chaos and tragedy of a civil war (Cagle, 2017). This goes with the present research done in rural areas with limited resources. A typical children's game-based teaching approach maximises the growth of early grade learners' basic motor abilities (Suherman & Vidákovich, 2019). Various abilities are created as children hop, run, sing, skip, and mimic other activities via exposure to conventional children's games. Results highlighted several conventional children's games that early grade learners liked playing, enabling them to acquire various childhood abilities. Given students' interest in the specified games, it is essential to address how ECD teachers may use conventional children's games in depth. Peacock (2013) responds to the aforementioned comment by claiming that teachers believe group activity disrupted the tidy classrooms' pristine surroundings. Peacock continues by saying that the formerly clean classroom areas have turned into a junkyard packed with materials gathered for student use during their play. According to Peacock (2013), teachers view the use of games in teaching and learning mathematics as play and a waste of time. On the other hand, games motivate kids to interact and communicate with adults and other peers.

Roza et al. (2020) found that studying cultural variety should not just be appreciated for the richness of cultures in Indonesia but also for studying other disciplines, including mathematics. It has potential as a learning tool in that nation. Many

researchers have found some mathematical ideas in Indonesian cultures (Roza et al., 2020), which supports the logical and appropriate use of local culture as a backdrop for teaching mathematics. Traditional games can be used to teach mathematics as part of culture. Research has shown that traditional games can even help students' mathematical comprehension (Luky Atmaja et al., 2021), and they can certainly raise their interest (Aras & Zahrawati, 2021) and drive to learn mathematics (Aguilar, 2021). Including traditional games in mathematics instruction also helps to develop students' communication abilities (Kamid et al., 2022). Therefore, aside from helping mathematics education, the utilisation of classic games can preserve their heritage, which is threatened by different technological advances in the era of digitalisation. These days, many children choose digital or internet games rather than conventional ones. Thus, employing conventional games as educational tools might help educators teach mathematics and expose students to traditional games, preserving their existence. Teachers in Indonesia find it difficult to choose relevant traditional games for arithmetic instruction among the many still in existence. Studies on this subject are thus required to enable teachers to filter what kinds of traditional games they may employ for a certain subject or grade.

3.5 THE ZIMBABWEAN ECD CURRICULUM: A NORMATIVE REVIEW

Teachers' ability to interpret and actualise the ECD curriculum is hinged on the training they receive during teacher training (Ministry of Higher and Tertiary Education, Science and Technology Development [MHTESTD], 2017). In December 2017, the government of Zimbabwe introduced the heritage-based philosophy for teacher education and higher education in general. It is anchored on the belief that science and technology development must revolve around the environment it intends to develop. As such, teachers must be trained to be conscious of the flora, fauna, water, minerals, and human resources endowed in Zimbabwe. Once teachers are conscientised of this heritage during their training, they will transfer the same knowledge to the level of learners. This heritage-based philosophy is widely known as Education 5.0, because it has five pillars: teaching, research, community development, innovation, and industrialisation. The teaching component emphasises the use of the local environment as a teaching tool. Any language can be used in teaching to improve the local environment as a teaching tool or improve the understanding of concepts. Then, the research component encourages students to discover new things because

new ideas are a product of research and development. The community development component seeks to improve the educational community, and the innovation component seeks to bridge the knowledge generated in class, laboratories, and industrial production. The industrialisation aspect focuses on producing certified prototypes at a large scale in industries. It is believed that if teachers are trained under this philosophy, they will inculcate the same in learners from a young age. How does this philosophy relate with the current Zimbabwean ECD curriculum?

The introduction of indigenous cultural games in the 2015-2022 curriculum framework in Zimbabwe was intended to help transform and contextualise mathematics teaching and locate it in the social domain of the child. The curriculum preceding the 2015–2022 curriculum mentioned only that play-based activities can be used in the teaching of EGLS, but did not specify the type of play. So, the new defining feature of the 2015-2022 and 2024–2030 curriculum frameworks spelt out that cultural games can also be used as teaching tools. Specifically, Section 8.1 of the revised competency-based curriculum specifies that mathematical play can be used to edify teaching of the following concepts: matching objects and pictures, classification, ordering, pre-number skills, shapes, patterns, measuring, volume, money, mathematical language, and time. This curriculum framework was replaced by the Heritage-Based curriculum Framework 2024–2030. The revised curriculum incorporates arts, culture and heritage as essential components of a comprehensive education system. Secretary's circular No. 9 of 2024 on school-based project learning for the Heritage Based Curriculum Framework (HBC) for Primary and Secondary Education 2024-2030, on Section 1.1 stipulates that this new curriculum is built on the strength of the competency-based curriculum and fosters the acquisition of 21st century competencies (Zimbabwe Heritage Based Curriculum 2024-2030). Thus, the HBC replaces the 2015–2022 curriculum framework, addressing gaps and modernising primary and secondary education. It emphasises a learner-centred approach, practical skills, and a deep connection to Zimbabwean heritage. The 2024-2030 Curriculum further states that multi-dimensional pupil-centred learning strategies shall be used to enable pupils to acquire the targeted knowledge, skills, values, and positive dispositions in their various learning areas. On page 18 of the HBC Framework, the teacher is urged to be creative and innovative to develop appropriate teaching and learning materials under each approach to ensure acquisition of the targeted knowledge, skills, values and aptitudes.

The curriculum's thrust is to ensure learners are able to produce goods and services for self, family, community, and nation, singing our tangible and intangible heritage. So, the curriculum is very clear on the mathematical concepts that early learners must be taught, and that play-based activities (including cultural games) can be used as teaching tools. However, it does not provide a step-by-step process on how play activities can be used to impart mathematical knowledge. As such, there is no hard and fast rule regarding how cultural games and other play activities can be used as teaching tools. So, it is the teachers' discretion to use this playing activity the way they deem necessary or understand. Considering this pedagogical gap, this study examines teachers' experience (that is, challenges and benefits) and teachers' views (that is, their knowledge, attitude, and perception) towards using cultural games as tools for teaching early-grade mathematics. This will go a long way in providing a comprehensive overview of cultural games as teaching tools and proffering a conceptual model informed by the curriculum provisions and views and experiences of daily users of the curriculum.

It is important to examine teachers' views and experiences in their interpretation and actualisation of the ECD curriculum. The updated curriculum emphasises that children learn through play and not through direct instruction; Section 4.1 provides as follows:

> *The syllabus, therefore, is based upon a* ***child-centred approach*** *to ECD. In other words, the pace of learning will be determined by the individual child's readiness to absorb a concept or master a skill, not by a teacher-centred timetable. Teachers should provide* ***stimulating environments*** *that allow the child to build on his or her existing knowledge, skills and experiences through* ***enjoyable exploration and experimentation*** *that lead to effective learning. The activities should lay a solid foundation for lifelong learning by promoting a positive attitude to the process of learning. To enhance understanding of concepts, teachers should use real objects first before exposing the learner to pictures of objects. Activities should involve learners, including those with special needs. It is essential that the atmosphere of the ECD class is positive, gentle, supportive and accommodates individual differences. Discipline needs to be achieved not by punishment but by careful application of natural and*

> *logical consequences that are respectful in their application, clearly related to the issue at hand and reasonable. The activities described in the syllabus content matrix and assessment guide should be communicated in the* ***language best known to the child****.*

Key issues emanating from Section 4.1 of the ECD curriculum are: (1) The use of a child-centred approach that emphasises the growth patterns of children; (2) emphasis on the catalytic role of teachers through directing, observing and modelling; (3) enticing learning using reasonable means such as play-based activities to capture the attention of learners; and (4) use of native language where possible to help learners master concepts, because most learners absorb more when they are instructed using their native language than a foreign one. So, the curriculum provides an overview of the approach that can used to give a general guide to teachers. However, it does not show how individual games can be used since there are several that can be used in practice. This, then, calls for teachers to choose appropriate games that can help learners absorb and master mathematical concepts easily.

Complementary to the Secretary's Circular 14 of 2004, which sets the guidelines for the establishment of ECD centres in Zimbabwe, Statutory Instrument [SI] 106 of 2005 expanded on the guidelines. Specifically, SI 106 of 2005 mandates the use of the Local Language (L1) as the instruction medium at the foundational level. This guideline is reflected in the updated ECD curriculum, which states that teachers must communicate in the language best known to the child, in this case, the child's native language. This makes it easier for teachers to use cultural games effectively as tools for imparting knowledge since most of the games are in a vernacular language. Section 3.6 examines the most widely used cultural games and assesses their conceptual orientation regarding early-grade mathematics. This review is very important because, as far as it can be ascertained, there is a scholarly source that examines Zimbabwean cultural games. Essentially, the next section discusses issues around the most widely used cultural games in Zimbabwe and the value they have in teaching mathematical concepts.

3.6 COMMON CULTURAL GAMES PLAYED IN ZIMBABWE

There are numerous cultural groups and cultural games in Zimbabwe (Mutema, 2014). Some cultural games are exclusive to certain tribes, while others are universal. This study focuses on cultural games played in the Shona culture, whose major sub-groups are identified as Hera, Zezuru, Korekore, Manyika (Nyika), Rozvi (Rozi), Tavara (Tawara), Ndau, and Kalanga (Western Shona), Karanga (Southern Shona) and Ungwe. The 2022 census report revealed that Shona is the dominant tribe in Zimbabwe, and out of the 16 official languages in the country, the Shona-speaking people account for approximately 80% of the population (ZIMSTATS, 2022).

In Zimbabwe, each society has a distinctive cultural and social identity that is peculiar to it. The uniqueness and identity of a community are reflected in its traditional games and leisure pursuits. Most scholars informed by post-colonial perspectives believe that the modern sports and activities that European settlers introduced when they colonised Africa, specifically Zimbabwe, divorce people from their identity (for example, Berti & Zingari, 2019; Chivuna, 2014; Mutema, 2014). This study is premised on the belief that children in Zimbabwe are, to a lesser extent, engaging in their native traditional games and leisure pursuits in their various geographic locations. In light of this, the formerly cherished traditional games and leisure pursuits risk being consigned to history with scant or no place in the future (Chivuna, 2014).

Since time immemorial, traditional Shona games have been played for entertainment, and children have learned valuable lessons about life while having fun. Some of the games they performed were crucial for their physical growth (since they involve exercising) and honing their cognitive skills. Shona cultural games have been found to teach various social skills, such as sharing, handling and managing conflicts, respecting gender dynamics, and maintaining friendships. Concerning managing gender dynamics, games that involved simulating fighting, hunting, climbing, and jumping were exclusively reserved for boys. Contrary to that, games such as *"*mahumbwe/matakanana" (socio-dramatic play), "pada" (hopscotch), "nhodo" (pebble play), "dunhu" (throw and dodge), "mafurawu", "raka-raka", and games that required playing with dolls, childcare, and nurseries were reserved for female players. Then, games such as "hwishu" and "tsoro" are gender-neutral and can be played by both

boys and girls. It can be deduced that cultural games embed expressive and communicative behaviour that is present in all cultures and is shared by all people.

It has been argued that cultural games are not only about running; they also meet the needs for conceptual understanding, personal and social growth, and problem-solving and motor skills (Berti & Zingari, 2019; Restati Siregar & Iiham, 2019). Berti and Zingari further argued that the intensity of good feelings was higher in cooperative games and lower in individual games, demonstrating their role in bringing people together. Back then, young children would congregate in open spaces in the mornings, late afternoons, and early evenings to run around, jump, roll, shout, and enjoy their favourite songs and dances. They occasionally competed against one another in straightforward games that rely on chance or probability and call for minimal to maximal physical effort.

The children's ingenuity and rivalry were centred on inexpensive items that could be found strewn across the homesteads and in the surrounding bush. As such, cultural games are built on inclusivity because children from low-income families can easily access them since they largely rely on low-cost game aids when compared to contemporary video games (Restati Siregar & Iiham, 2019). Despite the positive contribution of cultural games, modern video games are increasingly preferred over their traditional counterparts, and this partly explains why indigenous knowledge and recreational activities are gradually dwindling. Another major reason for the decline in the use of cultural games in education is the extremely rigorous school curriculum, which virtually eliminates all the children’s free time (Chivuna, 2014). The current video games and other foreign play patterns have mainly supplanted the old games that young children used to play.

There is an urgent need for the rediscovery, promotion, marketing, and preservation of Indigenous traditional games, which are an important component of local ethnic and national heritage, to address this changing pattern. This study seeks to discover teachers’ views on using cultural games to teach early-grade mathematics, drawing from teachers’ experiences. Teachers are examples of how children live while they are still tied to their past and mirrors of how children think and feel (Chivuna, 2014). Therefore, if these games are not maintained, a piece of our past perishes. The rest

of this section conceptually examines the most widely played games at the foundational level in Zimbabwe to foreground the discussion on teachers' views. This examination seeks to provide a descriptive summary of individual games and mathematical concepts entrenched in individual game characteristics for the interest of non-Shona-speaking people and conceptual clarity. Specifically, five games are discussed; "tsoro", "nhodo", "pada", "hwai huyai", and "dunhu".

3.6.1 Tsoro Defined

"Tsoro" is normally played on a level platform, either on the ground or a wooden board. On the platform, a rectilinear pattern of 24 holes or circles is marked to form a 6 by 4 grid, each circle with a diameter of about 8 to 10 centimetres and a depth of about 4 centimetres. Before starting, each hole must contain 2, 3, or 4 counters (mostly stones), depending on what the players agreed upon. The gameplay involves players shifting a set of stones from one hole to the one directly across from their opponent. So, the first player selects any hole from their side, collects all the counters in it, and distributes them one per hole in succeeding holes, moving in a consistent direction (either clockwise or anti-clockwise) throughout the game. If the last seed falls into a non-empty hole in the outer row, the player collects all the seeds in that hole and redistributes them. But, if the last seed falls into a hole in the inner row, the player captures all the seeds in their opponent's two holes in the same column and redistributes them. This allows the player to gather stones from the opponent's adjacent holes and add them to their own.

A player's turn ends when the last stone falls into an empty hole, and the other player comes in. The game continues with players alternating turns until one player removes all of their opponent's counters, thereby winning. So, "tsoro" requires careful calculation and strategic planning, so it teaches players to develop patience and foresight. It also has recreational value and encourages interaction between players of different ages and gender orientations. The game fosters counting in multiples of 2, 3, 4, and so on, depending on the number of counters assigned to each circle or hole at the beginning. Because of the underlying structure, "toro" promotes communication and understanding among children, thereby teaching teamwork. This is particularly evident when players collaborate to build the board or search for counters. Spectators can participate by advising and cheering the players, further fostering cooperation.

3.6.2 Tsoro Through the Lens of Mathematics

By its nature, “tsoro” indirectly helps young children learn and practice seven mathematical concepts. Firstly, the game involves counting the number of stones in each hole and keeping track of the stones collected. This reinforces the idea of *counting and number sense*. Secondly, as players gather or lose stones during the game, they constantly reduce and increase the number of stones in each hole, thereby practising *addition* and *subtraction.* Thirdly, the game fosters counting in multiples of 2, 3, or 4, which is a fundamental concept in *multiplication.* In this case, multiplication can be viewed as a shortcut to addition, so long as it is done in specified multiples. Fourthly, their spatial awareness is awakened by the board's layout or orientation and the holes' relative positions. This forms the basis of *geometry*, the study of shapes, their properties, and objects in spaces. Fifthly, the consistent direction of counter distribution (either clockwise or anti-clockwise) throughout the game introduces children to *sequences and series,* that is, the study of number patterns. Sixthly, players are somehow forced to analyse the chance or predict the likelihood of successfully capturing their opponent’s counters based on their actions. Although not explicitly exposed to measuring the chance of something happening, players may start to develop an intuitive sense of *probability.* Seventhly, deciding which hole to choose for distributing stones requires *problem-solving skills* and strategic thinking, key components of higher-level mathematics. This analysis has shown that “tsoro” possesses a realistic opportunity to expose EGLs to the fundamentals of mathematics, which, when formerly introduced at later stages of academic life, learners will find easy to embrace, especially predictive analysis embedded in probability.

3.6.3 Nhodo Defined

Just like “tsoro”, “nhodo” is played on a level platform using anything from 10 to 20 pebbles placed in a circle or shallow hole. This cultural game begins with players, ranging from two to five sitting around the circle. Each player has their spherical pebble (slightly bigger than the ones in the circle), known as the “mubhoga”. The game aims to eliminate all the pebbles from the circle over ten stages. In the first stage, known as “mamu bodzi”, a player tosses their “mubhoga” into space and drags more than one pebble out of the circle before catching the “mubhoga” in mid-air. Then, the player tosses the “mubhoga” again and drags all the pebbles back into the circle, leaving one

behind, signifying stage one. This lone spherical pebble is kept aside, and the process is repeated until all ten stones are removed from the circle. Upon completing stage one, the player advances to stage two, referred to as “mamu piri”.

The process is similar to stage one, but this time, more than two pebbles are dragged out of the circle, leaving two behind when returning the extra ones. If a player drops their “mubhoga” during their turn, they forfeit their turn to the next player. The new player starts from stage one but continues from where the previous player left off. If all pebbles in the circle are cleared, players who have previously eliminated pebbles must return them to the circle. Players must be careful when dragging out pebbles. They lose their turn if they fail to drag out the minimum number required for that stage or overshoot the circle. Similarly, if they fail to leave the minimum number of pebbles outside the circle, they also forfeit their turn. The game continues this way, with players advancing through stages and eliminating pebbles until all are removed from the circle. The winner is the first player who completes all ten stages.

3.6.4 Nhodo through the Lens of Mathematics

Conceptually, “nhodo” provides six lessons to players. Firstly, the game sets a good foundation for understanding *counting* and *number sense*. This is so because it involves counting the number of pebbles, keeping track of the stages, and understanding the concept of more than one or two. Secondly, players’ ability to subtract or reduce is sharpened through counting and elimination. This is supported by the fact that the process of eliminating pebbles from the circle can be viewed as a subtraction operation. For example, if there are ten pebbles and a player removes two, eight are left in the circle. Thirdly, the multi-stage nature of “nhodo” helps players understand the concept of *sequences* and *order.* Fourthly, sequences feed into the understanding of *patterns* and *algebra.* Each stage requires dragging out one more pebble than the preceding stage. This can lead to a sense of simple algebraic patterns. Fifthly, successful completion of all the stages revolves around one’s ability to estimate the distance to drag out pebbles without overshooting the circle. This game’s attributes reinforce the concept of *spatial awareness*. Sixthly, “nhodo” instils some elements of predictive analysis because it enables players to predict the likelihood of completing a stage based on their actions. Although not explicitly exposed, players may start to

develop an intuitive sense of ***probability*** in their quest to predict the chance of completing the game.

3.6.5 Pada Defined

“Pada” is akin to hopscotch, involving two or more participants playing on a court drawn on the pavement using a rock patch. Each player begins the game with box one as their initial target. A player propels a rock patch into the designated target box during their turn. The rock must land precisely within the confines of the target box; failure to do so results in the termination of the player’s turn, and they must await their subsequent turn to attempt again. If the rock successfully lands within the target box, the player navigates through the pattern of boxes to return to the starting point. This process involves hopping on one foot without placing both feet in the same box or stepping on a line. Any violation of these rules leads to the end of the player’s turn, and the game proceeds with the next player. The player repeats the process after successfully retrieving the rock from the higher box. The objective is to recover rocks from each box in the pattern sequentially. The game continues in this manner until one player successfully retrieves rocks from all boxes according to the pattern.

3.6.6 Pada Through the Lens of Mathematics

Since “pada” can be likened to hopscotch, it helps players learn and practise five mathematical concepts. Firstly, the game involves counting the number of boxes and keeping track of the sequence of boxes; as such, it sharpens one’s ability in *counting and number sense*. Secondly, the progression of the game is based on sequencing. Since the game is played sequentially, it helps players understand the concept of *sequences and order*. Thirdly, each turn requires tossing the rock patch into the next box in the sequence; reading and observing the pattern is key to the successful completion of the game. This can lead to an understanding of simple *algebraic patterns*. Fourthly, players’ success depends on their ability to estimate the distance to toss the rock patch into the target box and hop through the pattern of boxes without stepping on a line. Such an act improves the player’s *spatial awareness*. Fifthly, *“*pada”, just like “tsoro” and “nhodo”, has connotations of *probability*. Although not explicitly pronounced in the game's attributes, players may start to develop an intuitive sense of measuring chance as they predict the likelihood of successfully tossing the rock into the target box based on their actions.

3.6.7 Hwai-Hwai-Huyai Defined

*"*Hwai-hwai-huyai" [Sheep-sheep-come-over] is premised on the predator-prey relationship using hyena and sheep to mimic the predator and prey. It is usually played in the late afternoon or early evening during autumn to take advantage of the full moon. So, players group themselves into two groups; one pretends to be hyenas, while the other pretends to be sheep preyed upon by the hyenas. The sheep's group would have their mother (a ewe, that is, an adult female sheep) calling the lamb (the young ones of sheep) from afar. So, the hyenas are hidden for the sheep between the ewe and the lamb. The game is structured into a conversation between the ewe and the lamb; it goes as follows:

"Mai: Hwai hwai huyai! Hwai: Tinotya! Mai: Munotyeiko? Hwai: Tinotya mapere! Mai: Mapere akapera kuenda Hwedza, huyai tisangane! Mapere: Humwi-
"Ewe: Sheep, sheep, come over here! Lamb: We are afraid! Ewe: What are you afraid of? Lamb: We are afraid of hyenas! Ewe: The hyenas are not anywhere near, they have gone to Hwedza, a very faraway place, so, come over! Hyenas: Giggle" [also known as hoot-laugh, that is, a sound made by hyenas]

Upon receiving this invitation and assurance that the hyenas have gone to a faraway place called Hwedza, the lamb would run to their mother. Midway through, the hyenas intercept the sheep, and they have to run for their lives. The lamb would run as fast as possible until they arrived at a place of safety where the ewe would be. Those who could not run fast enough are caught, and once caught, one will be knocked out of the game. The game continues until all the sheep family members are knocked out.

Then, the two groups would exchange their roles, with the hyenas becoming sheep and vice versa. The game would continue to rotate until the children are tired because it involves physical exercise. So, this game keeps children fit by allowing them to exercise vigorously. Children learn to evade the enemy by running away from the hyenas that would have intercepted them on the way. They also learn to be constantly vigilant as the hyenas come from nowhere but in all directions. On one end, the ewe learns how to count down (subtraction) as the hyenas knock out lambs. Conversely, hyena participants learn addition as they capture the lambs.

3.6.8 Hwai-Hwai-Huyai Through the Lens of Mathematics

In addition to the concepts of addition and subtraction, the “hwai-hwai-huyai” game can also help children learn and practice four additional mathematical concepts. Firstly, the game involves understanding space in terms of “near” and “far”, as well as understanding direction and distance when running toward the mother or away from the hyenas. As such, it equips the participants with the basic knowledge of *geometry and spatial sense*. Secondly, principles of *measurement theory*, in the context of travel analysis (distance, speed, and time), are instilled in the participants. Specifically, the game can help children develop a sense of time (how long it takes to run from one point to another), speed (how fast they need to run to avoid being caught), and distance (how far they need to run). Thirdly, participants are introduced to the concepts of *data handling and probability*. Essentially, they can learn about data collection and interpretation by keeping track of how many times they were able to evade the hyenas or how many times they were caught. They can also start developing an intuitive sense of probability based on their experiences in the game. Fourthly, rotating roles between sheep and hyenas can help children recognise *patterns.* This idea is strengthened by monitoring how the number of players in the game decreases as players are caught.

3.6.9 Dunhu Defined

The game is designed for at least three participants and is conducted within a predefined area, typically measuring around eight by five meters. At the centre of this area, an empty 1-litre container is placed. The participants are divided into two distinct groups, assuming roles of the “target” and “throwers”. The target stands within the marked space, while the throwers position themselves on the edges of this area, facing each other. The throwers are provided with a softball, which they use to hit the target.

The commencement of the game is marked by the throwers exchanging the ball once without aiming at the target. Following this initial exchange, the throwers begin their attempts to hit the target with the ball. The target's objective is to avoid being hit.

If successful in catching the ball, they must throw it away from the playing area as far as possible. During the ball retrieval by one of the throwers, the target seizes this opportunity to fill up the container with soil. Once filled to its rim, the target continues its evasion of incoming throws while concurrently emptying the soil from the container. Upon complete removal of soil, they signal their victory by banging on the now-empty container up to a count of ten. In case of a failure to dodge and subsequent hit by the ball, the target is eliminated from their position. In such a case, they exchange roles. The game can also be played in teams comprising four or five players each. If a teammate is hit, they are temporarily eliminated until redeemed by their team members, who can do so by filling and subsequently emptying soil from the container up to a count of either 10 or 20. "Dunhu" serves as an effective means to develop and enhance skills such as agility, accuracy, and strategic planning.

3.6.10 Dunhu Through the Lens of Mathematics

Mathematically, "dunhu" is directly and indirectly associated with five mathematics concepts. Firstly, it involves counting up to ten or 20 when the target bangs on the container. This can help children practice *counting and number recognition*. Secondly, it requires players to be spatially conscious, that is, to develop an understanding of space (the eight-by-five-meter playing area) and volume (the 1-litre container). This can help children develop skills in *estimation and measurement.* Thirdly, central to this game is increasing the chance of hitting the target or successfully dodging the ball; such awareness can introduce children to the concept of *probability*. Fourthly, "dunhu" is structured as a sequence of actions (that is, throwing, dodging, filling, and emptying). Understanding and following that sequence can help children understand *patterns and sequences*. Fifthly, filling and emptying the container can be seen as *adding and subtracting* units of volume.

3.6.11 Lessons from Zimbabwean Cultural Games

Zimbabwean culture reviewed in the preceding paragraphs is rich in mathematical content, from which, when capitalised on, EGLs are bound to benefit since they are

fond of games. The repetitive aspect of games allows for consistent practise, which is crucial for understanding mathematics. Fouze and Amit (2018) have noted that children require numerous examples and practice to comprehend mathematical concepts, and cultural games can enjoyably provide these. Despite this richness, there is a dearth of studies explaining why educators are not capitalising on the mathematical richness embedded in cultural games.

Language is a cultural element that binds people together like threads in a cloth. It shapes our communication, relationships, and perception of life patterns. In knowledge transfer, students and teachers use language to express their thoughts. A study by Ball (2010) and Seudib et al. (2020) have concluded that children who learn in their native language are more likely to succeed in school. In Zimbabwe's primary schools, the medium of instruction alternates between English and the learners' native language (mostly Shona since 80% of the population is composed of Shona-speaking people). Using an Indigenous language in ECD centres and infant schools aims to foster cultural identity and facilitate knowledge transfer. Interestingly, all Zimbabwean cultural games are played using their native language. As such, they offer an excellent opportunity for children to learn using their language.

Another key conceptual lesson from Zimbabwean cultural games is that they embed at least four mathematical concepts. Common concepts have been identified as number systems, basics of geometry, sequences, and series, and fundamentals of probability. Much of the real-life facts come in numbers, symbols, diagrams, and graphs. So, exposure to number systems orients EGLs to the types, characters, and behaviour of numbers and enhances their ability to count, add and subtract. Furthermore, all reviewed cultural games happen in spaces and require players to have a spatially designed playing field (using regular shapes in most cases). A significant number of topics in mathematics are hinged on spatial relationships; as such, EGLs' cognitive development through spatial awareness forms a strong foundation for solving real-life problems using numeracy skills. Moreover, doing mathematics involves finding patterns and crafting beautiful and meaningful explanations. So, sequences and series jointly help EGLs to understand number patterns from different perspectives. It has also been demonstrated that Zimbabwean cultural games instil a predictive sense in players in their quest to analyse the

likelihood or chance of proceeding to the next stage in a game or possibly winning based on their actions. Overall, it can be deduced that cultural games provide EGLs with a point of entry into the development of a mathematical mind and a point of departure into understanding complex mathematics concepts later in their academic life. So, what could be the limiting factor in harnessing all these benefits deeply entrenched in cultural games and Zimbabwean indigenous games in particular?

3.7 GAP ANALYSIS: NEED FOR TEACHERS' VIEWS

Early childhood mathematics education is now considered important for children's educational success (Cross et al., 2009). According to Gasteiger and Benz (2018), while early childhood mathematics education has not been considered important for many years, there is now no doubt about the need to pay attention to children's early mathematical learning. This highlights the value placed on early childhood mathematics today (Gasteiger & Benz, 2018). Numerous studies have been conducted on the difficulties experienced by teachers in the early grades while trying to teach mathematics at the elementary school level. Some of the challenges that children experience when engaging in mathematics have been revealed in the foregoing review.

Many supporters of constructivist education based in children's cultural knowledge (Fletcher, 2018; Okyere, 2022) have lamented the development of mathematics education being far from Zimbabwean children's learning patterns. Teachers' acknowledgement of learners' past knowledge and views comes from their design of an environment involving learners physically and intellectually during the learning process. National educational objectives call for education to be pertinent to the learner (MoPSE, 2015, 2024). The teaching and learning philosophy of the present curriculum anticipates that teachers will energise the classroom for learners (Armah, 2021; MoPSE, 2024). Although several studies on indigenous games and teaching are coming out (Bhuda & Marumo, 2021; Fouze & Amit, 2018; Nabie, 2015), few have examined their clear relationship with the Zimbabwean curriculum. Mathematical ideas in our daily life are always employed and visible; teachers overlook the mathematical ideas early grade learners take in when they engage in cultural games. Should teachers stress these procedures, young children will find several mathematical ideas they can acquire during play, the goal of ethnomathematics (D'Ambrosio, 2016). We

think about ratios and proportions, for instance, when we combine materials for cooking and angle measurements for house building.

Armah (2021) contended that Zimbabwe should be mathematically hospitable, supporting our assertion that mathematics is everywhere. Cultural games provide chances, using guided discovery, for daily encounters to educate mathematics. Although most children's games are cultural, there are also other activities besides cultural games that children could do in daily life that also include mathematical concepts. Teachers must, therefore, grasp the cultural background of the early grade learner and then link the instruction of school mathematics to it (Dewah & Van Wyk, 2014). Colonisation and Westernised projects that have significantly affected leisure activities are clearly causing traditional games to disappear slowly (Smith, 2017). The lack of teaching materials in many rural Zimbabwean schools, which undermines good instruction (Madondo, 2020), and teachers' general apathy and ignorance of the significance of traditional children's games for classroom teaching motivated this study.

Some ECD teachers emphasise digital games from Western cultures above traditional children's games. "Traditional games have been carried down for generations since time immemorial and are always connected with the cultivation of norms/rules in socialising or interacting" (Ramayenda, 2020, p. 14). Traditional games are not just played for enjoyment. Traditional children's games and songs are essential components of IKS. Though their names vary based on communities or locations, they are alike in character (Tatira, 2014). Experience and observation as a classroom practitioner have revealed insufficient knowledge among the caregivers of the benefits of utilising cultural games, particularly for the untrained caregivers and inexperienced caregivers recently from the college. In the learning and instruction of ECD B classes, traditional cultural games seem not to be used efficiently for the children to develop holistically. Especially now that the new games have come from Western culture and those on toy cellular phones, computers, and video and television games, it seems that old cultural games are being eroded.

In their daily lives, pre-schoolers encounter mathematical concepts unknowingly and unwillingly. These experiences are occasionally created by participating in play where

they either add, subtract, or count. It has been revealed that teachers have a crucial role in early-grade learning, particularly in designing a mathematical educational process suitable for EGLs and embracing the mathematical experiences of children acquired in non-formal settings. Furthermore, it has been revealed that teachers do not use effective methods in introducing mathematics at the foundational level, which is partly explained by the fact that they continuously underestimate the value of IKS as a point of entry into mathematics. Clements and Sarama (2020) claimed that teachers rarely know how difficult it is for young children to understand mathematical concepts. This difficulty can be traced to three key sources: the educational process, the teacher, and the children themselves. These sources cannot be easily separated from each other, as explained by the CHAT. Still, several sources have concurred that evidence about the role of the other factors is overwhelming. However, there is limited knowledge of educators' perspectives on the subject under review, yet educators are responsible for translating the curriculum into a learning process.

Since mathematics can be seamlessly incorporated into children's plays, the teacher must provide a supportive environment, as well as tasks and ideas. According to Clements and Sarama (2020), games that the instructor is involved in and has planned fall under the category of instructional or pedagogical plays, and they promote sound learning. One defining feature of pedagogical plays is that they occasionally allow EGLs to discover when the teacher introduces them to materials and processes (Cutter-Mackenzie & Edwards, 2013). So, guided plays enable an efficient interactive process between learners and the teacher, where the teacher serves as a planner, observer, and modeller. In light of this, it can be claimed that teachers' resources and methods of communication awaken children's experiences. From a social perspective, mathematical thinking develops before language, implying that children may easily understand mathematical concepts before applying them. As such, teachers must smoothen how learners communicate.

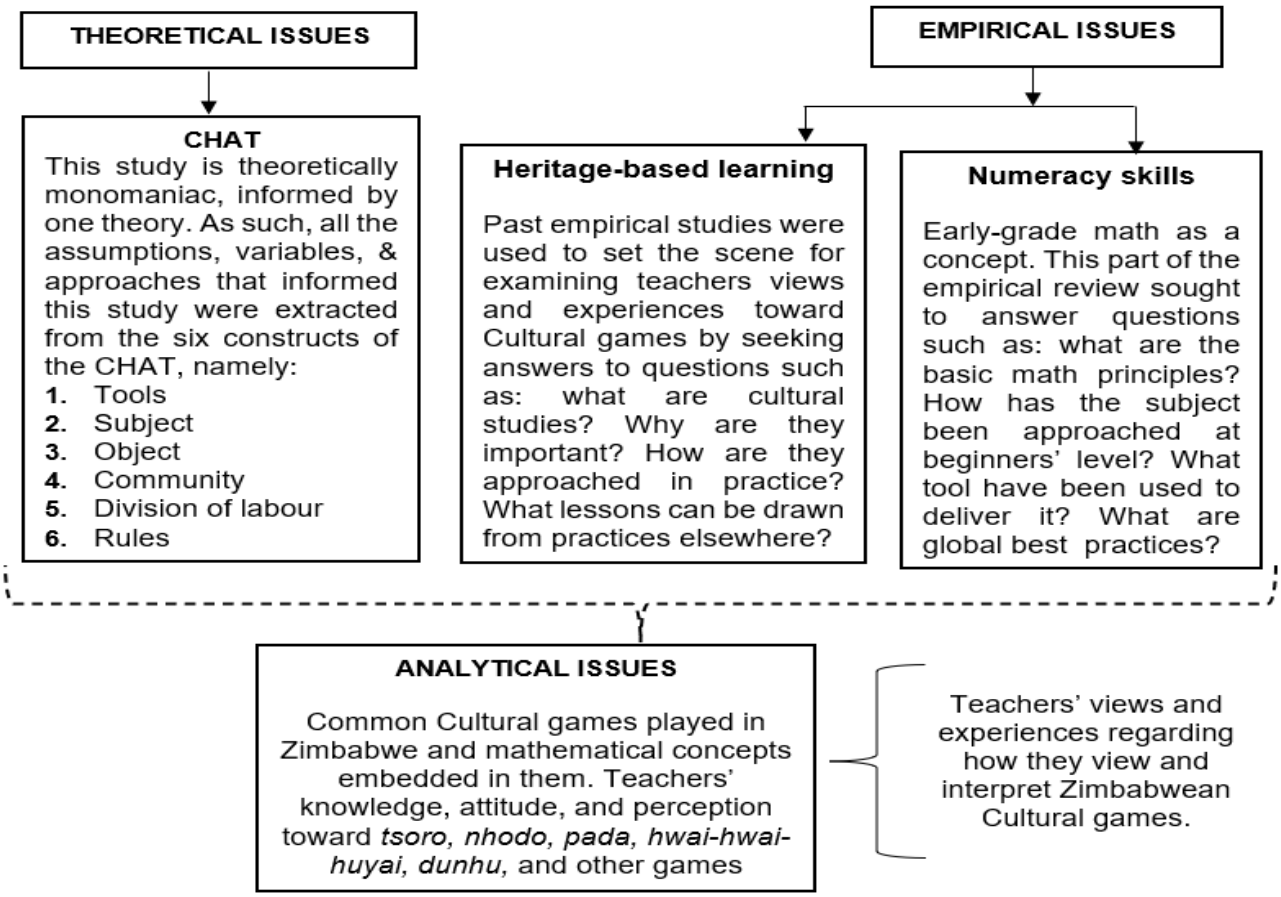
Since much of the revealed evidence revolves around shaping learners' communication, it can be claimed that young children communicate the most during cultural games. As such, early childhood educators can use a play repertoire to further children's knowledge of mathematics. Games and other play-based settings for mathematical instruction must be provided to manage and support the teacher

education process effectively (Trawick-Smith et al., 2016). While children engage in cultural games, teachers must speak clearly and act as competent observers. The way that teachers incorporate culture into their lessons has an impact on how well EGLs do academically since children's mathematical thinking and use of mathematical language are both significantly influenced by play (Trawick-Smith et al., 2016). The core findings of this review are threefold; theoretical, conceptual, and analytical. The first set of findings relates to the CHAT whilst the second is inclined to the cultural games as it relates to the teaching of mathematics, and the third relates to the common games played in Zimbabwe since it has been revealed that cultural games are unique to a particular group. So, a review of the most widely played games in Zimbabwe sets the scene for the discussion of teachers' views and experiences with them. Figure 3.1 provides a schematic summary of lessons drawn from previous studies by others.

Overall, the theoretical, conceptual, and empirical reviews reported in the preceding paragraphs have shown that there is a global consensus that EGLs do much of their learning through play, and these plays are culturally skewed. It has also been shown that educators have the sole role of translating global and national education policies into learning processes. This responsibility includes incorporating indigenous cultural games in mathematical learning at the foundational level. So, three questions must be answered in total to change the narrative around the nexus between cultural games and early-grade mathematics: the *what* question (giving a general description of what is expected of teachers): The *why* question (giving reasons for doing so); and the *how* question (giving procedural steps that must be followed in using such approaches). However, accessible literature has managed to provide answers to the what and why questions but does not provide satisfying answers to the how questions. Against this background, this thesis is one of the first to examine teachers' perspectives on the use of cultural games with the view of developing a procedural conceptual model for teaching early-grade mathematics using cultural games in Zimbabwe. Generally, African cultural games explored in this paper develop logical thinking, numeracy, problem-solving skills, measurement and spatial reasoning.

Figure 3.1

Summary of Literature Review



(Researcher's elaboration, 2024)

3.8 CHAPTER SUMMARY

The last segment has reviewed literature on cultural games and early-grade mathematics and briefly outlined Zimbabwean native games and the mathematical concepts embedded in them. Analytical and empirical perceptions of cultural games have indicated that most accessible studies are devoid of teachers' views and experiences regarding the use of cultural games as teaching tools. The forthcoming chapter gives an in-depth scrutiny of the approach adopted for this study. Issues relating to research philosophy, data collection, study design, and analytic instruments will be discussed. Indications will also be made to issues related to transferability and confirmability of study discoveries and lessons obtained during the data collection and analysis.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1 INTRODUCTION

In the preceding chapter, I reviewed accessible literature on the nexus between cultural games and the teaching of early-grade mathematics. The review expanded the statement of the research problem stated in Section 1.4.1 and clarified the gap that this study intends to fill: the need for teachers' views regarding teaching early-grade mathematics using cultural games as one of the teaching tools (see Section 3.7). This chapter frames the research approach and design adopted for this study. It answers six questions: what, why, where, how, who, and when data feeding into the conceptual model for infusing cultural games into the teaching of early-grade mathematics was collected, collated, presented, and analysed. The assembling of current, reliable, and relational data about teachers' perceptions, attitudes, and knowledge on the use of cultural games in teaching early-grade maths seeks to generate knowledge. More importantly, the answers to the six questions hinge on my global views regarding what constitutes acceptable knowledge. Such views and beliefs are deeply entrenched in the research paradigm and philosophy. The forthcoming discussion on the research philosophy sets the scene for the discussion on the research design, data sources, and sampling procedure, data collection methods and analytical tools I used, and how I upheld and handled elements of data quality and ethical considerations.

4.2 PHILOSOPHICAL AND PARADIGMATIC PERSPECTIVE

Overall, research philosophy creates boundaries and principles on how research should be conducted, and a paradigm defines the boundaries of how a study is structured and how its components function (Kivunja & Kuyini, 2017). In the same line of argument, Hartell and Bosman (2016) and Nieuwenhuis (2016) explained that a paradigm clarifies researchers' thinking about what will be studied, how the study will be carried out, and how it will be understood. Following this guide, the research paradigm offered me organising principles or a lens through which I viewed reality and helped to clarify the assumptions that guided me in carrying out this study. Considering the nature of the research problem, the absence of teachers' views (specifically, their perception, attitude, and knowledge) on the use of cultural games as teaching tools in imparting early-grade mathematics, I used the interpretivism philosophy to create

knowledge from the perspective of the participants (in this case, teachers). According to Denzin and Lincoln (2018), interpretivism, also known as constructivism, is premised on the belief that reality is fundamentally produced, and the researcher's job is to interpret it from the perspectives of the social actors who helped create it. It is, therefore, a form of inductive research that focuses on understanding the subjective meanings that individuals or groups ascribe to a social situation in its natural setting (Braun & Clarke,2013; Denzin & Lincoln, 2018; Maree, 2015). The merit of such an approach is that the researcher understands participants' points of view in their contexts and their voices (S. J. Taylor et al., 2016).

I analysed, comprehended, and interpreted a particular social reality during the study. So, the resulting information gave me a thorough comprehension of the participants' subjective viewpoints (Cohen et al., 2010; Creswell & Creswell, 2018; Maree, 2015). Overall, interpretivism partly enabled me to examine the relationship between cultural games and early-grade mathematics from the viewpoint of teachers. So, I framed this study using the four philosophical pillars Denzin and Lincoln (2018) identified: epistemology, axiology, ontology, and methodology. According to Denzin and Lincoln, epistemology focuses on whether knowledge can be generated objectively or subjectively, and axiology considers judgements of value that guide choice among various alternative steps in the process of social enquiry, while ontology looks at the nature of knowledge and phenomena as to whether they exist objectively or subjectively. Methodology focuses on how the ontological difference between social phenomena should be taken into account when conducting research. How these four pillars are used to shape a given study was interestingly summarised by Berryman (2019), who claimed that:

> *"Research and cooking are not as dissimilar as one might think. The vegetarians' kitchen may look a lot like the omnivore's kitchen, but open the cupboards and the refrigerator or look in the recipe files, and the differences will soon be apparent. The two cooks will define the world of edible food quite differently. Each carefully chooses recipes, ingredients, and cooking methods that fit his or her view of 'good' food well prepared."* (Berryman, 2019, p. 272)

The analogue of food used by Berryman to explain philosophical pillars shows that research, in its totality, is meant to generate knowledge. Still, the process of knowledge creation is not universal and thus debatable. Sections 4.2.1 to 4.2.4 detail how these four pillars shaped this study.

4.2.1 Epistemological Assumptions

The interpretive paradigm is premised on the belief that epistemology is the conviction that knowledge is arbitrary because it is a product of social construction and the mind. In line with this belief, the human experience is the source of truth. Therefore, although some realities may be universal, claims about what is true or wrong rely on culture, history, and context, as was explained in the CHAT (see Chapter Two). In my inquisitive attempt to understand teachers' views on using cultural games in teaching early-grade mathematics, I gathered this knowledge from the teachers' experiences. In this study, epistemology guided me in describing how I came to know the views of subjects (Cooksey & McDonald, 2019). As such, epistemology proved important as it enabled me to establish my faith in the data. Scholars such as Mertens (2019) asserted that knowledge is grounded on contexts and individuals unrelated to the researcher. In line with this assertion, the data collection process helped me improve my understanding of how teachers felt about using cultural games in teaching mathematics at a foundational level. One classical scholar, Glaser and Strauss (1967), whose ideas were extended by Cohen et al. (2018) and Braun and Clarke (2013), explained that this method of knowledge creation is known as grounded theory in interpretivism. To comprehend teachers' viewpoints from their perspective, I used inductive reasoning, that is, drawing general conclusions from specific cases.

4.2.2 Ontological Assumptions

Scotland (2012) underscored that the assumptions that researchers make to believe whether something makes sense or is real are underpinned by ontology. For example, the positivists' assumption that pre-existing knowledge and reality are waiting to be discovered (Denzin & Lincoln, 2018) is rejected by interpretivists, who hold that people construct truth in their interactions with others and attach meanings to it. Similarly, Creswell and Creswell (2018), Mertens (2019), and Neuman (2014) hold the view that knowledge is socially constructed. So, ontology played a key role in shaping my assumptions about the nature of reality in the teachers' use of cultural games in

teaching early-grade mathematics. The central ontological question of this study reads, *"Does the knowledge, attitude, and perception of teachers explain their level of incorporation of cultural games in their pedagogical approaches?"* Since interpretivism is premised on the belief that humans do not discover reality; rather, they socially construct it, I compiled teachers' views regarding the use of cultural games in teaching early-grade mathematics. This positionality is instrumental to understanding how I made sense of the data I collected. These presumptions guided my thinking about the problem, its importance to teachers and learners, and how I could contribute to its solution. Throughout the study, I believed that reality is dependent on imagination and social or personal constructs (Denzin & Lincoln, 2018; S. J. Taylor et al., 2016). According to Tuner and Baker (2019), subjects (teachers or educators) should be able to solve their difficulties and get meaning from their surroundings by rearranging their pedagogical strategies for teaching early-grade mathematics and enhancing their skills using locally accessible Indigenous systems such as cultural games.

4.2.3 Axiological Assumptions

Creswell and Creswell (2018) have argued that the ethical concerns that must be considered in preparing an investigation are deeply entrenched in axiological assumptions. Since this study leans on interpretivism, ethical considerations were central to the research process because knowledge is subjective, and reality is mind-constructed. Social inquiry is also value-bound and value-laden (Kivunja & Kuyini, 2017). So, I was guided by and upheld ethical considerations whose finer details are given in Section 4.9. Briefly, I asked the participants to sign consent letters to guarantee that they engage while fully understanding their rights. Then, guided by the fairness criterion, I treated all research participants fairly, and I upheld their rights (Nieuwenhuis, 2016). I also informed the participants that participating in group interviews was completely optional and that they had the right to revoke their consent and withdraw at any time. Participation in this study carried no psychological, bodily, or social hazards; rather, it helped participants improve their pedagogical abilities in teaching early-grade mathematics. I confidentially kept the generated data, and I assured the participants that I would use the study outcomes for the generation of academic and professional reports and other publications. Overall, every participant received respect and equal treatment without favouritism, or discrimination, or exposure to harm.

4.2.4 Methodological Assumptions

In this study, I learned about social reality guided by methodological assumptions (Cohen et al., 2018). Leaning on the interpretive paradigm, the interactions and the application of inductive research techniques helped me make sense of social actors' subjective meanings (Willig, 2013). Through group interviews and naturalistic observation, I connected with teachers and observed them instructing using cultural games in their natural environment. I was also guided by Mertens's (2015) advice to get a variety of perspectives on using cultural activities to teach early-grade mathematics; personal engagement is hermeneutical and dialectical. So, to learn about the varied viewpoints of the study participants, I used probing, follow-up, and clarifying questions to learn their diverse perspectives on the research issue. In particular, I captured teachers' opinions using open-ended questions to allow them to share their experiences (Creswell & Poth, 2018). I conducted the inquiry strategically, taking a flexible and open-minded approach and paying particular attention to the shifting circumstances, backgrounds, and situations in early-grade courses to be consistent with the philosophical perspectives already considered.

4.3 RESEARCH DESIGN

Using the analogue of a building plan, Saunders et al. (2016) noted that a research design takes the form of a plan where the architect starts with an end in mind based on their philosophical alignment. To come up with a functional design, an architect needs to know the purpose and type of building, its uses and users, and the site where the building is to be constructed. This is important because all these issues have a huge bearing on the nature of the design. Creswell (2021) and Creswell and Clark (2017) have concurred that a research design is a plan that details the research strategy, research choices, and time horizons, guiding how the research problem will be transformed into a research project.

The research plan of this thesis was twofold. This study officially started in January 2021, but the first leg of the plan was approximately four years, from January 2017 to September 2020, before the onset of the study. During this period, I started my Teaching Practice (TP) supervision of ECD student teachers in schools around Seke Rural and Seke Urban. I was given this task in my capacity as an ECD lecturer at Seke

Teachers' College (STC) in January 2017, and I later moved to Zimbabwe Ezekiel Guti University (ZEGU) in 2018, where I assumed the same role. While at ZEGU, I continued to supervise students in the Seke District and surrounding areas and noticed young children engaging in cultural games rich in mathematics concepts during their free time. Surprisingly, these games were not being incorporated into the classroom activities. This observation ignited my interest to read more, study more, and possibly write more about using cultural games as a numeracy teaching tool. So, in 2020, I applied for a place at the University of Pretoria (UP) to carry out a doctorate study based on my observation during TP supervision and was admitted in September 2020 for the 2021 academic year. This was followed by the second leg of approximately four years, from January 2021 to August 2024, after the onset of the study.

During the first two years of the second leg (January 2021 to November 2022), I sorted ethical clearance issues and conducted a literature review simultaneously. Following my admission in September 2020, my study's working title was officially approved in January 2021, and I successfully defended my research proposal in February 2021. Then, I obtained my ethics certificate in September 2022, which I used to apply to the MPSE for permission to collect data in public schools, and I was granted permission in November 2022. While sorting out clearance issues, I emphasised expanding the knowledge gap by reviewing theoretical, empirical, and methodological issues in the literature. This helped me extract study variables and assumptions and select relevant research methods based on lessons I extracted from past studies by others. In consultation with my supervisor, I also used the first part of the second leg of my research plan to develop a review manuscript, which I have yet to send for publication consideration in peer-reviewed journals. During the second part of the second leg, which lasted approximately half a year, I collected primary data using qualitative methods. Then, in the final part of the second leg, of approximately one and half years, I worked on data analysis to derive insights from gathered data and put the thesis together based on the structure presented in Section 1.11. During this stage, there were numerous back-and-forths with my supervisor, and this helped me shape my thesis to its current state

I used the case (situational) study and qualitative methods in terms of strategies. For the case study strategy. I drew data from the Zimbabwean foundational level teachers

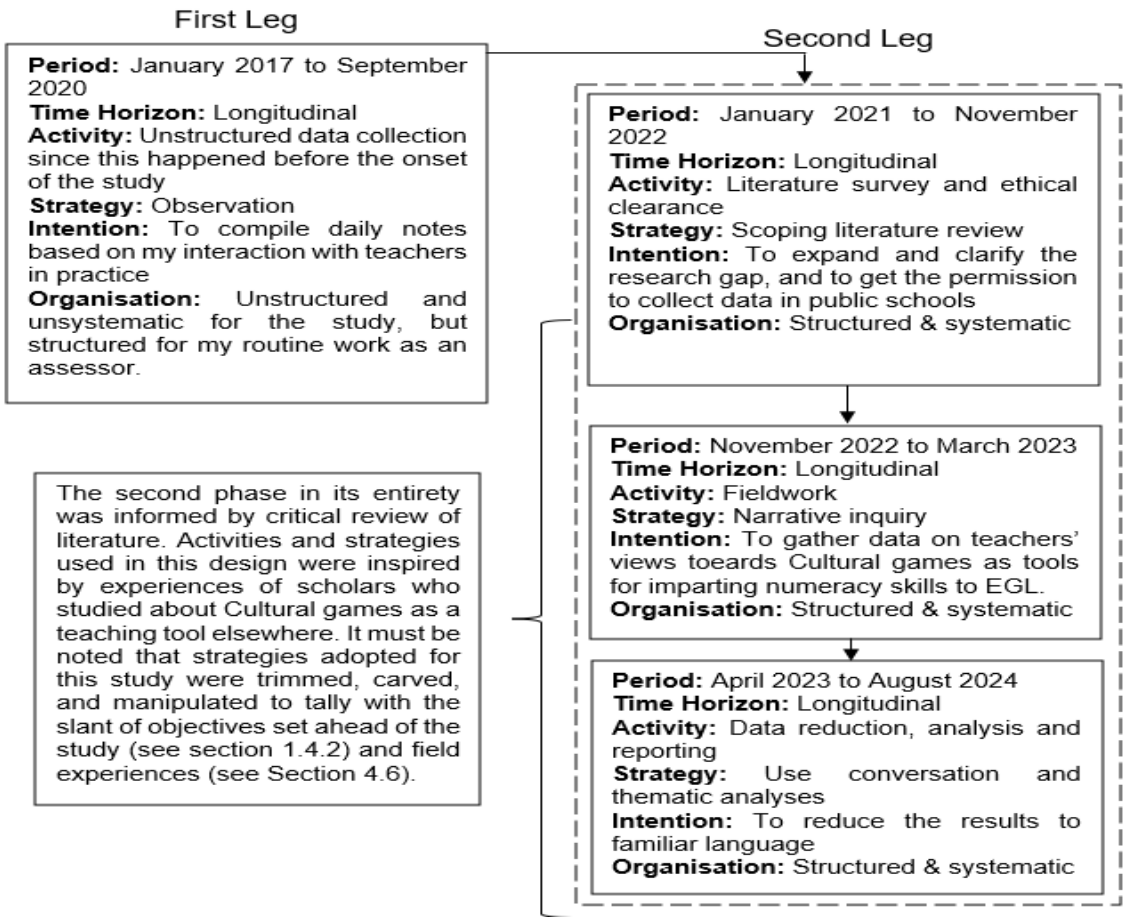
on the reasons why and how they were selected, which are given in Section 4.5. According to Saunders et al. (2016), the case study strategy enables the researcher to gather extremely rich and detailed data characterising a particular group of people or country because of its specific, focused structure. Situational studies can be categorised using two discrete dimensions: single versus multiple cases and holistic versus embedded cases (Yin, 2018).

Using the first dimension, a single case study focuses on one case only and aims to reveal peculiar issues, whereas multiple case studies focus on similar but not identical cases. I used multiple cases in this study because I collected data from ECD teachers drawn from three different schools. The use of multiple cases offered the scope for cross-examination of issues between and within cases and the generalisation of study findings (Hunziker & Blankenagel, 2021). Concerning the second dimension, it has been observed that a holistic case involves studying selected case(s) in total. In contrast, an embedded case has a bias toward studying particular section(s) within the selected case(s) (Yin, 2018). This study was embedded because I only gathered data relating to teachers' experiences in mathematics teaching using cultural games. Overall, I used three schools' multiple-embedded case study strategies to answer research questions.

After that, I gathered primary data using qualitative methods within the multiple case study. I gathered opinions of early-grade teachers on the use of cultural games in mathematics instruction. I had to get teachers to narrate real-life situations and interpret them (Algozzine & Hancock, 2016; Starman, 2013). I was able to build a full grasp of the issue using numerous cases (Yin, 2018). Specifically, the qualitative methods helped me gather participants' views on the subject under study. Then, I gathered secondary data (both qualitative and quantitative) from accessible documents and literature to examine the state of knowledge and agenda for further research. It has been opined that research strategies should not be thought of as being mutually exclusive (Saunders et al., 2016). As such, a study can use more than one strategy. A summarised version of the explained research design appears in Figure 4.1, which outlines that, in terms of time frames, the research plan was divided into two phases.

Figure 4.1

Research Design in Summary



(Researcher's compilation, 2023)

The second phase was split into three sub-phases: the two main tiers are conceptualisation and data gathering, and the last tier is data reduction, analysis, and reporting. The last tier of the second part is expanded in Section 4.7. It is crucial to note that strategies adopted in the second phase were largely informed by the lessons obtained from the literature review. The next section summarises how I translated the research plan presented in this section into a research project, from observation to conceptualisation and from data collection to data analysis, and how I positioned myself as a researcher or interpreter of participants' experiences.

4.4 RESEARCH PROCESS AND RESEARCHER'S POSITIONALITY

As a scientific method, the research process happens within a context in which steps are defined (Denzin & Lincoln, 2018; S.J. Taylor et al., 2016). For example, it can be argued that most studies begin with an observation. In the context of this study, I observed student teachers teaching early-grade mathematics during their TP. I realised that they hardly use cultural games, yet the ECD curriculum encourages them to use play-based methods in imparting knowledge (see Section 1.3). Turning this observation into a scientific problem was the most critical step because it involved linking it to existing literature and engaging in deep conceptualisation. This requirement, in its own right, was not a very straightforward process.

When I was sparked into interrogating the use of cultural games as tools for teaching early-grade mathematics, what I observed during teachers' assessments was the point of departure. It encouraged me to revisit my area of technical expertise and training, pedagogy, and I began to see what I noted as glaring gaps. I then formulated a rudimentary question: Why is it that most teachers are not using cultural games as tools for teaching early-grade mathematics? I started reading through the accessible literature and saw that a critical paucity marked the discussion to answer my posed question; that is, a general lack of literature on teachers' perception, attitude, and knowledge on the use of cultural games as teaching tools. This made me interested in plugging the knowledge gap to channel the generated knowledge to policy and ultimate practice.

Since I was dealing with a very familiar area of heritage-based philosophy, I largely relied on reflexivity, guided by Soedirgo and Glas (2020, p.531) who argued that *"being actively reflexive means engaging in the dynamic, continual, and fluid practice of interrogating our own assumptions of positionality, how positionality is being read by others, and the impact of these assessments throughout the research process"*. Because social science research begins in a particular context and ends in the same context, I was highly aware of how my positionality might challenge my epistemological, ontological, axiological, and methodological orientation. In this regard, I emerged as the *"forerunner"* in documenting issues of cultural games as a teaching tool in the Zimbabwean context. I, arguably, reviewed adequate literature to

understand the phenomenon and guide other researchers and policymakers on this critical issue. Henceforth, this work can be perceived as a reference point for those researching in the Zimbabwean context and beyond. This is particularly important given that ESD emphasises the importance of using culturally aligned approaches in teaching, yet few accessible sources outline principles and intervention models that contribute towards addressing prevailing problems. The thesis is a story of the Zimbabwean education landscape at risk of losing cultural identity. As someone who grew up playing cultural games, the power of reflexivity worked immensely. This study became scientific because I deliberately interrogated matters despite the familiarity. So, I ensured that my sampling procedure had limited bias for ease of transferability of study findings.

4.5 POPULATION AND SAMPLING PROCEDURE

According to Creswell (2014), population refers to the entire family of the variable(s) under study. Thus, population is a *'catch-all'* word for the collection of people, objects, organisms, and so on, sharing the same attributes. However, a distinction between the study population and the target population is essential when carrying out studies. Kazerooni (2001) clarified:

> *"A target population is the whole group of [individuals] to which we are interested in applying our conclusions. Unfortunately, the target population is not always readily accessible, and we can only study that part of it that is available. A study population, then, is the group of individuals or units to which we can legitimately apply our conclusions".* (Kazerooni, 2001, p. 993)

A sample denotes part of the study population. It is a subset of the entire group (study population) being researched. In any given exploration, a study can be carried out on a sample (sample survey) or a study population (census survey). If the study population, in its entirety, is studied, the results are regarded as final, but if a sample is considered, the results have to be inferred from the population. In most cases, a sample survey is preferred to a census survey because the population is large and complex to study. In this study, the sampling procedure covers the selection of the conceptual study area (cultural games as tools for teaching early-grade mathematics), the geographical study area (Seke District, Zimbabwe), and participants during the fieldwork.

4.5.1 Selection of the Conceptual Study Area

This section provides answers to the questions of why and how the conceptual study area presented in Section 1.6.1 and summarised in Figure 1.1 was selected. It is critical to note that this study revolves around the application of the heritage-based philosophy in the teaching of early-grade mathematics. Specifically, this philosophy emphasises the use of teaching tools drawn from the resources endowed in a given culture; in this case, the cultural games are anchored on Zimbabwean IKS. As a trained ECD educator and assessor of teachers during their TP, I use an observation schedule to assess the practical application of certain concepts. The Zimbabwean ECD curriculum states that the teaching approach must revolve around play-based methods regardless of the subject area (see Section 3.5). So, in numerous assessment sessions, I noticed a common trend among teachers: There was limited use of play-based methods, particularly cultural games, in the teaching of mathematics when compared to other areas such as expressive and language arts, social sciences, and technology. This, alone, ignited my interest to seek answers to this observed trend.

To situate this observation in literature, I read about issues related to the relationship between cultural games and early-grade mathematics. I found a vast amount of literature on this subject, but it mainly answered the question of what and why cultural games are instrumental in ECD. Yet, there is a dearth of studies answering the “how” question. So, I realised the need for contextual procedural literature to guide teachers on how to use cultural games since cultural games differ between regions. However, such procedures must not be imposed regardless of clear policy provisions because teachers’ perceptions, attitudes, and knowledge are key in determining the success of their usage in mainstream education. Overall, the reasons for why and how I selected this conceptual study area were sequential, as noted in this section and clarified in Sections 1.6.1 and 4.5. As per my earlier indication, most studies start with a particular setting and end with the same setting. The next section explains the geographical study area that formed the setting of this study.

4.5.2 Selection of the Geographical Study Area

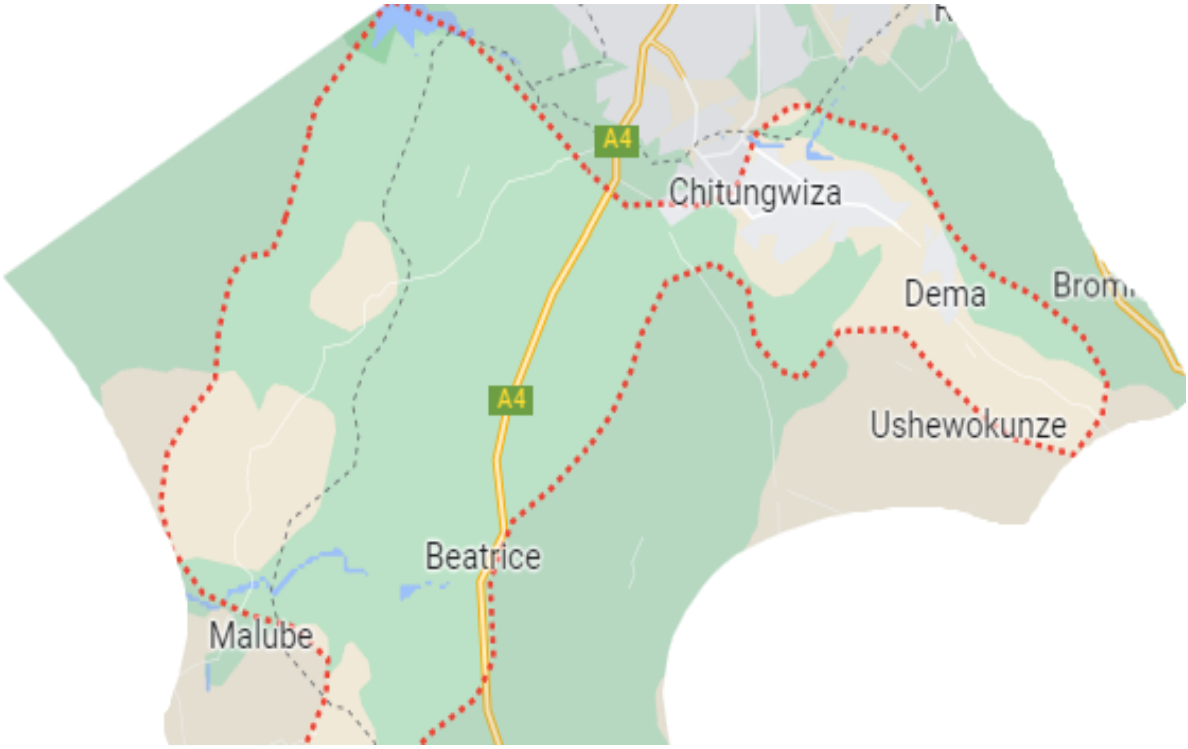
The Zimbabwean education system is such that TP assessors work according to

directions given to TP coordinators at teachers' colleges. In my case, between 2017 and 2022, I served as an ECD lecturer at STC and ZEGU, where I was mandated to assess teachers in practice in the Seke district, a Shona-speaking region (see Section 4.3). So, I first noticed the knowledge gap this study intends to fill in the Seke rural areas in Mashonaland East province. Guided by Soedirgo and Glas's (2020) assertion that a study starts with a particular context and ends within the same context, I purposively selected Seke Rural as a geographical study area so as to use the same context in carrying out the study. Since Seke district is in Mashonaland East province, it is largely composed of Shona-speaking people. According to ZIMSTATS (2022), Shona-speaking people constitute approximately 80% of the Zimbabwean population. Zimbabwe is divided into ten administrative provinces, and there are numerous districts in each province. Regarding spatial extent, Seke district covers approximately 2,637 km^2 piece of land and has a population of 200,478 as of 2022 (Zimastats, 2022). It is crucial to appropriately describe the geographical study area since it could significantly impact the results and how they are interpreted (S. J. Taylor et al., 2016). Figure 4.2 shows the Google Maps extract of the study area.

As shown in Figure 4.2, the geographical study area covers a considerably large area, and TP coordinators randomly send assessors to schools within a particular district. So, my initial observation started in the Seke Rural areas because I worked in this area for an extended period. There are 15 public primary schools in this era, all with ECD centres. During my extended period of working within this district, I had numerous visits to five schools, and it was in these schools that I made my initial observations. Initially, I wanted all five schools to be part of my investigation. Still, having realised the demands of carrying out a fieldwork in a geographically spread-out area, I followed the guidelines given by Cohen et al. (2018) and Creswell and Poth (2018) to focus on a small sample to allow for in-depth examination. So, using my calendar of schools I visited between 2017 and 2020, I saw that Besa, Jonas, and Marikopo (pseudonyms used) primary schools were the top three schools frequented, and I purposively selected them for that reason.

Figure 4.2

Seke District Map



(Adapted from Google Maps on 31 May 2023)

Both teachers and learners who participated in this study speak Shona, which is my first language. It must be noted that, in this study, teachers are the units of analysis, but they could only be assessed through and with their learners. Speaking the same language resulted in a more efficient and effective communication process. This confirmed Tenzer and Schuster's (2017) assertion that fieldwork is more effective when the researcher and participants speak the same language. This helped me understand the participants' responses and perspectives better. If I had not been fluent in Shona, I might have missed important nuances that could have negatively impacted the outcomes of this study.

According to Macmillan and Schumacher (2010), the natural environment is instrumental in comprehending social reality because it affects the character of reality. Carrying out this study in familiar territories enabled the smooth execution of fieldwork because the teachers, learners, and school administrators were all familiar with me, so they expressed themselves naturally. Participants tend to change their naturality

when there is no rapport between them and the researcher (Creswell & Creswell, 2018; S. J. Taylor et al., 2016). So, using Kazerooni's (2001) definition of target and study population and sample, the teachers in Zimbabwe form the target population. Still, the outcomes of this study can be legitimately applied to the Seke district, using case data from three schools I frequently visited as an assessor.

4.5.3 Selection of Participants During the Fieldwork

Since this study was ignited by observing a geographical area I frequented during TP assessments, I had to start and end it in the same context. So, my selection of units of analysis was purposive to ensure that my conclusions could be legitimately applied to that context. Scholars such as Maree (2015) and Patton (2015) have noted that qualitative researchers mainly use purposive sampling to find rich venues and rich informants about the phenomena they are studying in cases where it is wholly unmanageable to collect data from the target and study population in their entirety. Patten and Galvan (2019) have underscored that purposefully selecting participants enables the researcher to focus on participants with specific characteristics rich enough to explain a given setting or context. In the context of this study, teachers who teach early-grade classes are implementers of the updated curriculum developed for EGLs in Zimbabwe. So, I specifically selected teachers who teach EGLs in the three case study schools. Interestingly, all the school administrators and teachers in sampled schools expressed an unconditional willingness to participate and share their views and experiences regarding the use of cultural games in teaching early-grade mathematics.

From each of these three schools, I deliberately made it a point to work with four ECD teachers who would participate in in-depth interviews and FGIs. Overall, the selection of participants was purposive because I had to start and end with the same context; that is, teachers from schools I frequented during the TP assessments I did between 2017 and 2022. Then, it was convenient because I had a rapport with the school administrators in the sampled schools following my extended work period in their district. Interestingly, all school administrators in my area expressed their willingness to participate, citing that this study's outcomes might help improve their learning outcomes. However, I had no control over the choice of teachers who would participate in the study–the school administrators of individual schools pointed out the teachers

who participated. So, this study's findings were co-created by 12 participants, who participated in their individual capacities during one-on-one interviews and in groups since I conducted one FGI with participating teachers from each school. This sample implied that I carried out twelve one-on-one interviews with teachers and three with focus groups (each composed of four participants) over approximately half a year. Since the focus was on teachers and not learners, I emphasised teachers regardless of the number of learners they teach. This decision was not to ignore the fact that the teacher-to-pupil ratio affects the quality of tuition. Still, the idea was to remain focused on what I identified as the knowledge gap (see Sections 1.4.1 and 3.7).

4.6 DATA COLLECTION METHODS, TOOLS, AND PROCEDURE

It has been argued that to get reliable data, suitable data collection methods and tools must be used (Maree, 2015). So, this section details the suitability of methods, tools, and procedures used to generate data to address the research problem. In this section, I organised and presented the data collection procedure in keeping with the order described, applied, and learned (Creswell & Creswell, 2018; Soedirgo & Glas, 2020). A description provides theoretical backing about how a certain method is used. Application revolves around how a researcher conceptualises a method; in my case, I provide details on how I made it fit my study situation. Lastly, learning is about the lessons I drew using the methods I applied and even suggesting how researchers can best apply the methods in future studies. In carrying out this study, I have realised that conventional wisdom around the method does not *"straight jacket"* fit in every situation. Arguably, a method must be *"tailor-made"* to fit practical realities, even if it is a familiar method. As alluded to earlier, this study used both primary and secondary data, with a greater inclination towards primary data. Secondary data was gathered using literature and documentary reviews, and primary data was gathered using in-depth interviews, focus group interviews (FGIs), and observations. Finer details on how I used these methods are given in Sections 4.6.1 to 4.6.5.

4.6.1 Literature and Document Review

Secondary data was used as the main source of experiences involving cultural games in teaching early-grade mathematics. The data was gathered using literature and document reviews. According to Nieuwenhuis (2016), the two methods revolve around evaluating all written materials used to produce data about a specific phenomenon to

give context and meaning to a topic under investigation. It has been argued that the thin line separating the two is the source of data and the purpose of the review (Maree, 2015; Willig, 2013). For example, on the one hand, the literature review is done to give an account of what has been studied and outline the agenda of further research on a certain topic. Normally, peer-reviewed scholarly articles are used in literature reviews. On the other hand, document review is the examination of policy and administrative documents with the view of assessing their provisions.

I used textbooks, journal articles, unpublished studies, and conference papers as the primary literature sources in this study. These sources helped me to gather rich, historical, and current scholarly information on the interplay between cultural games and early-grade mathematics to establish what has been and what is yet to be studied. They also provided rich, historical, and current scholarly information on the interplay between cultural games and early-grade mathematics. The documents reviewed include the ESD strategy, the Zimbabwean ECD curriculum, schemes of work, lesson plans, and planning of cultural games in the teaching and learning of early-grade mathematics and children's mathematics and science workbooks in early-grade mathematics. It was, thus, sensible to review these documents to assess their provisions in the wake of objectives set ahead of the study.

Both reviews use the same tool, content analysis, to achieve their implied purpose. Content analysis has been defined by Saunders et al. (2016) as the technique of extracting important facts and deriving themes from existing data. It involves perusing through, skimming, collecting, collating, and manipulating data from accessible sources. I have learnt that a literature review is more valuable in the preliminary stages of a study, particularly in taking stock of the state of knowledge and conceptualising ideas, whilst a documentary review is ideal in expanding and clarifying policy and practical gaps, and it is best used as the study progresses.

4.6.2 Interviews

Dawson (2019) postulated that interviews, whether they take the form of key-informant or in-depth variants, are a robust data collection method in which people articulate their tacit perceptions, feelings, and understanding. It has been noted that key-informant interviews are directed to experts to provide their unique insights into given

subjects. In contrast, in-depth interviews (IDIs) normally take the form of one-on-one sessions to gather individuals' perceptions, experiences, and emotions. Dawson's characterisation of IDIs was well-aligned with this study's main concern: To examine the perceptions, attitudes, and knowledge of teachers on the use of cultural games in teaching early-grade mathematics. In support of this view, Delen and Zolbanin (2018) maintained that IDIs are used because more data can be gathered in greater depth and with greater flexibility as they allow restructuring questions during discussion sessions. Since the Zimbabwean ECD curriculum mandates teachers to use cultural games as teaching tools, a two-way dialogue with teachers partly enabled me to understand the lived experiences of the participants better (Cohen et al., 2010; Seidman, 2013).

All twelve interviews were directed by an interview guide to ensure that the answers relate to the study's objectives. The guide was structured to give background information on the study's purpose and a brief profile of myself. Following this background explanation, questions were modelled on probing, specifying, and follow-up constructs. Since the interviews were in-depth and semi-structured, probing questions enabled the teachers to comment without limit. Using Punch's (2014) advice that specifying and follow-up questions can be used to clarify specific issues raised by participants, I listened attentively and interjected where possible to get the interviewees to clarify hidden and less-discussed issues. I also found the advice given by Hendricks (2015) to conduct the interviews at convenient times helpful; I visited the participating schools and interviewed participants at times convenient to them. During all sessions, I jotted down short notes. Then, I expanded and structured them later, and in selected cases and with participants' consent, I would record the conversations using my smartphone.

4.6.3 Focus Group Interviews

Complementary to IDIs, I used three FGIs to get small group views and clarify some issues raised by individual participants. FGIs have been defined by Denscombe (2014) as small groups of people assembled by a researcher to discuss attitudes, perceptions, feelings, and ideas about a particular research issue in depth. It has been argued that FGIs are more successful when the setting is accepting, accommodating, and non-threatening (Chisaka, 2013). Before the start of each session, I established

ground rules with the participants to foster a climate of trust, friendliness, and openness. These rules guaranteed our discussions stayed focused while allowing all participants to express their opinions on the usage of cultural games freely and openly in teaching early-grade mathematics. Further, I asked participants to pledge respect for one another's opinions or views, and this was easy by keeping my groups small; each had four participants composed of all participating teachers from each school. In keeping with the naturalistic approach used by qualitative research (Denzin & Lincoln, 2018), I conducted the FGIs at the participants' actual schools, which was their natural environment. At least an hour was spent on each FGI. I audio-recorded all the FGIs to ensure I did not lose any points since a group interview generates more points than a one-on-one interview. Some of the benefits resulting from FGIs were in sync with accessible methodology literature. For example, compared to individual interviews, Focus group interview elicited a wider range of replies, yielding richer and more comprehensive data on the research problem (Cohen et al., 2018; Denscombe, 2014; Seidman, 2013).

4.6.4 Observation and Photography

The goal of observation is to gather data systematically without interacting with subjects (Creswell, 2014; Maree, 2015). According to Saunders et al. (2016), observations have two discrete dimensions: covert versus overt and participant versus non-participant variants. Concerning the first dimension, in a covert set-up, the participants are secretly observed without the knowledge that they are being studied, while in an overt set-up, the participants are highly aware that they are being studied while carrying out their daily activities. Since my initial observations happened before the onset of this study, but with the knowledge that the participants were being observed, considering my role as an assessor, I continued observing them in that arrangement even during the mainstream study.

Then, concerning the second dimension, in a participant arrangement, the researcher actively engages in activities that the participants are doing, either with or without their knowledge. At the same time, in a non-participant arrangement, the researcher only watches without being actively involved in the participants' routines. To gain the most out of the participants, I maintained my position as an assessor while they were teaching as usual. So, I used overt-non-participant observation.

Through this type of observation, I was exposed to practical realities around cultural games as teaching tools, as it assisted me in hearing, seeing, and experiencing teaching practice. This experience is something collectively confirmed by Nieuwenhuis (2016) and Seabi (2012), who state that observation is a technique where the quality of data generated depends on what the researcher sees, hears, and interprets. During the second observation phase, I used an observation checklist designed in line with the study objectives. This design of schedule was partly enabled by themes of what I observed before the onset of this study. Since my observation was structured and guided by an observation schedule, I leaned on Cohen et al.'s (2018) recommendation of taking notes to keep a record of what has been observed and descriptions of the individuals' setting. My observation of early-grade teachers and learners assisted me in obtaining a clearer picture of the hidden phenomenon, which is the teachers' understanding of cultural games. To help remember important events and subsequently tell stories, I used the photography technique to capture important events.

4.6.5 Researcher's Reflective Journal

As a trained teacher, I fully appreciate the importance of note-taking and record-keeping. So, to me, using a reflective journal was something to apply during the course of the study. Farrell (2013) described a reflective journal as a "handy" book kept by qualitative researchers to provide a written account of their activities, as this helps them remember important issues and subsequently tell a story. In the same line of argument, Rehm and Gadenne (2013) state that a reflective journal helps one to provide an audit trail of the research design and increase the transparency of the research process. From my initial observations before the onset of the study to the preliminary literature review, from problem exposition to conceptualisation, and from secondary to primary data collection, all my research activities are on record.

Regarding the notes I took before the onset of the study, I made no effort to seek special consent or bother to reveal this because it was just a record of my official contact with teachers as an assessor and not for academic or any other purposes. I remember a set of notes dated 14 March 2020, titled *"Notes taken one morning during an official assessment"*. After enrolling in this study, I declared my intention as a

researcher to adhere to research ethics. Therefore, I kept the details of the observations, interviews, and EGLs. I have learnt that keeping a reflective journal in an interpretive study helps achieve a rigorous and traceable research process. In my case, it broadened my perspectives on pedagogy and helped me develop new thoughts on teachers' views on pedagogy and their opinions about using cultural games as a teaching tool. Browne (2013) briefly summarised that reflective data may reveal important findings that would not have been discovered otherwise. For example, it can serve as a tool to voice criticisms, justify decisions, and record personal transformation during the research process.

4.7 ORGANISATION AND ANALYSIS OF DATA

This section discusses how I moved from data to insights, that is, how I analysed and reduced the gathered data into familiar language. Since this study is qualitative, I was guided by Nieuwenhuis's (2016) suggestion that an analysis must explore participants' perceptions, attitudes, knowledge, values, feelings, and experiences to learn how they understand the phenomenon being studied. In this study, the data analysis aimed to comprehend teachers' perceptions, attitudes, knowledge, and experiences in using cultural games to impart numerical skills at the foundational level. I used the interpretation of experiences (conversation analysis) from stories narrated by the participants to examine the findings (mainly interview data). In interpreting experiences, I was guided by post-structural perspectives that recognised the importance of language and discourse as primary determinants of how people understood themselves, others, and the world (Crowe, 1998). In doing so, I largely relied on Hardy's (2012) suggestion to avoid essentialist generalisations of participants' experiences, and instead, I focused on the local, subjective, partial, or even contradictory accounts. So, I read text and conversations, typically intensively, to identify assumptions and locate contradictions and conflicts. This perspective was instrumental in understanding the contextual use of cultural games as mathematical teaching tools.

In tracing participants' accounts and experiences, I was partly enabled by thematic analysis, defined by Braun et al. (2018) as a qualitative research analysis technique that focuses on examining patterns and themes within collected data. Maree (2015) argued that thematic analysis requires one to go through the entire dataset to find

recurrent categories and themes that capture participants' opinions. I represented the emergent pattern from the data using segments with a corresponding code. I did this in line with Braun and Clarke's (2013) six levels of thematic analysis presented in Sections 4.7.1 to 4.7.6. Similarly, Christensen (2014) noted that qualitative findings must be supported by a thick description of events. Initially, I intended to examine all the gathered data manually, but my supervisor encouraged me to use NVivo 12, a computer software application for analysing qualitative data. Because I was not familiar with this software, but it addressed what I wanted to do, I sought the services of a data analyst who did the technical work under my supervision. So, NVivo 12 smoothened the data analysis process, as explained in this section and clarified in Section 5.3. As much as I used software to analyse data, I had to observe at every stage to ensure alignment with the six steps that guided my thematic analysis. Based on my directive, any anomaly was rectified by the data scientist before moving on to the next stage.

4.7.1 Organising Data

Several sources have concluded that the first step of thematic analysis must focus on compiling gathered data into a computer database (Braun & Clarke, 2013; Marshall & Rossman, 2014). This comprises classifying data into computer files, index cards, or file folders. In my case, I created folders for each of the three schools that formed part of my multiple-embedded case study. I transcribed the audio-recorded information from each case's one-on-one interviews and FGIs with teachers verbatim. I also typed all the handwritten field notes and added them to the corresponding folders.

4.7.2 Immersion in the Data

It has been advised that during immersion, the researcher must reread data transcripts and listen to audio-recorded data numerous times (Braun & Clarke, 2013; Braun et al., 2018). In line with this second step, I repeatedly listened to audio-recorded interviews, which enabled me to confirm the information from FGIs. Then, I did a line-by-line review of the data transcripts to fully immerse myself and check for coherence between the audio files and transcribed scripts. Through immersion, I became familiar with repeated sentiments, giving me a somewhat general feel of emerging categories and topics. I made notes in the margins of the data transcripts as I became more

comfortable with the data. These reflective notes persisted throughout the process of data analysis and discussion.

4.7.3 Generating Codes

The creation of a coding system promoted familiarisation with the data. A code has been defined by Saldaña (2016) and M. B. Miles et al. (2014) as a word, phrase, or symbol that indicates a data segment of interest to the researcher. So, coding entails doing a line-by-line review of the data again, collecting and labelling data chunks pertinent to the research objectives (Saldaña, 2016; Willig, 2013). In my case, NVivo 12 used phrases to code data segments. Since I was now more familiar with the generated data based on clusters resulting from the analysis, the codes used were more *"data-driven"* than *"theory-driven"*. I used Braun et al.'s (2018) advice to carefully review the usefulness of a data segment before coding, since these codes would feed into data categories.

4.7.4 Generating Categories

Data segments are combined during this stage to create groups (Braun & Clarke, 2013). A data category, according to M. B. Miles et al. (2014), is a concise explanation of a data segment's main characteristics. In line with this definition, NVivo 12 copied the data segments with similar codes onto the same page. This procedure led to the generation of the study's initial data categories. By clicking a button and careful examination, large categories were divided into smaller ones, some were re-ordered, and the ones that did not apply to the study objectives were eliminated, as Braun and Clarke (2013) recommended. I reviewed the categories numerous times as fresh ideas arose from the data, in keeping with the adaptable character of qualitative research (A. Taylor et al., 2016).

4.7.5 Generating Themes

Once categories have been established, the next step is finding themes, reviewing, defining, and naming them. A theme has been defined by Braun et al. (2018) as an overarching idea or an important aspect of the data of the study issue. During this stage, I discarded categories that were not pertinent to the research questions and left some categories that helped clarify certain issues pertinent to the research questions. As I reviewed the themes several times, I continuously switched between the growing

thematic map and the raw data (see Braun & Clarke, 2013; Willig, 2013). Finally, I evaluated the themes, breaking up too-broad topics into smaller themes and compressing several themes and sub-themes. I continued going through the topics as fresh insights from the data came to light. Finally, I had seven themes (see Table 5.3 in Section 5.3.2).

4.7.6 Producing the Report

Braun and Clarke (2013) explained that the last stage entails thoroughly examining the research questions, pertinent literature, and theoretical framework, as well as crafting a meaningful and beautiful story out of their underlying relationship. Considering my familiarity with the research topic from initial observation to the literature review and from data collection to data analysis, I narrated a story based on the seven resultant themes. Throughout the report, I tried as much as possible to find a balance between my voice as the researcher and the voices of the participants (see Chapter Four). Data captured using observation and photography helped me remember instrumental cases within the multiple-embedded case study. I reported the intersemiotic relationship (picture-text relationship) of such instrumental cases through narration. Using features for visualisation and constant validation from raw data ensured an accurate representation of participants' views. It must also be noted that I used codes outlined in Section 5.3 to refer to specific sentiments by individual teachers or groups of teachers. To ensure dependability, and transferability of study findings, Saunders et al. (2016) advised researchers to adhere to data quality elements.

4.8 ELEMENTS OF DATA QUALITY

Overall, quality is the totality of all features that bear on a study's characteristics to fulfil its stated or implied purpose. According to Creswell and Creswell (2018), the researcher must ensure the attainment of the desired quality since they are the primary tool in data collection and analysis. As a researcher, my objective was to contribute a new understanding of the pedagogies used by teachers in imparting numerical skills to EGLs in educational research. To communicate with teachers and create a clear depiction of their perspectives on the subject matter, I employed the interpretivist paradigm. I generated data from documentary reviews, one-on-one interviews, FGIs, and observations in the participants' natural settings. So, I was responsible for studying and comprehending teachers' perspectives on using cultural games as tools

for teaching numeracy skills in the VaShona cultural group. I adhered to quality standards explained in Sections 4.8.1 to 4.8.6 to ensure the quality of the collected and analysed data.

4.8.1 Trustworthiness

It has been argued that one of the primary goals of research is to provide honest and genuine findings to users of the study outcomes (Korstjens & Moser, 2018). As such, reliability becomes a crucial issue in research. In the context of qualitative studies, trustworthiness refers to the degree to which study findings accurately reflect the subjects of the study. Throughout the research process, I ensured the trustworthiness of the gathered data by documenting every step of the research process using field notes. In the eyes of Phillipi and Lauderdale (2018), field notes serve many functions, including providing detailed, rich descriptions of the study and valuable contextual information from the encounter. In this study, I produced field notes to record almost every step of the research process. These notes partly enabled me to remember instrumental cases, produce meaning and logically tell a story about teachers' psychographics in view of cultural games as tools for teaching numeracy skills. Classical scholars such as Lincoln and Guba (1985) have argued that trustworthiness has four determining characteristics: credibility, confirmability, transferability, and dependability (see forthcoming sections).

4.8.2 Credibility

Credibility measures how closely research results resemble reality and are regarded as a true representation of research participants' actual experiences (Lincoln & Guba, 1985). Korstjens and Moser (2018) and Bryman (2016) further explained that credibility includes readers' faith in the veracity of findings to determine whether they make sense when viewed as a coherent whole. In my case, I maintained sustained contact with participants since it has been argued that long-term involvement is crucial for developing rapport and trust with research participants (Mertens, 2010). I found this important in preventing premature closure; interestingly, I carried out the research in my geographical working area, implying that I had been there before the onset of the study and that I was still there even after the closure of the study. The most important method for establishing credibility in qualitative research is member checks, as was asserted by Korstjens and Moser (2018). Credibility requires regular reporting

of data and interpretations to the study subjects to check for validity and adjust as needed.

4.8.3 Confirmability

Confirmability has been collectively defined by Cropley (2019) and Tracy (2019) as a criterion of trustworthiness that must be established in qualitative research. One classical source outlined that confirmability is concerned with proving that the data and interpretations of the findings accurately reflect the participants' actual experiences (Lincoln & Guba, 1985). This criterion seeks to ascertain the level of confidence that a study's findings are based on the participants' narratives rather than potential researcher biases, preconceptions, and value judgments. My analysis was largely guided by the post-structural perspectives, as explained in Section 4.7, to meet this criterion. Within this perspective, I thoroughly read the transcribed text to locate contradictions and conflicts and reduce the influence of the assumptions I had as a researcher with a background practice in pedagogy and educational research. In my reporting, I tried as much as possible to balance between participants' voices and my voice as a researcher. To this effect, I primarily relied on verbatims to back the interpretations of major accounts by participants, and I used my voice on minor accounts (see Chapter Five). Arguably, this study's findings are shaped by participants more so than by own interpretation. I have safely kept field notes, audio files, and other research materials to ensure the transparency of the research path and confirmability of this study.

4.8.4 Transferability

In qualitative research, transferability can be likened to generalisability or external validity in quantitative research (Creswell & Clark, 2017). It has been argued that it is key for researchers to provide readers with evidence that the study's findings could be applied to other contexts, times, and populations (Yin, 2018). In this study, I gave thick descriptions of the research approach in a step-by-step manner to provide readers with a robust and detailed account of my experiences during data collection and analysis. I provided comprehensive answers to the essential questions regarding data collection, organisation, presentation, and analysis. I further offered a detailed timeline of the research process, highlighting the various stages and sub-stages of the study (see Sections 4.3). This timeline provides a clear structure for the study's execution,

helping readers to understand the progression of the study. Arguably, these meticulous details help provide a richer and fuller understanding of the research setting. This information helps readers construct the scene surrounding this study. It is against this background that Yin (2018) concluded that such finer details allow outside researchers and readers to make the transferability judgements themselves.

4.8.5 Dependability

According to Korstjens and Moser (2018), dependability is concerned with whether the research process is carried out according to the rules of the selected methodology. If research results remain reliable, they must be accurate and consistent. If a study yields the same results when replicated in similar situations, it is considered reliable (Korstjens & Moser, 2018; Maree, 2015). By using triangulation, member checks, thick descriptions, purposeful sampling, and interview recording, I increased this study's dependability.

4.8.6 Triangulation

Triangulation has been characterised as a complementary way researchers use to enhance the credibility of research findings (Maree, 2015). It has been long established that to produce corroborating evidence, researchers must make use of a variety of various data sources and data collection methods (Lincoln & Guba, 1985). In this study, I used secondary and primary sources to gather data to answer research questions. It must be noted that the data-gathering process was iterative; it started with observations I made before the onset of this study, followed by a preliminary literature review I used to clarify the knowledge gap. Then, I ventured into a more structured literature review to conceptualise the study, followed by one-on-one interviews, more structured observations, and FGIs. So, triangulation partly enabled me to have a *"helicopter view"* of the study, where I could gather data using multiple methods for ease of cross-examination of study participants. This gave me a deeper understanding of the subjects' views since I examined the research issue from several perspectives.

4.9 ETHICAL CONSIDERATIONS

Ethical issues are regarded as rules of conduct, typically conforming to a set of principles by which people can judge their actions as right or wrong and good or bad. Ethical issues have moral implications in social science inquiry (Creswell & Creswell, 2018; Creswell & Clark, 2017). A critical first step in ethically conducting research is to obtain approval or permission (Cohen et al., 2010). The University of Pretoria Research Ethics Committee (UPREC) accepted and successfully processed my application for ethical clearance. Since my study was carried out in public primary schools in Zimbabwe, I also had to seek approval from the MPSE. So, I sent a written request for approval to carry out a study in the Seke district to the MPSE head office, the Provincial Education Director (PED) for Mashonaland East Province, and the District Schools Inspector (DSI) for the Seke district. After getting permission to do so, I later on approached the heads of ECD and infant departments and school administrators of the case study schools, who approved my study as well.

I told all the participants that taking part in the study was voluntary. Fortunately, all the participants who served as units of analysis in this study expressed an unconditional willingness to share their thoughts regarding using cultural games as numeracy teaching tools. So, they accepted participation of their own free will without being coerced, deceived or induced to do so. I explained to the participants the purpose, objectives, and how the study results were to be communicated before they signed consent forms. Furthermore, permission to access participants was sought from relevant authorities (MPSE, in this case), and I assured all the units of analysis that their thoughts were to be used for academic purposes only.

Since participation was strictly voluntary, I explained to participants that they had the right to withdraw their participation at any time without fear of any negative repercussions during and after the study. Again, I informed the participants that they could refuse to answer the questions they found uncomfortable without any negative consequences. As such, I adhered to the advice given by Creswell and Clark (2017), who maintained that informed consent requires researchers to provide adequate information about their research studies to prospective participants to enable them to

understand the implications of agreeing to participate and to arrive at informed decisions without being subjected to any form of force or coercion.

This ethical rule's fundamental tenet is that participants' information should not betray their identities, and nobody else should have access to it (Cohen et al., 2010). However, total anonymity may be impossible in studies where interviews and observation are the main data collection tools. Hence, to protect the anonymity of participants, I used pseudonyms during interviews so that whoever might come across audio files or any other material from this study could not recognise them. So, I maintained participants' privacy by anonymising their responses. Therefore, confidentiality was guaranteed by attaching codes rather than the real names or identities of the individual participants. I also reported the results in such a way that it did not reveal the participants' identities except where consent was sought and granted by the participants within academic and professional ethical limitations. I issued every participant a consent form to check their understanding of the purpose of the study, to check their awareness of their rights as participants and to confirm their willingness to take part in the study. I did not disclose any information to individuals or organisations in order to protect the participants. In addition, I took heed of Gray's (2019) advice of avoiding the use of offensive, discriminatory, or unacceptable language in formulating questions for interviews and FGIs. Thus, the FGI guide and interview guide were all language-checked through pre-testing and pilot-testing before they were applied.

Part of the data collection period coincided with just after COVID-19-induced lockdowns, where all human interactions were forced to adhere to World Health Organization's (WHO) protocols. Some of the measures included maintaining reasonable physical distance between people, regular and proper hand washing, and proper wearing of face masks in public. So, during the physical meetings with the participants, the participants and I properly wore facemasks, sanitised our hands, and observed the recommended physical distancing of at least one and a half meters from one another in line with established WHO protocols. Furthermore, I did not administer or conduct any interviews when feeling ill. In the same vein, I discouraged participants from participating in a situation when they were not feeling well or when they were presenting symptoms of COVID-19.

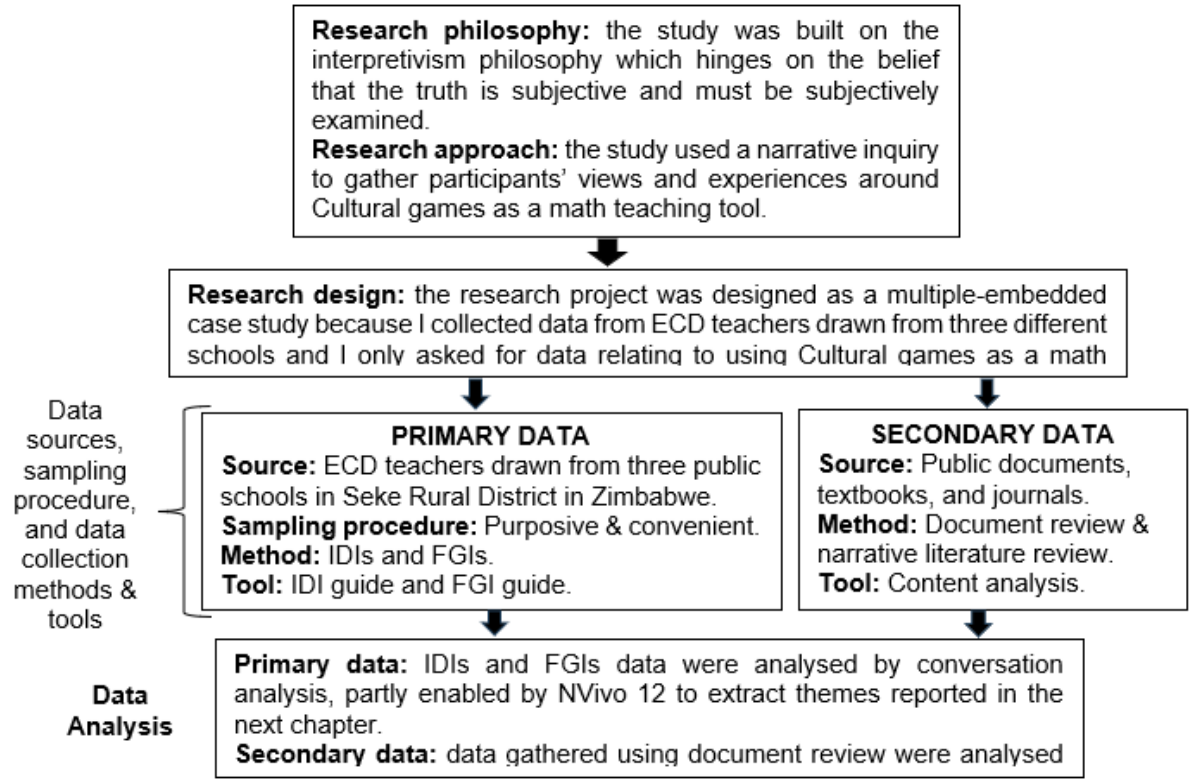
4.10 SYNTHESIS OF METHODOLOGICAL ISSUES

Figure 4.3 provides a diagrammatic summary of the study design, data sources, sampling procedure, data collection methods, and data analysis techniques used to answer research questions. The study was guided by interpretivism, premised on believing that truth is constantly negotiated and interpreted. As such, it must be examined using subjective tools to allow participants to share their lived experiences.

Considering the stated problem, I used the qualitative approach since the variables characterising the research problem sought to explain the quality of views and experiences of ECD teachers. As depicted in Figure 4.3, the study was designed using the case-based reasoning approach based on three public schools drawn from the Seke Rural District in Zimbabwe. Primary data was gathered using 12 IDIs and 3 FGIs, all guided by IDI and FGI guides. Complementary to interviews, observation and photography were used to identify and note instrumental cases in line with the research questions. Then, secondary data was gathered using a narrative literature review and document review. First, a literature review was used to evoke experiences elsewhere; past studies were sourced from textbooks and journal articles. Second, a document review was used to assess educational provisions enshrined in international documents such as the ESD by UNECE, and local documents such as the Zimbabwean ECD curriculum by the MPSE.

Figure 4.3

Summary of the Methodology



(Researcher's analysis, 2024)

Concerning data analysis, primary data (from both IDIs and FGIs) was analysed using conversation analysis, partly enabled by NVivo 12 to extract themes reported in the next chapter. And, secondary data was examined using manual textual analysis, guided by principles of qualitative content analysis. I concurrently discussed all study outcomes to easily trace similar and different experiences. I also juxtaposed study outcomes with accessible literature and theories to show where they are supported, extended, or contradicted by existing knowledge.

4.11 CHAPTER SUMMARY

This chapter has detailed the research approach and strategy for gathering and analysing data to address the research problem. Essentially, the information related to the philosophy and paradigm that informed this study's design, the sampling procedures used, the data collection techniques and tools used, and the analysis techniques used have been unveiled and justified. Issues relating to the quality of the

study findings were also discussed. The preceding chapter answered the six questions: what, why, where, how, who, and when data on teachers' views towards cultural games as a numeracy teaching tool was collected, collated, presented, and analysed. Since large volumes of varied data was collected to develop a conceptual model for infusing cultural games into the teaching and learning of early-grade mathematics, the following chapter presents study findings and discussion thereof in the context of existing knowledge.

CHAPTER FIVE: FINDINGS AND ANALYSIS

5.1 INTRODUCTION

The preceding chapter discussed the research methodology, which established that this study is interpretivist in nature and provided details on the data collection and analysis procedure. The presentation and analysis of results in this chapter feed from the core objective of this study, as stated in Section 1.4.2, to develop a conceptual model for infusing cultural games into the teaching and learning of early-grade mathematics. Restating the specific objectives puts this chapter in context:

- Examine the main tenets of the CHAT explain approaches used to teach EGLs
- Understand how early-grade teachers use cultural games in operationalising the updated ECD mathematics and science competence-based curriculum
- Explain how teachers' knowledge, attitude, and perceptions explain their level of incorporation of cultural games in their pedagogical approaches
- Determine which cultural games teachers observed EGLs engage in during free play
- Classify the most important mathematical concepts children learned while playing cultural games from teachers' perspectives
- Synthesise some of the teachers' experiences in using cultural games as part of their pedagogical approaches
- Construct an effective framework based on cultural games to develop EGL's mathematical skills

Most accessible studies discussed in Chapters Two and Three have shown that cultural games have latent potential to improve the teaching of early-grade mathematics. Furthermore, the rollout of pedagogical strategies has largely been informed by theoretical and empirical perspectives, mainly from developed countries and, to a lesser extent, from developing countries, thereby lacking the contextual appropriateness necessary for upholding diverse heritages and cultural values. In an

inquisitive attempt to fill this knowledge gap, previous chapters assembled theoretical, conceptual, analytical, empirical, and methodological explanations.

This chapter unfolds by exploring the biographical details of the participants so that findings can be contextually understood within the scope of these demographics. It also discusses the descriptive outcomes of the thematic analysis procedure in Nvivo 12, as highlighted in the methodology chapter. Nvivo 12 served as a crucial methodological frame, allowing for a meticulous examination of linguistic patterns through sentimental analysis and exploration of relationships through cluster and hierarchical analyses. After that, the rest of the chapter discusses the seven themes resulting from the analysis. It is critical to note that these results are discussed in the context of the reviewed literature and the CHAT underpinning this study.

5.2 DEMOGRAPHIC PROFILE OF PARTICIPANTS

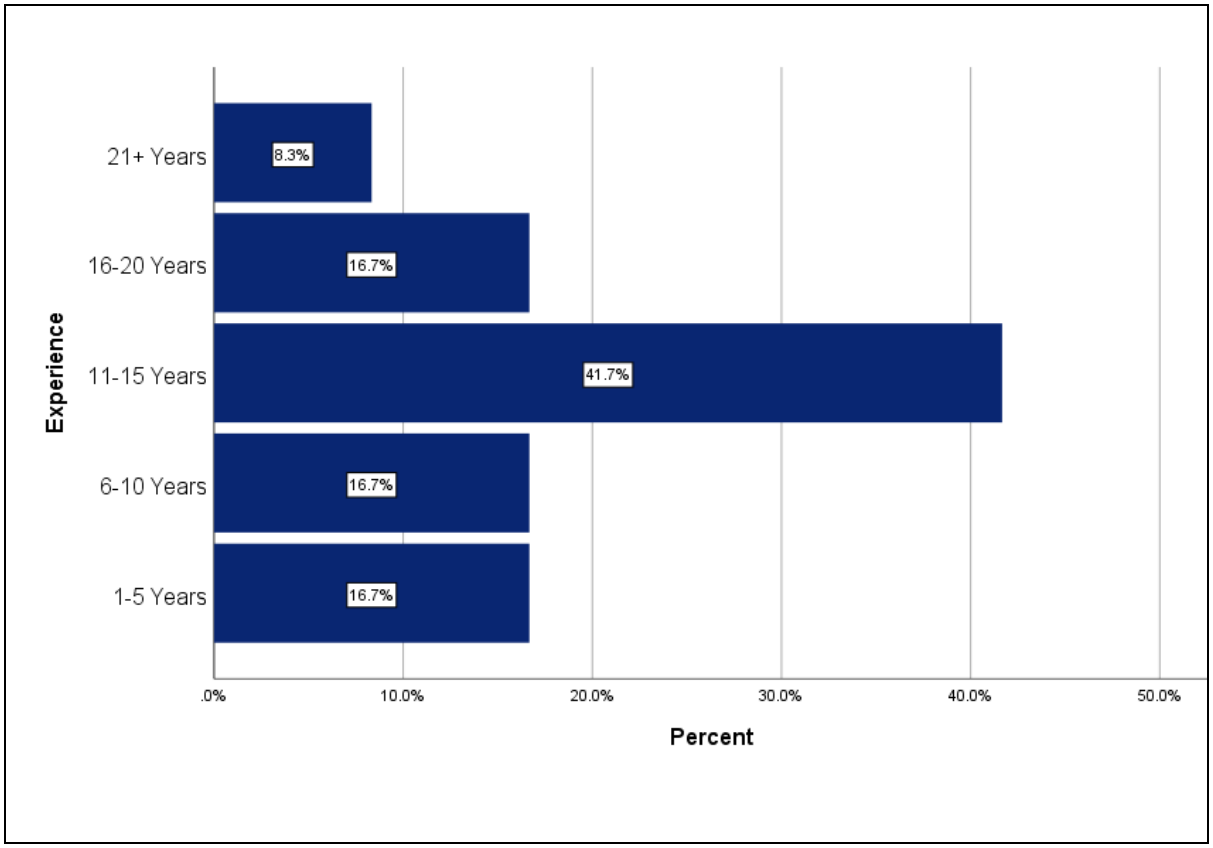
As was alluded to in Section 4.5, narrative data was gathered from 12 participants, constituted by four purposively selected ECD teachers from each of the three sampled schools. Notably, all participants were female, which aligns with prevalent biological perceptions, associating female teachers with maternal qualities, compassion, and tolerance towards EGLs. Sections 5.2.1 to 5.2.3 present demographic data about the participants' age, qualifications, and professional experience. The compilation of demographic data was inspired by Li et al. (2021, p.3), who argued that *"demographic variables, such as age, gender, education, and income, are essential for understanding and describing sample characteristics in research"*. Min et al. (2018) further justified the role of biographical data by maintaining that it improves the clarity, trustworthiness, and validity of a study's findings. As such, the skewness of a study's findings arguably depends on the demographic profile of the participants.

5.2.1 Experience

Over and above qualifications, it can be argued that teachers' performance is partly enabled by their level of experience. Experience loosely defines the proficiency and efficiency that one develops as a result of doing the same thing over and over again. An inquiry into the level of experience, in years, of teachers generated the results summarised in Figure 5.1.

Figure 5.1

Experience of the Participants



(Study findings, 2024)

The gathered data revealed that most participants have a moderate level of professional experience, falling within the 11-15 years range. This group constitutes 41.7% of the participants, suggesting a considerable accumulation of knowledge and expertise. Participants with “1-5 years”, “6-10 years”, and “16-20 years” of experience each represent 16.7% (n=2) of the participants, indicating a distribution across various experience levels. Notably, individuals with extensive experience (21+ years) constitute a smaller percentage at 8.3% (n=1), implying a comparatively limited representation of highly seasoned professionals in the sample. Cumulatively, 66.7% of the participants have more than a decade of teaching experience, implying that they are well-grounded in balancing educational theory and practice. This distribution of experience levels provides valuable insights into the diversity and expertise of the study participants. Overall, it must be noted that this study’s findings are partly shaped by the profile discussed in this section. As such, they are skewed towards gender,

age, professional experience, and educational qualifications of participants collectively as summarised in Table 5.1.

Table 5.1

Profile of participants

Pseudonym	Age	Gender	Experience	Qualification
T1S1	23	F	3	Diploma
T2S1	35	F	6	Degree
T3S1	30	F	11	Degree
T4S1	36	F	12	Degree
T1S2	24	F	4	Diploma
T2S2	40	F	14	Diploma
T3S2	42	F	18	Degree
T4S2	33	F	12	Degree
T1S3	31	F	11	Degree
T2S3	27	F	6	Diploma
T3S3	46	F	20	Degree
T4S3	47	F	22	Degree

(Study findings, 2024)

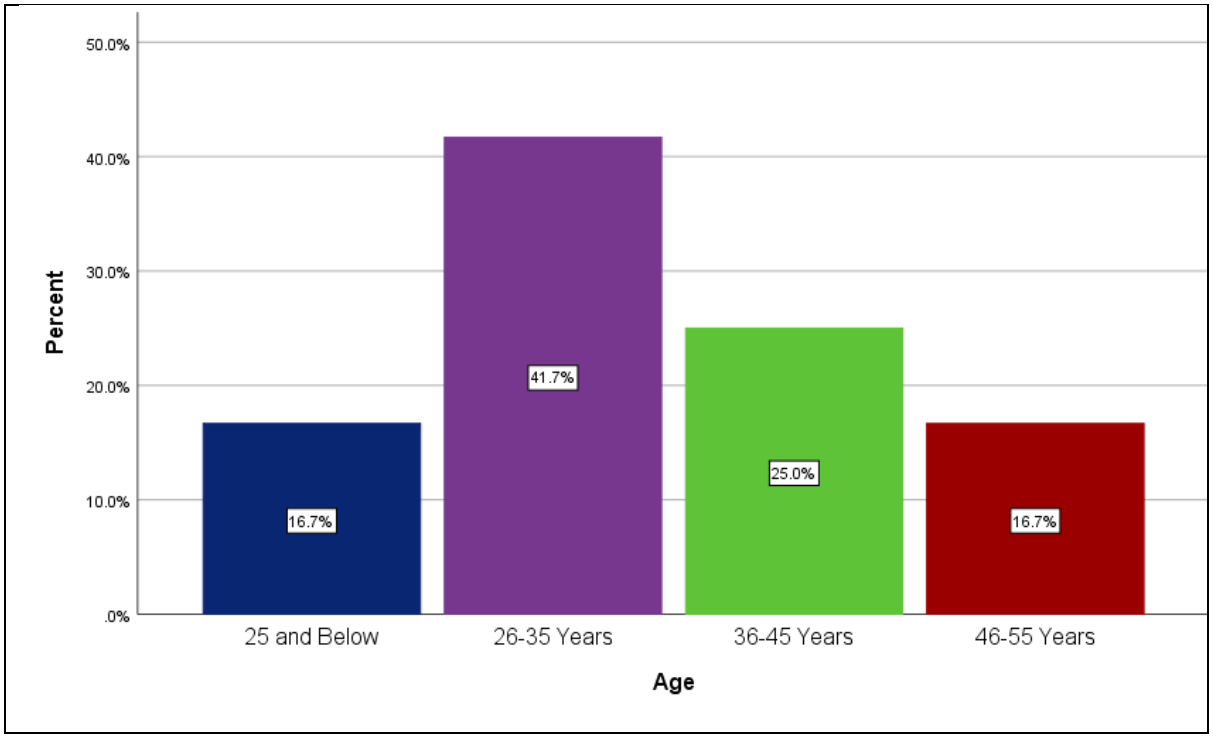
The first column of Table 5.1 provides the unique identifiers of individual participants as generated by Nvivo 12, the software used in analysing qualitative data. For example, codes T1S1 and T4S3 can be loosely interpreted as Teacher 1 from School 1 and Teacher 4 from School 3, respectively, but do not reveal which specific school and teacher is identified by a specific code. Each unique identifier is linked to profile attributes shown in the rest of the columns. It must also be noted that three FGIs were held with participating teachers at each of the three case study schools. Throughout this study, they are referred to as F1, F2, and F3, which means the first, second, and third FGI, respectively. It must be noted that Section 4.7 explained data organisation and analysis but did not give a descriptive narrative of the outcomes of data analysis, which led to the generation of codes and themes. The next section provides that summary, setting the scene for the discussion of themes resulting from data analysis.

5.2.2 Age

A significant percentage (41.7%) of teachers who are responsible for teaching EGLs mathematics are aged between 26 and 35 years, followed by teachers of the ages 36 to 45 years, accounting for 25%. Generally, age groups of 25 years and below and 46 to 55 years constitute the equal and least number of ECD teachers in the sampled population, each accounting for 16.7% of participants. Perhaps middle-aged women, that is, 26 to 45 years of age, inclusive, constitute the highest percentage of ECD teachers because they are in the common age range of mothers and they have the maternal qualities to understand and relate EGLs with ease. Interestingly, no issues of child labour were noticed among the participants because those below 25 years were all above the age of majority in Zimbabwe (18 years). Similarly, no teachers were reported to be above the retirement age in Zimbabwe, that is, 60 years. Figure 5.2 provides a visual summary of the composition of sampled teachers in terms of age.

Figure 5.2

Age of the Participants



(Study findings, 2024)

The simple bar graph in Figure 5.2 reveals a predominant age range among the teachers, with the majority falling between 26 and 45 years inclusive. Subsequently,

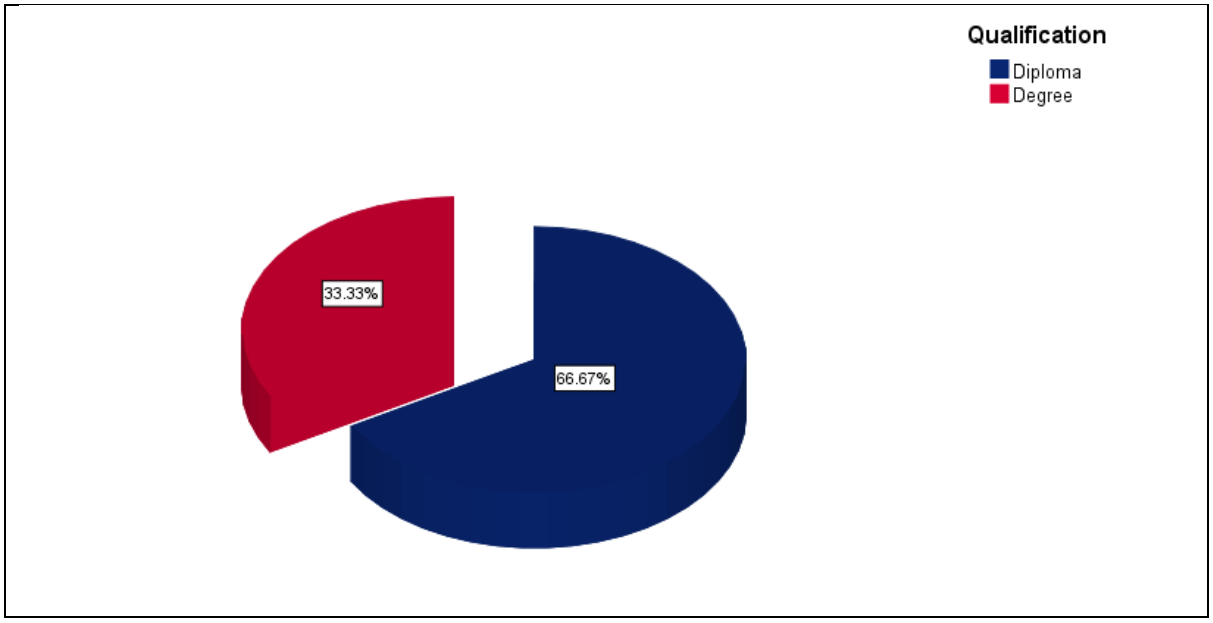
in the "26-35 years" category, 41.7% (n=5) have been accounted for, and following the "36-45 years" category, an additional 25% (n=3) which brings the cumulative percentage to 83.3%. Then, within the "25 and below" and "46-55 years" categories, 33.4% (n=4) of individuals have been identified with an equal share per category.

5.2.3 Qualifications

As would be expected in an ECD teaching population, the study revealed that all of the participants, across all age groups, had attained at least an Ordinary Level qualification, which is in sync with the high literacy level in the country (ZIMSTATS, 2022). Interestingly, all the participants went beyond the minimum by attaining either a diploma or a degree in education, which qualified them to teach EGLs. According to Koszalka et al. (2021), qualified teachers are a critical component of CHAT because they are responsible for identifying and using ideal teaching tools to impart numeracy and literacy skills. Commenting on the same from the perspective of professional rules that guide teachers, Ryder and Yamagata-Lynch (2014) maintained the need for teachers with a minimum level of pedagogical knowledge to interpret the object (mathematics knowledge in this case) using available tools. Figure 5.3 shows the percentage distribution of participants according to their qualifications.

Figure 5.3

Qualifications of the Participants



(Study findings, 2024)

In terms of understanding the mathematics curriculum and pedagogy, the provided data suggests that the participants in the study possess a substantial level of qualification in the field of education. Specifically, a significant majority, constituting 66.7% (n=8), hold diplomas, reflecting a diverse group of educators with a solid foundation in educational theory and practice. One-third (33.3%, n=4) of the participants hold degree qualifications, indicating a subset with a higher level of academic attainment. This distribution implies a mix of educators with varying levels of formal education, which can contribute to a diverse and enriched understanding of curriculum development and pedagogical approaches within the educational context under study. The combination of diploma and degree holders suggests a potential for a multifaceted and comprehensive perspective on educational practices among the participants.

5.3 DESCRIPTIVE OUTCOMES FROM DATA ANALYSIS

In this study, I used a multiplicity of methods (method triangulation) to gather data to answer research questions (see Section 4.6). Data from in-depth interviews and FGIs was imported into NVivo 12, and observation and review data was used to clarify and specify reported realities. This section buttresses the data analysis procedure presented in Section 4.7 but goes further to report outcomes resulting from open coding, axial coding, and theme establishment. Open coding-initiated data exploration by assigning broad descriptive labels to text segments and breaking down the data (Maher et al., 2018). Axial coding was adopted in organising open codes by identifying relationships, patterns, and categories, creating a structured understanding (Allsop et al., 2022). To establish themes, I derived overarching patterns from axial coding, providing a higher level of abstraction.

5.3.1 Open Coding

The open codes generated in the analysis are categorised into various nodes, each representing a distinct theme or aspect. The nodes and their respective statistics are shown in Table 5.2

Table 5.2

Open Coding

Codes	Number of coding references	Aggregate number of coding references
Nodes\\Adequacy of cultural games in teaching Maths	17	17
Nodes\\Class Resources for cultural games	7	7
Nodes\\cultural games used in class	27	27
Nodes\\Curriculum and cultural games	26	26
Nodes\\Familiar cultural games	21	21
Nodes\\Incorporation of cultural games in Lesson	38	38
Nodes\\Learners Views and Attitudes	27	27
Nodes\\Maths policy document and cultural games inclusion	16	16
Nodes\\Resources for cultural games	24	24
Nodes\\Support for cultural games	15	15
Nodes\\Support Needed	15	15
Nodes\\Teachers' Understanding of cultural games	15	15
Nodes\\Training on using cultural games	15	15
Nodes\\Use of cultural games in teaching and learning	24	24
Nodes\\Views on teaching and learning using cultural games	21	21

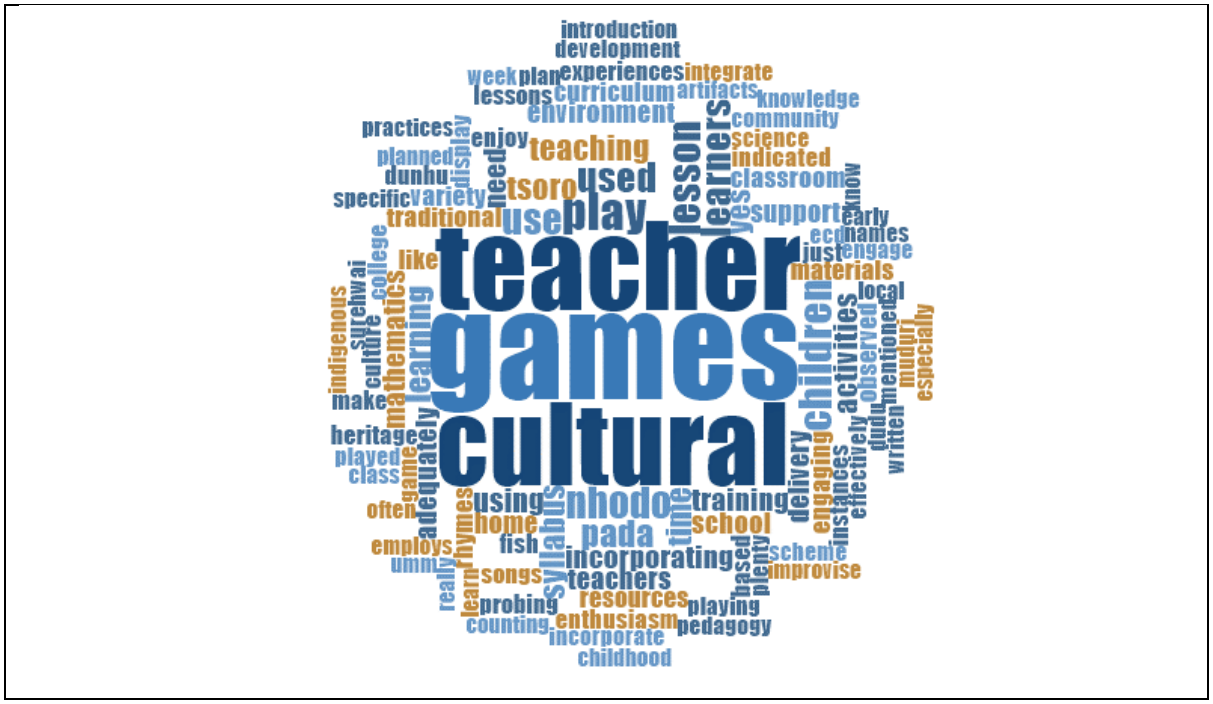
(Study findings, 2024)

Within the system, a term document matrix was developed using snowballing to accumulate words into a dendrogram. Snowballing of words implies the word count of the coded nodes served as a quantitative measure, allowing me to assess the frequency and distribution of specific terms or themes in the data. This form of frequency analysis helped me identify patterns, trends, and significant terms, facilitating a more systematic and data-driven exploration of qualitative content.

Snowballing of words culminated in a word cloud that was built based on the occurrence of words in the document term matrix. Figure 5.4 shows a word cloud resulting from identified themes.

Figure 5.4

Word Cloud Resulting From Identified Themes



(Study findings, 2024)

In interpreting Figure 5.4, the word size in the word cloud shows the rate of occurrence in teachers' sentiments. The colours of the words, generated by a colour brewer, differentiate the words, rendering their frequencies for ease of identification and interpretation. The word count analysis indicates that "games" is the predominant term, appearing 215 times, suggesting a significant focus on gaming activities within the dataset. The word "teacher" follows closely with 176 mentions, reflecting the central role of educators as subjects responsible for using cultural games as teaching tools. Additionally, terms such as "cultural" and "children" appeared 166 and 46 times, respectively, highlighting the thematic emphasis on cultural aspects and the target demographic. Notable mentions include "nhodo", "learners", and "tsoro", underscoring the specific cultural games referenced. Finer details describing each of these games are given in Section 3.6. This analysis offers valuable insights into the frequency and

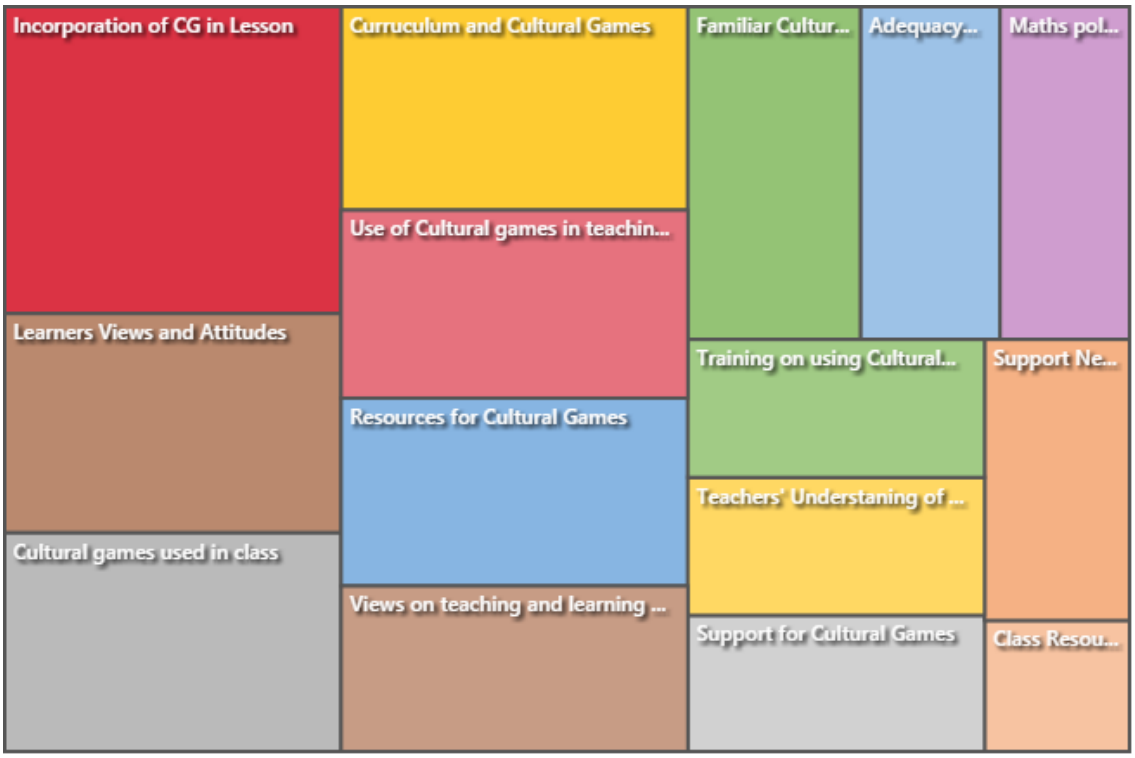
prominence of key terms that aided my ability to identify prevalent themes and patterns within the data.

5.3.2 Hierarchy Chart and Axial Coding

In organising the codes into themes, I used the hierarchy of nodes chart in Nvivo, which was significant for organising and assigning themes systematically. This hierarchical structure allowed me to group related concepts, facilitating a more organised and intuitive representation of the data. It helped me create a visual framework that reflects the relationships between overarching themes and their subthemes, enabling a clearer understanding of the data's complexity, as was noted by Alam (2021). Figure 5.5 shows the hierarchical chart of nodes resulting from the analysis.

Figure 5.5

Hierarchical Chart of Nodes



(Study findings, 2024)

The hierarchical chart of nodes enhanced the efficiency of coding and analysis by providing me with a structured framework to navigate through and interpret the diverse elements within their data. Table 5.3 summarises the themes established in the study.

Table 5.3

Axial Coding

Themes	Aggregated Codes	Files	References
Teachers' understanding of cultural games		22	36
	Familiar cultural games	21	21
	Cultural games used in class	23	27
Teachers' views on teaching and learning of mathematics using cultural games		20	21
	Use of cultural games in teaching and learning	27	51
	Adequacy of cultural games in teaching mathematics	17	17
	Incorporation of cultural games in lesson	12	38
Curriculum and cultural games			
	Mathematics policy document	15	16
	Cultural games inclusion		
Resources for cultural games	Class resources for cultural games	25	31
		7	7
Support for cultural games		14	15
	Support Needed	14	15
Training on using cultural games		15	15
Learners' views and attitudes		27	27

(Study findings, 2024)

Figure 5.5 and Table 5.3 collectively show that teachers' perceptions and practices regarding integrating cultural games in mathematics education resulted in the following themes: teachers' understanding of cultural games, views on teaching with cultural games, curriculum alignment, resource availability, support of cultural games, training on the use of cultural games, and learners' attitudes. According to Table 5.3, some themes were aggregated from one, two, or three sub-themes. As such, Sections 5.4 to 5.10 are presented under the identified themes to explore the complexities and implications of using cultural games as a pedagogical tool for enhancing mathematical learning and cultural inclusivity.

5.4 THEME 1: TEACHERS' UNDERSTANDING OF CULTURAL GAMES

Theme 1, presented in this section, was aggregated by the two codes identified as *"familiar cultural games"* and *"cultural games used in class"*. To obtain insights on this theme, I asked participants to explain briefly what they understood by the term cultural games, and I followed up with a question asking which games they were familiar with. Sections 5.4.1 and 5.4.2 present teachers' general and specific views on cultural games based on the two sub-themes.

5.4.1 Teachers' General Views on Cultural Games

As perceived by educators, cultural games play a crucial role in children's play and learning experiences, integrating traditional elements such as language, customs, and activities. I found that teachers understand cultural games as activities that serve as a means to engage children in both play and learning, connecting them to their cultural heritage. Collectively, teachers underscored that language is a crucial part of the cultural games. This revelation showed me that they find cultural games to have limited input in the learning of mathematics when compared to language arts. In support of this, T1S1 highlighted the centrality of the use of native language and traditional activities in cultural games by saying the following: "cultural games are activities children engage in where they use their native language and native/traditional activities. When children engage in activities of this nature, we can say they are practising cultural games".

Another group of teachers view cultural games as educational plays intertwined with heritage, customs, and traditions. Such a sentiment was well-narrated by T2S1, who explained that: *"*cultural games are traditional plays used for entertainment by our forefathers, and they were educative at the same time. Their instrumental feature is that they are indigenous to a given cultural group".

Singing a similar tune to T2S1, T3S3 underscored the historical significance of cultural games, emphasising their past use and connection to children's homes. The study further found that the richness and depth of cultural games portray them as dynamic tools that not only entertain but also serve as a conduit for cultural immersion and heritage preservation in educational settings. This sentiment stood out as an instrumental finding during F1, where it was noted that cultural games emphasise the use of native language, customs, and traditional activities as glue the binds players together.

The binding nature of cultural games serves as a means to engage children in both playing and learning, thereby connecting them to their cultural heritage, as was narrated by T1S1. Putting it differently, T4S1 noted that cultural games are homegrown indigenous games specific to an identified group, highlighting their significance in preserving cultural identity. This line of thinking was further reinforced during F2, when it was stressed that cultural games are deeply rooted in the traditions, customs, and cultural practices of a specific group or community. Since they are deeply entrenched in cultural practices, cultural games have historical significance and are passed down from generation to generation, acting as a method of preserving and transmitting cultural knowledge. Additionally, cultural games are seen as reflections of cultural values, customs, and historical significance. It is further viewed that cultural games are activities played by children at home during free time, serving as a means to connect them with their cultural heritage. T3S2 further explained that these games are portrayed as often played during social gatherings, festivals, or leisure time, each with its set of rules reflecting cultural values and traditions.

Interestingly, these findings reveal variations in teachers' understanding of cultural games across different schools. While common themes of cultural heritage preservation and the use of traditional elements emerge, individual perspectives and

contextual nuances contribute to a rich tapestry of meanings associated with cultural games in educational settings. Understanding these variations is crucial for fostering culturally responsive teaching practices and promoting inclusive educational experiences.

Another instrumental finding is that language has been perceived as an important aspect central to cultural games, regardless of the type of play. This is supported by one instrumental source that asserted that language is not merely a tool for communication but a repository of cultural heritage and a means of expressing one's worldview (Wa Thiong'o, 1986). Therefore, cultural games help preserve and promote Indigenous languages, arguing that linguistic diversity is integral to maintaining the richness of various cultures. As such, cultural games can be used to *"hit two birds with one stone"*, teaching numeracy and literacy skills simultaneously. To this effect, teachers need more orientation on how best they can use the same games to impart numeracy skills over and above the literacy skills they are richly familiar with.

Arguably, the teaching of mathematics using cultural games hinges on decolonial and post-colonial theories in pedagogy and epistemologies, encouraging teachers to use their native languages to challenge the dominance of colonial languages in education. Despite the richness of cultural games and their latent potential to improve mathematics teaching, teachers might find translating the games into foreign languages difficult. Instead, they must embrace the use of native language to the empowerment of local cultures. This helps counteract the effects of cultural imperialism on contextual understanding of mathematics; after all, the Zimbabwean ECD curriculum provides for the use of what has been referred to as L1 in Section 3.5 and was well expanded in SI 106 of 2005.

Findings on teachers' understanding of cultural games are supported by past studies that view cultural games as embedded in a group's heritage over generations. For example, Nabie (2015) concluded that cultural games encompass both enjoyable pursuits and significant problem-solving abilities, diverse concepts in mathematics and languages, and potential learning of health and life skills. Many other scholars, such as Moloi (2015) and Nkopodi and Mosimege (2009), also attest to these findings since they advocated for an educational approach that encourages children to personally

construct their mathematical understanding and contextualise mathematics learning in their daily lives. This perspective aligns with the endorsement of incorporating games into mathematical education. Games, as activities characterised by integrated opportunities (Nabie, 2011), play a crucial role in establishing foundational processes and thinking strategies while also reinforcing pre-existing cognitive frameworks (Gedera & Williams, 2016). As such, this study's findings add a voice to the rationale for refining the use of cultural games in mainstream curricula through the amalgamation of theoretical and practical opportunities within games.

In line with Lev Vygotsky's CHAT, the teaching of mathematics through cultural games aligns with the principles of decolonial pedagogy and epistemologies. The CHAT underscores the role of mediating tools, subjects, objects, community norms, division of labour, and rules in shaping learning experiences (Leont'ev, 1981). Through the use of students' native languages, teachers can challenge the hegemony of colonial languages in education, fostering a more inclusive and empowering learning environment. Embracing cultural games allows children to engage with mathematical concepts in familiar contexts, leveraging their mother tongue to strengthen their connection to local cultures. This approach counteracts the impact of cultural imperialism by enriching the contextual understanding of mathematics within diverse cultural frameworks, as advocated by CHAT's emphasis on the socio-cultural aspects of learning and development.

Despite the revealed teachers' ability to characterise cultural games as the fusion of culture and history (Sannino & Engeström, 2018), I discovered that they missed the most important thing, which positions them as key participants or enablers in activity systems. Scholars such as Kaptelinin and Nardi (2006) and O'Donoghue and Harford (2020) argued that teachers must view cultural games from the perspective of culture, history, and learners and also from their perspective as equal participants. The CHAT is premised on the notion that teachers are not just educators, but active participants in a collective process of improving students' learning (Engeström, 2018; 2020; 2023; Nabie, 2011). So, a holistic definition must spell out what constitutes cultural games, the involved parties and their roles, how they are played, and when they are played, among other properties. The next section explores the question: How do the revealed

general views on cultural games relate to teachers' understanding of the most widely played and used games in Zimbabwe?

5.4.2 Teachers' Specific Views on Common Shona Cultural Games

To understand teachers' familiarity with cultural gamesbetter , I asked them to name some of the cultural games they know. In this exploration, I sought to determine the level of teachers' awareness of the most widely played Shona Cultural games across different schools. I found this exploration instrumental in establishing a point of entry into incorporating familiar cultural games into classroom instruction, focusing on observations in mathematics lessons and teachers' perspectives. Teachers from different schools mentioned that they were familiar with numerous cultural games such *as "pada", "*chihwande-hwande", "zai rakaora", "tsoro", "maflawa", "arawuru", "dudu-muduri", "chutu", "dunhu", "nhodo", "raka-raka", and "hwai-hwai-huay". In addition to the games mentioned by the majority of participants, T1S1 also mentioned "zambiringa munyembi", and T1S2 mentioned "bhangi-ngiriya-ngiriya". Interestingly, of the fourteen games identified by teachers, "pada", "tsoro*"*, and *"nhodo"* were the dominant ones, as shown by the word cloud in Figure 5.4. These three top-identified games are part of the five games described in Section 3.6.

Games such as "pada", "tsoro", and "nhodo" offer comprehensive insights into the active involvement of learners in traditional activities, shedding light on how children participate in these games during their leisure time. They even engage in these games within the school environment. These games not only serve as recreational pursuits but also as valuable windows into the cultural and social dynamics that shape the leisure experiences of students, providing a rich source of understanding regarding their preferences and interactions within the school context. While teachers demonstrate awareness of various cultural games, the actual participation of students in these activities during lessons appears limited. This is a true reflection that some teachers fail to capitalise on games' intermediary role.

In explaining the mediating role of tools, Section 2.3.2 underlined that games serve as tangible tools that teachers can manipulate through directing and providing a structured framework for understanding numerical relationships. Could their low appetite to take advantage of the games frequently played by learners be explained

by their educational experiences, cultural heritage, and historical contexts? Engeström (2023) noted these contexts as significant shapers of educators' beliefs about the functioning of various teaching strategies. The forthcoming sections of this chapter provide more insights into the underlying factors around teachers' views and experiences regarding using identified cultural games as mediating tools. Plates 5.1 to 5.3 show images I captured while learners played selected cultural games during their spare time in the school environment.

Plate 5.1

Girls Playing "Pada"

(Field observation)

Plate 5.2

Girls Playing "Nhodo"

(Field observation)

Plate 5.3

Boys Playing "Tsoro"

(Field observation)

The level of concentration invested by learners during play, as shown in Plates 5.1 to 5.3, shows that there is a latent opportunity for integrating cultural elements into mainstream education. It is possible to develop a compilation of the most widely used cultural games, highlighting how they are played and how they can be adapted as mathematics teaching tools. The juxtaposition of classroom observations, student engagement, and teacher perspectives offers a nuanced understanding of the dynamics surrounding incorporating cultural games in educational settings. In line with the CHAT, the findings indicate that learners' participation in traditional cultural games enhances the recreational pursuits that help in social interactions. Instead of adopting the games as they are, Garraway and Van Graan (2024) advised for adaption. This adaptability and flexibility ensure that instructional strategies stay relevant and effectively address the diverse needs of learners and curriculum requirements. Educators can, therefore, trace the historical and cultural roots of these games and thoughtfully adapt them for modern classrooms (see Section 2.3.3), preserving their significance while making them engage since the learners passionately engage with these games.

This contextual exploration aligns with past scholarly work that has underscored the pivotal role of cultural games in educational settings (for example, Garraway & Van Graan, 2024; Nkopodi & Mosimege, 2009). These studies have consistently highlighted the importance of integrating cultural games into the curriculum, revealing their potential impact on learners' holistic development and learning experiences. Teachers, as key stakeholders in the educational process, serve as conduits for this integration, recognising the cultural games' relevance and their capacity to enhance understanding of numeracy skills (Gedera & Williams, 2016). A common and profound suggestion by Engeström (2018) urges teachers to enhance learner engagement and foster deeper understanding by developing an awareness of the cultural narratives embedded within these resources. Arguably, the recurrent mention of certain games by teachers, specifically "pada", "tsoro", and "nhodo", not only indicates their popularity but also underscores their alignment with mathematical concepts. This alignment reinforces the interconnectedness between cultural games and mathematical learning, emphasising their potential as valuable pedagogical tools for fostering a deeper understanding of numeracy principles. Theme 2 examines what was found regarding the interplay between the ECD curriculum and cultural games.

5.5 THEME 2: ECD CURRICULUM AND CULTURAL GAMES

The Zimbabwean Competency-Based Curriculum (CBC) for ECD and infants, as depicted in Figures 5.6 and 5.7, particularly in the mathematics and science section, explicitly permits teachers to incorporate cultural games into teaching practice (see the mathematics syllabus, Page 16, which incorporates traditional games).

Figure 5.6

Competency Matrix of ECD A-Infant Maths and Science Syllabus

ECD A: TOPIC: NUMBER AND SCIENCE CONCEPTS

TOPIC	LEARNING OBJECTIVES Learners will be able to:	CONTENT	NOTES & SUGGESTED ACTIVITIES	SUGGESTED RESOURCES
NUMBER	• say and count objects up to 5.	• Count objects	• Counting and saying numbers from 1 to 5.	• Counters, stones, blocks, seeds and bottle tops **NOTE: Teachers must make learners aware of the danger of putting things in the ears, nose and mouth hence increasing disaster risk management awareness.**

ECD A: TOPIC: NUMBER OPERATIONS

TOPIC	LEARNING OBJECTIVES Learners will be able to:	CONTENT	NOTES & SUGGESTED ACTIVITIES	SUGGESTED RESOURCES
ADDITION	• demonstrate addition of numbers • sing addition rhymes	• Addition games and rhymes	• Playing traditional addition games in groups • Playing modern addition games in groups • Chanting addition rhymes • role playing addition	• outdoor play area, counters, charts, DVDs, computers and smart phones
SUBTRACTION	• demonstrate subtraction of numbers • sing subtraction rhymes	• Subtraction games and rhymes	• Playing traditional subtraction games in groups • Playing modern subtraction games in groups • Miming subtraction rhymes • role playing subtraction	• outdoor play area, counters charts, DVDs, computers and smart phones

Source: Ministry of Primary and Secondary Education (2015, p. 16)

From the above extract of the CBC syllabus of the 2015-2022 Curriculum Framework for ECD A, under the content section, notes and suggested activities, one notices that traditional games can be used for teaching and learning mathematics. The same content and suggested activities have been noted again in the Competency Matrix of ECD B below. However, it can be observed that the specific traditional games to be played are not specifically indicated, and the onus is upon the early grade teacher to

choose the traditional (cultural) games that learners know and are age-appropriate and culturally relevant for the learners.

Figure 5.7

Competency Matrix of ECD B-Infant Maths and Science Syllabus

ECD B: TOPIC: NUMBER AND SCIENCE CONCEPTS

TOPIC	LEARNING OBJECTIVES Learners should be able to:	CONTENT	NOTES AND SUGGESTED ACTIVITIES	SUGGESTED RESOURCES
NUMBER	• say numbers • count objects • count objects and animals • say ordinal numbers	• Count objects from 1 to 10 • Objects and animals can be counted • Ordinal numbers from 1st to 5th.	• Listing numbers from 1 to 10 • Stating objects from 1 to 10. • Identifying objects and animals from 1 to 10 • Stating ordinal numbers from 1st to 5th.	• Stones, counters, empty plastic containers, outdoor play area, bottle tops, small blocks, power points, music Grouping domestic and wild animals and dance.

ECD B: TOPIC: NUMBER OPERATIONS

TOPIC	LEARNING OBJECTIVES Learners will be able to:	CONTENT	NOTES AND SUGGESTED ACTIVITIES	SUGGESTED RESOURCES
ADDITION	• play traditional addition games for numbers • play modern addition games for numbers • sing addition rhymes for numbers	• Addition games and rhymes (1 up to 10)	• playing traditional addition games in groups • playing modern addition games in groups • Miming addition rhymes	• Outdoor play area, counters, charts, DVDs, computers and smart phones
SUBTRACTION	• play traditional subtraction games • play modern subtraction games • sing subtraction rhymes	• Subtraction games and rhymes within the range	• playing traditional subtraction games in groups • playing modern subtraction games in groups • Chanting subtraction rhymes	• Outdoor play area, counters, charts, DVDs, computers and smart phones

Source: Ministry of Primary and Secondary Education (2015, p. 16)

The extracts from the infant mathematics syllabi for ECD A and ECD B for the 2024–2030 Heritage Based Curriculum (HBC) are depicted in Figures 5.8 and 5.9 below. One can notice that traditional games are still being emphasised under addition and subtraction, thus strengthening the CBC 2015-2022 gains. Section 1.5.7 of the HBC 2024-2030 stipulates that heritage issues should be considered. The same syllabus

emphasises that the syllabus has been developed to enable learners to acquire competencies physically, intellectually, emotionally and socially, using tangible and intangible heritage (Ministry of Primary and Secondary Education, 2015, p.8), and cultural games are a Zimbabwean intangible heritage that cannot be disputed.

Figure 5.8

ECD Topic 2, Operations

8.2 (ECD A) TOPIC 2: OPERATIONS

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (Skills, values; attitudes, and knowledge)	SUGGESTED ACTIVITIES and NOTES	SUGGESTED RESOURCES
Addition • Addition games and rhymes	• demonstrate addition of numbers through games from 1-5 • recite addition rhymes from 1-5 • sing addition songs from 1-5	• Addition games • Addition rhymes • Addition songs	• Playing traditional addition games • Playing modern addition games • Reciting addition rhymes • Singing addition songs	• ICT gadgets • Resource persons • Outdoor play area • Pebbles • Dices • Digital tools
Subtraction • Subtraction games and rhymes	• demonstrate subtraction of numbers through games from 5-1 • recite subtraction rhymes from 5-1 • sing subtraction songs from 5-1	• Subtraction games • Subtraction rhymes • Subtraction songs	• Playing traditional subtraction games • Playing modern subtraction games • Reciting modern and traditional rhymes • Singing modern and traditional subtraction songs	• Traditional equipment in the school • Pictures • ICT gadgets

Infant Mathematics Syllabus MoPSE 2024

16

Source: Ministry of Primary and Secondary Education (2015, p. 16)

Figure 5.9

ECD: Topic 2 Operations

8.6 (ECD B) TOPIC 2: OPERATIONS

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (Skills, values; attitudes, and knowledge)	SUGGESTED ACTIVITIES	SUGGESTED RESOURCES
Addition	• demonstrate addition of numbers through games from 1-10 • recite addition rhymes from 1-10 • sing addition songs from 1-10	• Addition games • Addition rhymes • Addition songs	• Playing traditional addition games • Playing modern addition games • Reciting addition rhymes • Singing addition songs	• ICT gadgets • Resource persons • Outdoor play area • Pebbles • Counters from the local environment
Subtraction	• demonstrate subtraction of numbers through games from 10-1 • recite subtraction rhymes from 10-1 • sing subtraction songs from 10-1	• Subtraction games • Subtraction rhymes • Subtraction songs	• Playing traditional subtraction games • Playing modern subtraction games • Reciting modern and traditional rhymes • Singing modern and	• Locally available objects • Pictures • ICT gadgets

Infant Mathematics Syllabus MoPSE 2024

22

Source: Ministry of Primary and Secondary Education (2015, p. 16)

Multiple school observations and FGIs that I had with participants revealed this alignment with the curriculum guidelines. Both the CBC syllabus, which was strengthened by the HBC syllabus, state that the curriculum seeks to enable learners to develop an awareness of the importance of culture in learning mathematics. Such awareness enables learners to conceptualise, analyse, and solve real-life problems. Furthermore, both syllabi state that learners should be able to interpret and apply mathematics and science in real-life situations. Interestingly, the Zimbabwean ECD curriculum provides an enabling environment for using heritage-based methods in teaching mathematics. Engeström (1987) noted that curriculum requirements and guidelines may make teachers either feel limited or liberated to experiment with different teaching methods.

Despite the clarity of the curriculum on topics such as addition and subtraction, where it is suggested that traditional plays involving addition can be used as teaching tools, lesson observations have shown that there is limited use of cultural games during lesson planning. While some teachers acknowledge the encouragement and recognition of cultural games in the curriculum, there are instances where the integration of cultural games into lesson planning is not consistently implemented. This

shortcoming is because some teachers lack the skills to plan their lessons and include cultural games as teaching tools. In some cases, teachers plan for games in their lessons, but the types of games (whether modern or cultural) are not clearly articulated. This was evidenced in the plan in Class 2 observation at School 1, in which the teacher mentioned using games as teaching aids without clearly specifying the nature of games. During the observation of Class 4 at School 1, I also noted that the plan merely mentioned *'playing games',* but did not specify or explain whether they were referring to modern or cultural games.

This observation raises an important question: Do teachers have genuine incentives to incorporate cultural games into their teaching, or do they merely reference them in lesson plans to meet curriculum requirements? Lektorsky (1984) argued that teachers' perspectives on using cultural games are not just personal preferences but are shaped by their understanding of how these games enhance learner participation and engagement. A teacher with positive past experiences using cultural games may be more inclined to implement them, whereas those without such experiences may be hesitant. My observations in Classes 2 and 4 at School 1 suggest that the teachers may have included games in their plans only to fulfil curriculum expectations, rather than with a genuine intention to use them. Alternatively, the school's institutional culture might not support cultural games as a teaching tool. Fleer and Veresov (2018) noted that teachers are less likely to adopt new methods if their school or community norms favour conventional teaching techniques different from cultural games.

Additionally, there are discrepancies in teachers' awareness of the explicit mention of cultural games in the curriculum, with some expressing uncertainty about the specific references. For example, in the observation of Class 3 at School 3, I observed that while cultural games were indicated in the syllabus and scheme of work, they were not incorporated into the lesson plan. In addition, in School 3, Classroom 4, I observed that cultural games were not captured as part of the lesson plan, but they were indicated under the activities column. These findings highlight the need for greater consistency and clarity in integrating cultural games into lesson planning. Teachers' awareness of the explicit mention of cultural games should be improved to ensure effective implementation and alignment with educational objectives.

In my inquisitive attempt to understand what probably explains the identified inconsistency, I asked the participants whether the Zimbabwean ECD curriculum allows them to use cultural games in class. Interestingly, I got varying perspectives on the inclusion of cultural games in class. The responses provided by teachers during F1 offer a varied perspective on whether the Zimbabwean curriculum permits using cultural games in class. For example, T1S1 unequivocally stated that cultural games are allowed in the syllabus, indicating a clear awareness of the curriculum's stance on this matter, citing what is provided in Sections 3.1 and 3.6 of the syllabus. This response suggests confidence in the curriculum's support for incorporating cultural games into the teaching of early-grade mathematics.

Contrary to this view, during the same FGI, T3S1's response reflects a sense of uncertainty, indicating a lack of confidence in their knowledge of whether cultural games are permitted in the curriculum. This response can be likened to T1S2's expression of uncertainty about the explicit mention of cultural games in the curriculum when she said*, "I did not see where it is written specifically".* This uncertainty may stem from a lack of familiarity with the specific details of the curriculum or a lack of clarity in the documentation regarding the inclusion of cultural games. However, they acknowledge that cultural games are encouraged, suggesting a willingness to integrate such activities if allowed. T4S3's response provides additional insight by mentioning that she has only *"seen them in the visual and performing arts and family and heritage studies"* curriculum. This probably means that some teachers are finding it difficult to relate cultural games to mathematics and science tuition.

This observation implies that while the curriculum may not explicitly mention cultural games, they are present in related subjects or resources, indicating a potential indirect allowance for their use in classrooms. As has been evidenced, F1 highlighted a range of perspectives, from certainty to uncertainty, regarding the inclusion of cultural games in the Zimbabwean ECD curriculum. These varied responses highlight the need for clear and consistent communication regarding the curriculum's position on cultural games, ensuring that teachers can effectively integrate them into their teaching practice. The CHAT recognises that individuals often face inconsistencies within their systems of activities, which can influence how they engage with resources like cultural games (Lektorsky, 1984). For example, while teachers may acknowledge the benefits

of cultural games, their ability to implement them effectively may be hindered by institutional constraints, personal preferences, past experiences, or their level of competence (Kaptelinin & Nardi, 2017).

During F2, T1S2 narrated that there is a general lack of overt sanctioning of cultural games in classrooms. She had this to say in her own words: *"in Zimbabwe, the curriculum does not explicitly allow the use of cultural games in the classroom"*. In the same line of argument, T2S2 expressed uncertainty, highlighting their pronounced presence in the *"visual and performing arts, and family and heritage studies"* section only. Conversely, T3S2 firmly affirmed the inclusion of cultural games in the syllabus, while T4S2 remained uncertain about this aspect. This divergence in opinions within a single school underscores the complexity and potential ambiguity in understanding curriculum guidelines, affecting teachers' perspectives on the inclusion of cultural games in teaching mathematics at the foundational level.

Similarly, during F3, T1S3 acknowledged the allowance for incorporating cultural games, but she said that she had never encountered explicit stipulations in the curriculum. Contrary to that view, T2S3 mentioned the inclusion of traditional games as teaching tools in the syllabus. Then, T3S3 admitted personal uncertainty about the curriculum's explicit mention of cultural games, while T4S3 confidently affirmed the curriculum's permission for the integration of cultural games when she said:

> *"Yes, the curriculum in Zimbabwe does allow us to incorporate cultural games into the classroom. It recognises the importance of preserving cultural heritage and encourages teachers to integrate cultural games into their TP (T4S3)*."

T4S3's sentiments on recognising the importance of preserving cultural heritage and encouraging teachers to incorporate these games into their instructional practices align with broader educational goals. Insights from individual teachers' interviews across different schools provide a nuanced understanding of the inclusion of cultural games in the curriculum. For example, T1S1 affirmed that the curriculum encourages the use of cultural games, while T1S2 asserted that the presence of cultural games is explicitly stated in the syllabus when she said that *"the curriculum encourages us to use cultural games".*

Sharing a contrary view, T1S3 explained that the syllabus does not explicitly state such information, but she highlighted the importance of teacher creativity, possibly indicating a reliance on adaptation without explicit guidelines. This position shows that some of these teachers are also inexperienced regarding the curriculum. This lack of skill in interpreting the syllabus was also exhibited by T2S2, who emphasised the improvisation by teachers in the absence of explicit documentation, underscoring the adaptability and flexibility teachers employ to ensure student comprehension. Then, T2S3 vaguely acknowledged the mention of games without specifying their nature, potentially indicating a lack of clarity in communication or awareness.

In another revelation, T2S1 confirmed the presence of cultural games in the syllabus but expressed uncertainty about the specific location, suggesting a potential need for clearer communication and documentation. T3S1 only identified the reference to cultural games in *“family and heritage studies”*. Similarly, T3S2 outlined the inclusion of cultural games in various resources, citing examples from teachers’ books such as *“best approach to visual and performing arts, and family and heritage studies”*. Perhaps, having such texts on how cultural games can be used in the teaching of early-grade mathematics will go a long way in clarifying what is hidden to some teachers.

Similarly, T3S3 acknowledged the presence and importance of cultural games in introducing new concepts, emphasizing the potential of integrating cultural elements into various aspects of teaching. Then, T4S1 affirmed the presence of cultural games in scheme books and plans, while T4S2 expressed uncertainty, saying the following in her own words: “tongoti ehe asi handisati ndazviona” [we can say yes, but I am yet to see where it is indicated].

T4S3 asserted a greater extent of allowance for the use of cultural games, attributing this claim to the explicit mention in the mathematics and science syllabus. Notably, the current system has no Head of Department in the Foundational Phase who guides teachers or routinely facilitates workshops to guide teachers in interpreting the syllabus. This partly explains the reasons behind teachers' varying degrees of awareness, reinforcing the need for clear communication and training to ensure

consistent implementation of cultural games' integration into the curriculum. This observed and reported reality underscores the complexity and diversity of perspectives surrounding incorporating cultural games in the educational context. Theoretically, classical scholars Leont'ev (1981) and Vygotsky (1978) asserted that for cultural learning to be successful, the mediating tools that are critical in the process are the impartation and acquisition of knowledge and skills. As such, teachers will, arguably, find it difficult to extract and impart knowledge or skills embedded in cultural games if they cannot effectively interpret the curriculum.

Previous studies advocated for empowering children to construct their numerical competence and relate mathematics to their daily lives, endorsing the integration of games in mathematical education (Moloi, 2015; Nkopodi and Mosimege, 2009). It has also been argued that games offer holistic learning experiences, fostering cognitive processes and consolidating existing knowledge (Gedera & Williams, 2016), which provides a rationale for incorporating cultural games into the curriculum (Nabie, 2011). Nabie (2011) also underlined that teachers' familiarity with cultural games is crucial for the development of effective teaching methods since games serve as mediators to connect with mathematics concepts. Despite this growing emphasis, the general lack of teachers' familiarity with the curriculum is not peculiar to Zimbabwe. Sulistyaningtyas and Fauziah (2019) concluded that teachers in India struggle to implement cultural games due to a lack of understanding. Similarly, some Ghanaian teachers fail to appreciate the connection between indigenous mathematics and cultural games due to a lack of mathematical understanding (Nabie, 2011). Could the teachers' ability to interpret the curriculum be partly shaped by their perception and attitude toward cultural games in general?

5.6 THEME 3: CULTURAL GAMES AS A TEACHING TOOL

This theme explores teachers' opinions on using cultural games in teaching and learning. These views were collated from the examination of classroom observations, in-depth interviews, and FGIs. This inquiry was driven by the underlying aim to understand the confidence and perceived benefits of incorporating cultural games into curricular and co-curricular activities. This theme feeds from three sub-themes: the use of cultural games in teaching and learning, the incorporation of cultural games in lessons, and the adequacy of cultural games in teaching mathematics (see Table 5.3).

5.6.1 Use of Cultural Games in Teaching and Learning

The analysis of the use of cultural games in teaching and learning revealed a mix of perspectives and practices among teachers across different schools. While some teachers effectively integrate cultural games into their lessons, others face challenges or rarely utilise them. For example, in my observation of T1S1's teaching practice, it came to my attention that the teacher was aware of the value of cultural games by drawing examples from some of the games children play at home, but she did not allow the learners to play them during lesson time. Contrastingly, T4S1 confidently and passionately mentioned names of cultural games such as "nhodo" (pebble game), "pada" (hop-scotch), and "dunhu", showcasing a positive attitude towards their use. Then, T4S3 expressed enthusiasm for their use, and in her own words, she narrated:

> *I integrate cultural games into my teaching almost every day. Cultural games allow my lessons to be more interactive, fun, and memorable. Depending on the subject and topic, I incorporate relevant cultural games to enhance learner engagement and understanding. (T4S3)*

However, T2S2 noted that time constraints are one of the key challenges limiting the use of cultural games in everyday teaching. She explained: *"Uhm, I rarely use them during teaching and learning … I do not have time, and the timetable is always congested"*. In light of these contrasting views, I discovered that some teachers fail to distinguish between material and symbolic tools, as explained by the CHAT (Roth & Radford, 2012). Teachers can use symbolic rather than material tools where time is perceived as a limiting factor. For example, teachers can extract cognitive frameworks from games such as "nhodo", "pada", and "dunhu" and help learners use them to interpret experiences and build understanding (see Section 2.3.1). When advancing knowledge proves challenging using a single dimension of tools, Engeström (2018) recommended combining material and symbolic tools to facilitate both abstract reasoning and hands-on engagement. The games themselves function as tangible tools that learners can interact with, while the embedded rules and mathematical concepts create a structured framework for understanding mathematical relationships.

Notably, T2S2 considered cultural games to be playful activities that contained some learning points but that they were not so important for classroom learning. The analysis

of teachers' sentiments regarding integrating cultural games in teaching and learning reveals various approaches and frequencies across different schools and educators, reflecting the diverse pedagogical practices and contextual factors influencing instructional decisions. In the minimalistic view of the importance of cultural games, T1S1 acknowledged that she utilises them just for lesson introduction and the conclusion, while T1S2 highlighted that she uses cultural games in selected cases, both highlighting an intention to gauge student understanding through *"experiential learning"*. This was established when they said the following in their own words:

> *"Cultural games are used normally for the introduction and conclusion of a lesson to check on how much knowledge has been acquired (T1S1)."*
>
> *"While I may not use them daily, I incorporate cultural games strategically throughout the academic year (T1S2)."*

Following the sentiments given by T1S1 and T1S2, it can be deduced that cultural games are used in the introduction, selected subject matter concepts, and even for assessment. Further supporting this revelation, T1S2 explained that she adopts a weekly structured incorporation of cultural games during lesson introductions, aiming to enhance student engagement with new concepts. This perspective aligns with the CHAT's *'tools as shapers of activity'* component (see Section 2.3.4), which emphasises that tools mediate human behaviour and enhance the effectiveness of an activity (Engeström, 2018). Building on this idea, it can be argued that teachers incorporate cultural games in specific contexts to facilitate learning. Consequently, activities supported by these tools provide EGLs with structured opportunities to engage with numerical concepts collaboratively, fostering problem-solving skills through interactive experiences. Instead of overreliance on cultural games, some teachers are using them as stepping stones to introduce and clarify certain concepts.

Conversely, T1S3 adopts a more flexible approach, adapting the use of cultural games based on perceived instructional needs, suggesting a *"responsive teaching strategy"*. T2S2 delineates a specific temporal framework, indicating the strategic use of cultural games during the initial weeks of the academic term to scaffold numerical concepts

when she narrated. In addition, T2S2 emphasised the importance of culture in learning:

> *I use cultural games when there is need, for example, once per term or week especially when introducing a new topic …zvinenge zvakanaka nekuti vana vanobva vakura vachiziva zvetsika dzavo […it will be a noble idea because children grow up knowing about their own cultural values]. (T2S2)*

To realise more of the benefits pointed out by T2S2, teachers across different schools underscored the importance of addressing barriers inhibiting the full adoption of cultural games and called for supporting the effective integration of cultural games into teaching and learning. Further clarifying this suggestion, T2S4 underlined:

> *We feel culturally inferior because of the dominating Western cultural curriculum whose game we can teach in confidence. We must embrace our native games to contextualise education and at the same time preserve our endangered culture. (T2S4)*

This perspective aligns with the CHAT, which emphasises that using cultural games as mediating tools acknowledges and values a child's cultural identity (Gedera & Williams, 2016). This idea traces back to Vygotsky's (1978) view of tools as cultural artefacts that embody a society's values, beliefs, and traditions. These tools are essential for understanding human interactions with their environment as they carry the historical significance of collective experiences and knowledge. In this context, T2S4's assertion that cultural games reflect cultural norms and social connections suggests that their use fosters the production of context-specific knowledge, making learning more relevant and meaningful to EGLs' daily lives.

Meanwhile, T3S3 demonstrated a more pervasive integration of cultural games, leveraging them as daily tools to invigorate lesson delivery and cater for diverse learners' needs. However, amidst these varied approaches, there are instances where teachers express minimal utilisation of cultural games. T4S1's assertion of non-use highlights potential barriers or constraints that hinder the integration of cultural games into instructional practices. Similarly, T4S3's sporadic use of cultural games suggests

a need for further exploration of factors influencing pedagogical decisions and resource allocation. These diverse perspectives collectively illustrate what Engeström (2018) identified as the challenge teachers face in aligning their learning objectives with learners' evolving conceptual understanding of mathematics. The need to continuously adapt teaching methods to accommodate the shifting needs and perceptions of EGLs can be overwhelming for some educators. This challenge stresses the importance of providing ongoing support and professional development focused on culturally responsive teaching (Kamisli, 2019).

Furthermore, these diverse perspectives highlight the nuanced interplay between pedagogical beliefs, instructional contexts, and resource constraints in shaping teachers' utilisation of cultural games. Through the foregrounding of the CHAT, these dynamics (conceptualised in Section 2.5.1 as *'Object's Dynamic Nature in the CHAT'*) are crucial for devising targeted interventions and professional development initiatives aimed at the insertion of more culturally balanced, equitable, and inclusive educational practices. Additionally, it highlights the need for collaborative efforts among educators, policymakers, and stakeholders for the effective integration of culturally relevant pedagogies in teaching and learning environments. It can be argued that this enhances learners' engagement, learning outcomes, and cultural appreciation.

5.6.2 Incorporation of Cultural Games in Lessons

Analysing how cultural games are incorporated into lessons across different schools provides valuable insight into the varied practices and challenges involved in integrating indigenous elements into teaching methods. This exploration uncovers a range of implementation strategies, from effective applications to obstacles that hinder integration. Key barriers, such as inadequate planning and limited resources, must be addressed to enhance the successful adoption of cultural games in education. Kamisli (2019) highlighted that applying the CHAT in practice often encounters challenges stemming from any of its six components (tools, subjects, objects, community, division of labour, and rules). Investigating these contextual approaches within specific study areas offers a deeper understanding of how the CHAT can be adapted and applied across different educational settings.

In School 1, while cultural games are indicated in lesson planning, they are not effectively integrated into teaching practices. For instance, a discrepancy was observed between planned activities and actual implementation. This was particularly noted in a case where cultural games are planned for in each lesson; however, they are indicated in the syllabus but not captured in teachers' scheme books. This indicates a gap between intention and execution when incorporating cultural games. Similarly, in School 2, cultural games are notably absent during lesson delivery despite being planned for. These observations reveal that cultural games are not adequately used in the class, and in some cases, they are not used at all. This discrepancy underscores the challenge of translating planning into action and highlights potential barriers to effective implementation.

Conversely, positive instances were observed in School 3, where some teachers effectively incorporated cultural elements into lessons. For example, one observation notes that *"during introduction and conclusion, the teacher and learners chanted 'dudu-muduri katswe'".* This demonstrates an active effort to engage students through cultural activities, enhancing their learning experiences. Mentz and De Beer (2021) claimed that the primary incentive for teachers to include cultural activities in their lessons is the desire to enhance learners' engagement and make learning more relevant. In the context of this study, the observed motivation to connect mathematical concepts to EGLs' real-world experiences serves as a powerful driver for teachers.

However, inconsistencies were also observed within School 3, indicating room for improvement. While cultural artefacts were present in the classroom, there was inconsistent utilisation of cultural games during lessons, as indicated by the observation: *"cultural games are planned for in each lesson in the class; however, they are just indicated in the syllabus but not schemed for".* This suggests a need for better alignment between planning and implementation. It can, therefore, be deduced that these outcomes highlight the importance of addressing barriers and supporting the effective integration of cultural games into teaching and learning. Professional development initiatives and access to resources may be needed to bridge the gap between intention and action, ultimately enhancing student engagement and cultural appreciation in the classroom.

Recent studies on educators' career development, particularly about the theoretical perspective of cultural games (e.g., Cole, 1996; Engeström, 2023; Mentz & De Beer, 2021; Kurniawan, 2022), present similar yet distinct perspectives on the gap between intention and implementation. Kurniawan (2022) observed that teachers' willingness to incorporate cultural activities into their lessons is often linked to their training and professional development experiences. Engeström (2023) stressed that access to professional development opportunities focused on culturally responsive teaching equips educators with the confidence and skills to integrate local knowledge into their classrooms effectively. Likewise, Cole (1996) and Mentz and De Beer (2021) argued that teachers motivated by career advancement are more likely to experiment with innovative teaching approaches, including the use of cultural games, as they seek to enhance their pedagogical practices and professional growth. By mirroring the observed inconsistencies in contemporary literature on the gap between planning and implementation, it can be deduced that career development programs must be contextually designed to push a heritage-based approach to teaching.

Viewing the discovered inconsistent findings on the use of cultural games in everyday teaching and learning, it is prudent to juxtapose them with accessible empirical literature. Modern educational theory acknowledges games as significant learning aids due to their ability to enhance motivation for learning (Boyle et al., 2016; Subhash & Cudney, 2018). Game-based learning is increasingly being utilised across various educational domains, particularly at the foundational level, to enhance learning effectiveness and offer immersive learning experiences (Ayale-Perez & Joo-Nagata, 2019; Prensky, 2003). The literature further indicates that cultural games ensure that pupils maintain active engagement because they rely heavily on the motivational aspect of completion, rewards, and enjoyment (Vocaturo et al., 2019). This study's findings have shown that teachers are somehow aware of some of the benefits associated with cultural games identified in past studies, but they have mixed reactions regarding infusing cultural games into pedagogical practice. We now address the question: What are some of the explanatory factors for the reported and observed mixed reactions?

From both theoretical and practical perspectives, using an appropriate educational strategy within cultural games can enhance the achievement of learning objectives

and improve learning outcomes, experiences, motivation, and cognitive abilities (Melero & Hernández-Leo, 2014). For example, scaffolding-supported learning is commonly employed in game-based learning, aiding players in accomplishing learning objectives and tasks through suitable cues and receiving consistent feedback and task-specific support (Erhel & Jamet, 2013). In the context of games examined in this study, this could entail incorporating incentive structures such as winning a house *"pada"*, progression of levels in "nhodo", or any exclusive rewards in particular games. This leads to the question: Does the minimalistic approach currently being used by some teachers in adapting cultural games as teaching tools have some traces of their inadequacy in providing the desired learning outcomes?

5.6.3 Adequacy of Cultural Games in Teaching Mathematics

The analysis of the sentiments on the adequacy of cultural games in teaching mathematics revealed varied perspectives between and within reported and observed realities. While there is explicit permission within the Zimbabwean curriculum to integrate cultural games into mathematics education, it was observed that the actual implementation is at its minimum and lacking at times. Emphasising the discrepancy between recognition and practice, two different teachers had this to say:

> *I believe cultural games are not adequately used in teaching early-grade mathematics. There is a need for increased emphasis on their incorporation in the curriculum and comprehensive training to ensure their effective utilisation for meaningful learning experiences. (T1S1).*

> *As for me, there is a need for greater recognition and integration of cultural games into the curriculum to promote cultural appreciation, enhance learning outcomes, and create an inclusive and culturally responsive environment. In other words, they are not being planned for in our classes. (T2S2)*

Accounts given by T1S1 and T2S2 attest to the fact that, since cultural games are not mandatory, teachers are selectively using them for their convenience. This implies that if cultural games are made compulsory, teachers are ready to use them as a key tool for transferring knowledge. There is a clear need for teacher training on effectively incorporating games into mathematics instruction, as many educators lack experience

using them as teaching tools. This reflects the evolving nature of educational tools and the incentives for teachers to adopt them, as outlined in the CHAT (see Sections 2.3.5 and 2.4.1, respectively). Engeström (2001) underlined that activity systems are inherently dynamic, adapting over time to internal and external influences. This suggests that educational tools must evolve to remain effective as pedagogical approaches shape teaching practices. To facilitate this adaptation, Engeström (2018) highlighted the importance of training and flexibility for teachers. Many educators may lack the confidence to implement game-based strategies due to inadequate training or support. Therefore, ongoing professional development is essential to equip teachers with the necessary skills to navigate these challenges, ensuring a culturally responsive learning environment that enhances student engagement and understanding (O'Donoghue & Harford, 2020).

In addition to teachers' willingness to use cultural games in mainstream education, T2S1 raised the time constraint challenge and a congested timetable since most games require a considerable amount of time to be completed; sometimes, that time outweighs the allocated lesson time. She had this to say in her own words:

> *They are not adequately used because there are time limitations due to work pressure, and congested timetable. So, it is difficult to implement them. Furthermore, with the advances in technology, cultural games are slowly being overtaken by modern digital games. (T2S1)*

T2S1's concerns about limited time and technological advancements can be analysed within the framework of tool development in CHAT (see Section 2.3.5). Engeström (2001) asserted that activity systems and educational tools must evolve to remain effective in the wake of pedagogical shifts or technological advancements. This perspective challenges mathematics content developers to digitise cultural games, enhancing their efficiency in classrooms while ensuring they remain engaging and relevant for modern learners. Instead of relying solely on traditional, time-consuming manual gameplay, integrating digital versions of these games can streamline learning while simultaneously fostering cultural appreciation, numeracy competencies, and technological literacy.

Despite the presence of challenges highlighted by other teachers, T4S3 reiterated the potential benefits of cultural games resulting from proper planning by narrating:

> *"When implemented effectively, cultural games can significantly enhance the learning of early-grade mathematics. As such, games must be utilised more extensively (T4S3)*."

T4S3's perspective on the effectiveness of cultural games in mathematics instruction highlights the need to overcome barriers to their integration into mainstream education to fully harness their potential for enhancing learning experiences. This aligns with the principles of cooperation and community involvement in the CHAT. Engeström (2018) argued that teachers influence and are influenced by their interactions with tools, community members, institutional regulations, and the division of labour. Within this study, teachers exercise agency by selecting instructional strategies, planning their integration thoughtfully, and executing them effectively. When they recognise the value of cultural games in helping EGLs connect mathematical concepts to their lived experiences, they adapt their approaches to foster a more inclusive learning environment. In this sense, teachers can catalyse change through collective, purpose-driven advocacy within schools.

Research shows that incorporating cultural games into lessons can enhance children's learning experiences. According to Henniger (2013), a play-based curriculum helps reinforce key skills, such as classification, essential for early-grade learners. Clements and Sarama (2020) further argued that mathematics can naturally blend with children's play when teachers create a supportive environment and provide appropriate tasks. Cutter-Mackenzie and Edwards (2013) described pedagogical play as a process where teachers guide children through discovery and interaction, helping them build a deeper understanding of mathematical concepts. Similarly, Trawick-Smith et al. (2016) highlighted that cultural games can effectively teach mathematics, especially when teachers actively engage with learners during play. However, this study found that some teachers are reluctant to use cultural games for various reasons. This hesitation may limit learners' ability to develop numeracy skills, as teachers play a crucial role in linking these games to mathematical concepts.

5.7 THEME 4: RESOURCES FOR CULTURAL GAMES

Scholars such as Trawick-Smith et al. (2016) underlined the importance of analysing resources for cultural games in various educational settings because it presents a nuanced picture of availability and utilisation, highlighting both strengths and challenges across different schools and teachers. In light of this advice, I inquired about resources, availability, and utilisation through the lens of cultural games. This inquiry gave me invaluable contextual insights into the resources necessary for implementing cultural activities and strategies that can be employed to address resource limitations.

Observations across all schools consistently acknowledge adequate resources for cultural games activities, with teachers affirming the presence of plenty of materials (Coverage 0.74%-0.80%). In School 1 Class 1, materials such as the pebbles used for “nhodo” and “tsoro” were available. Ropes for skipping games and flat stones for playing “pada” (hopscotch) were easily accessible. Similarly, in School 2, Class 2 observations indicated that although resources were deemed sufficient and easily accessible, there was a noted lack of utilisation, indicating a potential gap between resource availability and implementation (Coverage 0.88%-1.25%). However, in Class 3, observations carried out exhibited that resources were abundant, especially in the outdoor play area (Coverage 0.98%). This suggests a favourable environment for cultural game implementation.

Furthermore, F1’s group views expressed confidence in the availability of resources, citing materials readily accessible within the local environment or brought from home. This was confirmed by T3S1, who stated:

> *We have plenty [of] resources because most of the materials needed for games are found in the locale. For example, in games such as ‘hwai-hwai-huyai’ and ‘zvamutsana-mutsana tsuro nembwa’, children mimic animals, and for games such as ‘zai rakaora’, they use a stone to represent an egg. Then, balls can be made from plastics or rugged clothes. (T3S1).*

Similarly, in F2, teachers highlighted the improvisational nature of resource procurement, leveraging materials found in the local environment or created at home or school. However, F3 presented a contrasting scenario, with teachers acknowledging resource scarcity but emphasising resourcefulness and creativity in improvising materials. F3's group sentiments on scarcity could be a misinterpretation of their prevailing circumstances because they mentioned room for improvisation. So, there is a sense of underutilisation or a limited supply of materials for certain games. Individual teachers' perspectives offered additional context to group views. For example, T2S1 emphasised the abundance of locally available materials, minimising the need for additional resources. This was established when she said:

> *"We do not require additional resources to play cultural games because most of the needed material is locally found in the school environment or children can bring from home (T2S1)."*

Overlaying groups' and individuals' sentiments suggest that resources needed for cultural games are available in their abundance, either directly or indirectly, through improvisation. The findings underscore the importance of resource availability and creativity in facilitating the implementation of cultural games activities in educational settings. While some schools benefit from ample resources and supportive environments, others face challenges that require innovative solutions. Teachers are crucial in maximising available resources and leveraging local contexts to enrich students' cultural learning experiences through games and activities. Inspired by the CHAT, Engeström (2009) asserted that by employing strategic approaches, educators can create inclusive interaction and engaging learning environments that promote cultural appreciation and understanding among students. This implies that even in class, teachers must strategically use in-class resources.

The findings on in-class resources for cultural games across different schools revealed varying degrees of provision and utilisation of cultural artefacts, which are essential for integrating cultural games into classroom activities. T4S3's class setting served as an instrumental example of the appropriate collection and usage of in-class resources for cultural games. The classroom can be described as having cultural artefacts that enrich the learning environment. This underscores the importance placed on creating

a rich cultural context within the classroom setting, facilitating meaningful engagement with cultural games among students. This was followed by my observations of T1S2 and T2S1 in practice. I noticed a consistent acknowledgement of appropriate resources for cultural games in the classroom. In these settings, teachers have ensured the presence of cultural artefacts, creating a conducive environment for incorporating cultural games into their teaching practices. This indicates a proactive approach by educators in curating resources that reflect diverse cultural experiences and enhance students' understanding.

On the other hand, T3S2 exhibited a comparatively lower emphasis on cultural artefacts in the classroom. While cultural artefacts were present, the extent of provision was limited, potentially impacting the breadth and depth of cultural games integration. Notably, the significance of class resources, particularly cultural artefacts, is crucial in fostering the incorporation of cultural games into teaching practice. Schools and educators prioritising such resources contribute to creating inclusive learning environments that celebrate diversity and promote cultural understanding among students. Conversely, instances where resource provision may be limited underscore the need for targeted efforts to enhance resource availability and support educators in integrating cultural games effectively into their teaching repertoire.

Teaching early-grade mathematics using cultural games has important implications when considering how tools are socially and historically produced. As such, educators should intentionally choose an application of culturally appropriate resources. By doing this, they can design educational activities that speak to the identities and experiences of the EGLs. Furthermore, teachers should also be encouraged to consider the historical relevance of the teaching aids they employ. They can better understand how these tools have changed over time and how to modify them to fit modern learning objectives with the aid of this reflection.

One widespread piece of advice by Engeström (2018) encouraged teachers to increase EGLs’ engagement and advance deeper understanding by cultivating an awareness of the cultural narratives woven across these resources. These suggestions attest to the flexibility of CHAT's tools and offer insights into prospects for modifying teaching methods to promote effective learning outcomes. Since a society's

acquired knowledge is embodied in its tools, teachers can establish rich learning environments that respect EGLs' backgrounds and encourage meaningful engagement by using cultural games that reflect learners' cultural backgrounds. This explains partly why the CHAT regards tools as shapers of activity. Leont'ev (1981) agreed with Vygotsky's (1978) idea that mediating tools are critical in the impartation and acquisition of knowledge and skills.

Tools, according to Vygotsky (1978), are more than just instruments, because they also affect how we connect with the outside world and mould our cognitive processes. This was further developed by Engeström (2023), who saw tools as essential parts of an activity system that also consists of subjects (actors), objects (goals), and the society in which the activity takes place. Tools consist of material products, including instructional games, manipulatives, and online materials. Cultural games can be useful educational resources that help EGLs learn mathematical ideas through play in their early years. Teachers may facilitate mathematics instruction by using pedagogical tactics influenced by cultural customs. Effective teaching requires understanding how to combine these intellectual tools with tangible ones. These tools have a mediating effect on how learners and teachers interact. Early-grade teachers can use cultural games as pedagogical tools that promote learning rather than just offering amusement when incorporating them into their mathematics lessons. This supports CHAT's claim that social interactions mediated by culturally appropriate artefacts are how learning happens (Mentz & De Beer, 2021).

Early-grade teachers can use cultural games as pedagogical tools that promote learning rather than just offering amusement when incorporating them into their mathematics lessons. This supports CHAT's claim that social interactions mediated by culturally appropriate artefacts are how learning happens (Mentz & De Beer, 2021). According to the main tenets of the CHAT, these tools work together to shape human behaviour and outcomes rather than functioning independently. For instance, when educators use cultural games in early-grade mathematics instruction, they combine material tools (such as game pieces or digital platforms) with symbolic tools (such as game rules and mathematical language).

A recent publication by Garraway and Van Graan (2024) has suggested that incorporating culturally relevant games into mathematics lessons allows learners to connect mathematical concepts with their lived experiences. In addition to making learning more meaningful, this connection also encourages collaboration as EGLs work together to tackle challenges within the games. However, ineffective tools, whether poorly designed or misaligned with learning objectives, can hinder comprehension. For instance, a game lacking clear mathematical connections or failing to capture learners' interest may not effectively mediate understanding. In such cases, EGLs may struggle to see the relevance of the activity, leading to disengagement or frustration.

5.8 THEME 5: SUPPORT FOR CULTURAL GAMES

I inquired about the support for cultural games in educational settings to gain a deeper understanding of the resources for cultural games around their availability and utilisation. This inquiry brought to light varied levels of institutional and administrative assistance available to teachers for implementing culturally inclined activities in general. I probed the participants to narrate their experiences in the context of mathematics. During F1, the group expressed dissatisfaction with the lack of materials specifically procured for cultural games. Voicing on behalf of the group and receiving mass support from the other participants, T1S1 highlighted the need for resources such as skip-ropes for fish-fish. Bringing in a new perspective to the general lack of specific resources, T2S1 acknowledged the accommodating school environment for incorporating cultural games, indicating implicit support despite the absence of specific resources when she stated:

> *"While no specific support has been provided for implementing cultural games, our school environment accommodates and encourages the incorporation of such activities (T2S1)."*

In the same line of expression, the second group (F2) echoed somewhat similar sentiments, with T1S2 noting the absence of support but expressing optimism about potential assistance upon request. She said: *"No support is given, but if you ask for it, I am sure they will give us support".* T3S2, however, takes the initiative based on

personal research, demonstrating self-driven efforts to integrate cultural games into lessons when she pointed out:

> *"I have not been given any specific support to implement cultural games. However, based on my research and understanding, I have taken the initiative to explore and incorporate cultural games into my lessons (T3S2)."*

Teachers' views around administrative support towards cultural games suggest that the school heads are not making a deliberate effort to support teachers in the use of indigenous pedagogical approaches. In addition to the need for administrative support, T1S1 identified the need for a wider array of resources, with particularly recorded and well-articulated materials accessible on platforms such as YouTube. She had this to say:

> *Most modern games are well-articulated in books, and accessible in recordings on platforms such as YouTube, yet our native games are not easily accessible. If we had the same coverage with the cultural games, it would be easier, and we would also have learned from different tribes in the Zimbabwean culture. (T1S1)*

These sentiments underscore the importance of comprehensive resource provision beyond physical artefacts to facilitate effective teaching and learning. Conversely, T2S2 and T1S3 highlighted the responsive nature of school support, emphasising the significance of communication in accessing resources. This was established by their comments:

> *"If we tell the school what we need, they do give us, but if you don't tell them, they may not know what we need (T2S2)."*
>
> *"The school managed to clear the ground by cutting grass (T1S3)."*

The teachers' responses indicate a laissez-faire environment regarding the needed support. They show a lack of leadership or, at best, a decentralised approach to support, where teachers' needs are met through explicit communication with school administrators. Additionally, parental involvement emerges as a source of support, as mentioned by T2S3, who explained that parents contribute by making toys and

materials for cultural activities. This collaborative effort underscores the importance of community engagement in enriching educational experiences. The adoption of the collaborative approach is not without its challenges, as explained by T4S2. She expressed that there is a general lack of support for implementing cultural games at the institutional level. In highlighting the challenge, T4S2 clarified:

> *It is not just the understanding of the current head or collaborating parents, but there is a need to have systems at the institutional level or at the policy level to oversee resource allocation and support of cultural games, but at the moment, we do not have such higher-level support. (T4S2).*

These perspectives highlight the need for systematic improvements in recognising and addressing the importance of cultural games in the curriculum. It can be noted that while some schools demonstrate proactive efforts to support the integration of cultural games, challenges such as resource limitations and institutional inertia remain prevalent. It is against this background that teachers emphasised the adoption of a collaborative approach to create a culturally enriched learning environment characterised by access to diverse games, pedagogical guidance, and community involvement. Furthermore, it has been revealed that the collaborative approach must be guided by clarity in planning, resource availability, and technological integration.

During F1, T1S1 emphasised the necessity for access to diverse cultural games, stressing the enrichment of teaching practices through documenting games from various tribes. Clarifying this point, T2S1 highlighted the disparity between the accessibility of modern games and cultural games, advocating for similar coverage to enhance teaching and learning experiences. In the same line of thought, T3S1 underlined the need for workshops and resource persons to bridge cultural gaps between teachers and learners. Some of these sentiments, captured in their own words, read as follows:

> *“To enhance the implementation of cultural games, it would be beneficial to have access to a variety of games. Considering the multiplicity of games emanating from different tribes, having resources and materials that document them would enrich our teaching practice (T2S1).”*

> *"We need workshops and resource persons to guide us because some of us do not share the same cultural background with learners (T3S1)."*

Evident from the position of participants in F1, teachers need a manual of cultural games documenting the most widely used games in Zimbabwe. In a somewhat similar line of thinking, F2 participants underscored the need for clarity in planning cultural games, more resources for implementation, staff development on their usage, and a larger time block to accommodate the organisation of learners. This indicates the need for a multi-dimensional approach to address support requirements, ranging from pedagogical guidance to logistical considerations. This suggests a need for structured guidelines or training to facilitate integrating cultural activities into lesson plans, ensuring alignment with educational objectives.

Therefore, concerning staff development on the use of cultural games, F1 and F2 expressed similar concerns. These concerns indicate a desire for professional development opportunities to enhance teachers' knowledge, skills, and pedagogical strategies related to integrating cultural games into teaching practices. T4S1 emphasises the necessity of allocating a substantial block of time for cultural games due to their organisational demands. This implies the need for scheduling flexibility and adequate time management strategies to accommodate the planning, execution, and reflection phases of cultural activities within the curriculum. Teachers from these two schools expressed willingness to learn more and, perhaps, embrace culture and transfer the knowledge to learners.

Singing a similar tune but using a different tone, participants from F3 placed much emphasis on leveraging technology and community involvement to support cultural games. For example, with the support of other participants, T1S3 called for the development of a digital database that collates cultural games according to the numerical competencies they best teach. Just like modern games, she added, instructions for each game must be clearly laid out to guide first users. Such a strategy is as good as killing two birds with one stone; that is, teaching numeracy and technological competencies simultaneously since the ECD curriculum seeks to impart both skills to learners. Considering other dimensions of support, T2S2 argued that

resources and support for cultural games are two sides of the same coin. She explained that the role of parents and the community in providing materials and sharing knowledge to revive fading cultural games is commendable, but more can be done, as she said,

> *"Parents and the local community should do more by providing materials and sharing their knowledge of cultural games that are fading away due to passage of time (T2S2)*."

This implies that parents and the community must be indirectly active in the co-creation of knowledge since they are the custodians of culture. Therefore, it is not the sole responsibility of teachers to introduce learners to games, but it must begin at home, and teachers build on that by conceptualising games for the benefit of learners. T1S2 and T2S2 highlighted that some games do not need a lot of space and can be played in the classroom, but some of the rooms are shared because of shortages of learning space. This point was well put across by T2S2, who said,

> *More classrooms are needed so that there won't be any sharing. This creates adequate space that even in class, learners will have enough space to move around (T2S2).*

In addition to the construction of additional classrooms being essential for cultural games, T2S2 noted that mathematical cultural games are mainly played outdoors. She expressed contentment with the existing resources when she said, "*aah-chiko senhodo unongo nhonga uye vana ukavaudza vanounza"* [Aah, for example, nhodo, you just pick pebbles from the locale and children can bring some pebbles]

From the analysis of teachers' views around support for cultural games, it can be deduced that they have diverse views, encompassing access to resources, pedagogical guidance, community involvement, and technological integration. Addressing these needs requires a comprehensive approach involving collaboration between educators, administrators, parents, and the broader community to create an enriched learning environment centred on cultural appreciation and engagement. The dialogic nature of interactions, as prescribed by CHAT, puts the community at the

anchor in collaboration and in providing access to environmental resources, land, and human support for cultural games.

Scholarly literature on support for cultural games underscores the necessity for assistance in utilising cultural games. For example, there is a general consensus among scholars that early childhood education is important in cultivating mathematical proficiency among young students (Burns et al., 2001; Chesloff, 2013; Gifford, 2015; Van Oers, 2013). Considering this importance, support needs to be available in the teaching of mathematics to young children to enhance their verbal, spatial, and memory skills, all of which are fundamental across various domains of life. According to the participants, this support for cultural games is very broad; training on the use of cultural games as a teaching tool stood out as the key support mechanism needed.

A key idea in the CHAT is the “object”, which acts as the activity’s focal point and motivates respondents’ behaviour (Vygotsky, 1978). The conversation in this section examines the object's function in the CHAT, specifically as it relates to educators’ opinions regarding the use of cultural games in early mathematics instruction. Through analysing the object’s impact on teaching methods, one can learn more about the reasons behind and results of including cultural games in mathematics classes. The object is the objective or reason behind an activity (Engeström, 2020). Furthermore, the shared understanding of the object also mediates interactions among participants. In this context, it acts as a focal point that shapes how subjects engage with one another and with the tools at their disposal. For example, when teachers introduce cultural games into their mathematics instruction, they provide a framework for learners to jointly explore numerical concepts. As EGLs interact during gameplay, they negotiate meanings related to the object, whether it is understanding how to count points or strategising how to solve a problem presented by the game. Kaptelinin and Nardi (2017) argued that this mediation is essential for fostering a rich learning environment where learners can develop mathematical skills and the ability to collaborate effectively

5.9 THEME 6: TRAINING ON THE UTILISATION OF CULTURAL GAMES

The finding on training teachers on using cultural games presents various experiences and perspectives among educators, shedding light on the varying levels of

preparedness and support across different educational settings. Gathered insights underscore the significance of targeted training and professional development in effectively integrating cultural games into teaching practices. Sharing her background training and experiences in using cultural games, T1S2 explained,

> *"Although I have not received specific training in using cultural games, I integrate my own childhood experiences and knowledge to introduce new songs, games, and rhymes to the learners (T1S2)."*

From this account, it can be deduced that in cases where some teachers did not receive formal training on using cultural games, they rely on personal knowledge and anecdotal experiences. This form of innovativeness is something that must be encouraged because it adds value to the attainment of the expected learning outcomes. Instead of waiting to receive formal training, teachers can ride on their experiences. It also came to my attention that answers to the question of whether teachers have formal background training on using cultural games differed between teachers depending on the teachers' college they attended. I deduced this from the diametrically opposite answers they gave. For example, T1S2 reported that she did not receive formal training at the college, whilst T4S3 and T2S2 reported that they received formal training. Probing further, it came to my attention that these teachers attended different training schools. Recalling a more structured training experience they had during their college education, T4S3 and T2S2, in their own words, said the following:

> *During my college education, I received training on the effective use of cultural games as teaching tools in a classroom set-up. This training provided me with a solid foundation in understanding the educational value of cultural games and equipped me with strategies to incorporate them into my teaching practices. (T4S3)*

> *"I did not receive specific training in using cultural games in my class. However, during my time at the training college, we were introduced to the general principles around incorporating cultural elements into our teaching practices (T2S2)."*

Testimonies given by T4S3 and T2S2 are a true reflection that some teachers' colleges are giving training on cultural games either in passing or in detail. This difference highlights the importance of having comprehensive training programmes aimed at equipping educators with the necessary skills and strategies to leverage cultural games for educational purposes effectively. The confidence in T4S3's expression indicates her inherent ability to train others. Therefore, it may be prudent for educational districts to form clusters of schools and share good practices around the use of cultural games.

Furthermore, the variations in sentiments around the level of training on cultural games, ranging from no exposure to limited exposure and widening to include full exposure, indicate a gap between theoretical exposure during teacher training and practical implementation in the classroom. Furthermore, some interviews with individual participants highlighted the need for ongoing professional development and support in utilising cultural games effectively. Specifically, T3S3 mentioned, *"I attended one professional development workshop where cultural games were being encouraged"*.

This view shows that there is a distinct lack of follow-ups after workshops. Under ideal conditions, professional development programmes of that nature must have a deliberate monitoring and evaluation plan to check on progress. This underscores the importance of targeted workshops and professional development opportunities, which are designed to include monitoring and evaluation exercises to enhance educators' understanding and implementation of cultural games. Overall, findings on training highlight the need to bridge the gap between theoretical exposure during teacher training and practical implementation in the classroom. Furthermore, it extends to include ongoing support and professional development opportunities to enhance educators' capacity to utilise cultural games to enrich teaching and learning experiences.

In support of this study's findings, Nabie (2011) argued that there is a deficiency of games within the teacher training curriculum. Such a deficit partly explains the limited integration of games into instructional approaches. According to Nabie, this observation underscores a lack of awareness among educators regarding the

pedagogical benefits of utilizing games as a tool for effective teaching strategies. Furthermore, in the recent past, it has also been indicated that educators must understand how to incorporate various gaming methods into educational practices (Kurniawan, 2022). Therefore, assessing teachers' competencies and potential training requirements regarding game-based learning is crucial, as is establishing and executing teacher training initiatives. These training initiatives are vital for the advancement of the game-based learning approach.

The literature confirms that a significant percentage of the teachers (96.35%) did not receive any training in game-based learning, gamification, educational games, or related technological tools (Kamisli, 2019). This lack of training indicates a significant gap in the professional development of educators regarding integrating gaming elements into their teaching practices. This disparity suggests that most teachers may lack the necessary skills and knowledge to utilise game-based approaches in their classrooms effectively (Kamisli, 2019). This highlights the need for targeted training initiatives to address this deficiency and enhance teacher preparedness using game-based learning methodologies (Kurniawan, 2022). Viewing this study through the lens of the CHAT, subjects (educators) use teaching tools (cultural games) to impart numeracy competencies to EGLs. I found it necessary to ask educators about learners' attitudes towards cultural games because they use games through and with learners.

It is especially important to remember that the subject mediates their activity, motivated by personal and group objectives, using tools and cultural objects. People's interaction with their environment is not only transactional; historical and cultural factors shape their perceptions and involvement in their activities (Roth & Lee, 2007).

For instance, teachers' personal educational histories and experiences influence their views on the worth of cultural games in teaching mathematics. Some have contended that their perspective is greatly shaped by the topic's historical and cultural backdrop (Engeström, 2020; 2023). Teachers' views on the use of cultural games in mathematics teaching, for example, are shaped by their backgrounds, including their education, life experiences, and cultural legacy.

Teachers' opinions on the worth of cultural games in mathematics instruction are often impacted by their educational background, cultural legacy, and historical setting. According to Engeström (2020; 2023), these elements greatly affect teachers' perceptions of the efficacy of several instructional approaches. A teacher who had good experiences with cultural games throughout their schooling, for example, may be more likely to use such tactics in their classroom and the other way around. Classical scholar Lektorsky (1984) claimed that both personal experiences and the larger cultural-historical background shape the production of an object inside an action.

Kamisli (2019) claims that instructors who have concentrated training in culturally responsive pedagogy are more likely to see the advantages of including cultural activities in their lesson plans. Through this training, students acquire the necessary information and skills for connecting mathematical concepts to EGLs' cultural backgrounds, hence enhancing relevance and involvement.

Likewise, Kurniawan (2022) stressed that instructors are empowered to apply local knowledge in the classroom when they have access to professional development opportunities, stressing the use of culturally relevant strategies. This empowerment is crucial to establishing a classroom environment where EGLs feel valued and involved by means of culturally relevant learning possibilities. Many teachers may not have access to outstanding professional development courses focusing on including cultural activities into mathematics classes. Moreover, some teachers may find themselves up against institutional obstacles that reject the use of non-traditional teaching methods. 1881 (2018) succinctly described these problems by highlighting those conflicts within activity systems, such as conflicting viewpoints on what constitutes appropriate teaching approaches, that can impede teachers from attaining their full pedagogical potential. Teachers could feel pressured to follow traditional approaches instead of trying with culturally relevant tools like games. This is frequently observed at institutions that give creative teaching approaches second place in favour of standardised testing.

5.10 THEME 7: LEARNERS' ATTITUDE TOWARDS CULTURAL GAMES

The findings on the learners' views and attitudes towards cultural games in diverse schools highlight a consistent theme of enthusiasm and enjoyment among students. Across various observations, students consistently demonstrated excitement and positivity towards engaging in cultural games, indicating a genuine interest in these activities. In all the schools, it came to my attention that the learners were not only excited about participating in cultural games, but also actively displayed enthusiasm while engaging in these activities. Teachers reported that students enjoy adding variations to the games and sharing ideas with their peers. As such, teachers enjoy using games as part of the teaching and learning process. Some of the teachers reported:

> *"Learners enjoy using games. They have a positive attitude towards them as they add variations to the games to make them more interesting (T4S1)."*
>
> *"My learners have a positive attitude towards using games for teaching and learning. They actively participate, share ideas, and enjoy the interactive nature of the activities (T3S1)."*

From the sentiments expressed by T4S1 and T3S1, it is aptly clear that students' positive attitude towards cultural games is exhibited in their active participation and idea-sharing tendencies during plays. It was also reported that learners' level of happiness and excitement increases when they participate in cultural games during free play. From the thick description given by T2S3, students express enthusiasm for interactive experiences, highlighting the genuine interest and enjoyment they derive from participating in cultural games. However, some teachers acknowledged challenges, such as time constraints, that hinder students' full engagement with cultural games. Despite this, students' overall positive attitude towards game-based activities remains evident. In explaining some of the limiting factors, T1S3 noted,

> *"Learners enjoy playing cultural games, but some of them are too young to play and master most of the games (T1S3)."*

Despite challenges due to the limited time and the age of learners, the findings underscore students' widespread enthusiasm and enjoyment for cultural games.

Teachers' views and observations from various educational settings provide concrete evidence of students' active participation, idea-sharing, and positive attitudes towards these activities, reaffirming the value of cultural games in promoting engagement and learning among learners.

Previous literature provides valuable insights into the views of learners regarding cultural games. Research conducted by Kurniawan (2022) highlighted that both teachers and pupils often lack awareness of the value inherent in traditional games. Similarly, Kamisli (2019) pointed out that the absence of games in teacher training programmes leads to a lack of understanding regarding their importance in teaching methodologies. Similar to past studies by scholars such as Kurniawan (2022) and Kamisli (2019), this study's findings underscore the need for greater awareness and appreciation of cultural games among both educators and learners. So, this study adds to the body of literature that highlights the importance of recognising and harnessing students' positive attitudes toward cultural games to enhance learning outcomes and promote cultural appreciation in educational settings.

5.11 CHAPTER SUMMARY

In exploring teachers' views towards cultural games used in teaching numeracy competencies to EGLs, this chapter provided a comprehensive overview of issues around seven themes resulting from this study. In their totality, the seven themes explored teachers' psychographics (that is, their knowledge, perceptions, and attitudes) in view of the cultural games around them. The themes include their appreciation and how they relate to the ECD curriculum, the value they add to the impartation of numeracy competencies, the resources and support needed to smoothen their usage, and learners' attitudes towards them. It must be noted that the outcomes of this study are partly shaped by the demographic characteristics of the participants around their gender, age, and educational qualifications, as presented in Section 5.2 (see Li et al., 2021).

Overall, it has been established that most teachers are aware of cultural games and the value they add to smoothing the learning process. However, some teachers lack a general appreciation of how best to use them professionally. This lack emanates from the fact that some teachers received formal training, but some only received

limited-to-no training during their teacher education. As such, they need formal exposure, continuous development training, and supporting material to embrace cultural games fully as teaching tools. Interestingly, the participants are open to infusing cultural games into their pedagogical practice if some of the concerns they raised are addressed. Some discussion proxies around the question have been used to show how this study is supported or contradicted by past studies, setting the scene for the discussion chapter. Detailed discussion around how and why this study's findings are concordant or discordant with past studies is given in the next chapter.

CHAPTER SIX: ALIGNMENT OF FINDINGS WITH LITERATURE

6.1 INTRODUCTION

The previous chapters examined teachers' perceptions and experiences in using cultural games as instructional tools for teaching early-grade mathematics, focusing primarily on the Zimbabwean context. This chapter integrates the theoretical, conceptual, analytical, methodological, and empirical dimensions discussed earlier. Such a synthesis is crucial to address the research problem and demonstrate how this study contributes to filling the gap stated in Section 1.4.1 and expanded in Section 3.7. Grounded in the notion that research aims to advance knowledge (Denzin & Lincoln, 2018; Hartell & Bosman, 2016; Nieuwenhuis, 2016), this chapter highlights how this study edified knowledge.

It must be noted that this study generated seven themes around teachers' views and experiences, as presented in Chapter Four. This chapter explores this study's findings by contextualising them within the existing literature, highlighting areas of alignment, divergence, and unexpected results. This discussion uncovers how the present study contributes to and challenges established knowledge by tracing the concordant and discordant findings with past research. Additionally, unexpected findings are examined for their implications, offering new avenues for inquiry or practical application. This analysis not only situates the study within its academic context but also emphasises the nuances and complexities revealed through its findings. For easy comparison of this study's findings with past findings, this chapter uses a tabular approach to trace similarities and differences.

6.2 FINDINGS CONCORDANT WITH THE LITERATURE

This study's findings are concordant with Hartell and Bosman (2016) as a study's results that align with or support conclusions from previous studies. As such, such findings reinforce existing theories or perspectives by demonstrating consistency across different contexts, methodologies, or populations. Identifying concordant findings strengthens the validity of the present study and highlights areas of consensus within the academic community. Denzin and Lincoln (2018) further clarified that concordant findings confirm the reliability of earlier studies by producing similar outcomes, showing how findings hold across diverse environments or conditions, and

solidifying understanding of well-established phenomena while adding nuanced insights. Tables 6.1 to 6.7 summarise where the seven themes generated by this study are concordant with past studies' findings.

Table 6.1

First Theme Concordant with the Literature

Theme 1: Teachers' understanding of cultural games **Sub-theme 1: Teachers' general views on cultural games** **Sub-theme 2: Teachers' specific views on common Shona cultural games**		
Source	**Existing knowledge**	**Remarks**
Gedera and Williams (2016) Leont'ev (1981) Moloi (2015) Nabie (2015) Nkopodi and Mosimege (2009) Wa Thiongo (1986)	Beyond its function as a communication tool, language acts as a repository of culture and heritage, preserving collective identity and traditions. Cultural games can be traced back to a group's heritage over time. Children personally construct their numeracy competencies by engaging in educational play. Thus, cultural games play a pivotal role in educational settings. Teachers are key in connecting learners with knowledge enshrined in cultural games.	Most participants acknowledged that cultural games are highly effective communication tools because they incorporate singing, dancing, and playful interactions. Interestingly, they noted that most songs and dances associated with these games can be traced back to the heritage or culture of a particular group of people. As such, they also help preserve cultural values across generations. Since these values are passed between generations, it implies that the connecting thread runs over an extended period spanning generations. During F1, F2, and F3, it was revealed that teachers are instrumental in connecting EGLs with the numeracy competencies they need to master. While they can discover and create knowledge on their own, they need some clues to provide them with a sense of direction, emphasising the importance of an educational setting.

Table 6.2

Second Theme Concordant with the Literature

Theme 2: ECD curriculum and cultural games		
Source	**Existing knowledge**	**Remarks**
Gedera and Williams (2016) Moloi (2015)	Clarity of an educational curriculum is the foundation for realising the desired end. Past studies have concluded that the end refers to improving EGLS' knowledge, and the means refers to the curriculum that specifies the skills they must attain at the end of the learning process and how to attain the desired skills.	This study corroborates the well-established notion that a well-structured curriculum is essential for achieving specific educational goals. Here, the goal is to enhance early-grade learners' numerical skills, with the curriculum outlining the skills to be developed and how to achieve them. However, the fieldwork revealed mixed interpretations of the ECD curriculum among participants. Some teachers faced difficulties understanding it, suggesting the curriculum may lack clarity in specifying its expectations.
Nkopodi and Mosimege (2009)	The CHAT argues that tools shape how an activity must be carried out by having complementary instructions on how the subject should engage with the object. It has been concluded that tools can transform the subject and the object.	
Nabie (2011) Sulistyaningtyas and Fauziah (2019)	Teachers find it difficult to extract and impart knowledge embedded in cultural games if they cannot effectively interpret the educational curriculum.	Lesson plans often mentioned using games but failed to distinguish between modern and traditional ones, complicating evaluation efforts. The inability to specify one's intention in their plans could be partly attributed to challenges in interpreting the curriculum or the vagueness of the curriculum. In selected cases, I observed that while cultural games are indicated in the syllabus and individual scheme of work, they were not incorporated into lesson plans.

Table 6.3

Third Theme Concordant with the Literature

Theme 3: Cultural games as a teaching tool **Sub-theme 1: Use of cultural games in teaching and learning** **Sub-theme 2: Incorporation of cultural games in lessons** **Sub-theme 3: Adequacy of cultural games in teaching mathematics**		
Source	**Existing knowledge**	**Remarks**
Ayale-Perez and Joo-Nagata (2019) Erhel and Jamet (2013) Melero and Hernández-Leo (2014) Prensky (2003) Vocaturo et al. (2019)	Games are a significant learning aid because they enhance motivation for learning. Past studies have concluded that they ensure pupils maintain active engagement because games generally motivate players to compete and get a reward while enjoying. For this and other reasons, learning at the foundational level has relied mainly on game-based approaches. However, these approaches are teacher-dependent since teachers are responsible for directing and guiding learners by giving suitable cues, consistent feedback, and task-specific support. As such, games are inadequate to serve as instructional tools since they largely rely on teachers' active role.	Some participants, for example, T4S3, revealed that they try to incorporate cultural games as much as possible in teaching, especially when delivering topics with a greater inclination toward practical realities. Since some participants frequently use cultural games, T1S1 and T1S2 narrated that they only use them to introduce specific topics and clarify certain concepts. All participants concurred that EGLs are motivated to participate each time they use cultural games compared to other teaching approaches. Given this context, many teachers incorporate cultural games into their teaching practices, albeit to varying degrees. Teachers were found to engage with cultural games at different levels of immersion. This study has revealed that teachers use different strategies to incorporate cultural games in mainstream learning based on their experience, knowledge of cultural games, and time available to deliver specific topics. This demonstrates the inadequacy of cultural games as a teaching tool since they depend on teachers' ability to direct, guide, and assess learners using cultural games.

Table 6.4

Fourth Theme Concordant with the Literature

Theme 4: Resources for cultural games		
Source	**Existing knowledge**	**Remarks**
Engeström (2009)	Available research emphasises the critical role of resource availability and effective utilisation in employing cultural games as teaching tools. Since cultural games rely heavily on the availability of proper materials, teachers should ensure that all necessary resources are readily available for their successful implementation.	Interestingly, all participants agreed with the general consensus in the literature that the use of cultural games is partially dependent on resource availability. Observations further revealed that some teachers integrate cultural artefacts as teaching aids. For instance, T1S2 and T2S1 ensured their classrooms included cultural artefacts, fostering an environment conducive to incorporating cultural games. This reflects a proactive effort by educators to curate culturally relevant resources that enrich teaching practices and enhance the learning experience by meaningfully connecting learners with their heritage.
Leont'ev (1981)	According to the main tenets of the CHAT, the activity-based model is actualised by obtaining relevant and adequate resources. These resources can be material or intellectual assets, tangible or intangible, or a combination.	
Trawick-Smith et al. (2016)	Some sources have advised teachers to employ strategic approaches to ensure the effective use of cultural games as teaching tools because adequate resources are not always available.	F1 and F2 participants' sentiments revealed that resources are always scarce, but that does not hinder them from exploring alternative options. The participants highlighted that most of the material resources they need for cultural games are locally available and can be improvised. Teachers usually leverage materials found in the local environment or created at home or school. Participants' sentiments suggest that resources needed for cultural games are available in their abundance, either directly or indirectly, through improvisation.

Table 6.5

Fifth Theme Concordant with the Literature

Theme 5: Support for cultural games		
Source	**Existing knowledge**	**Remarks**
Burns et al. (2001)	Accessible sources have collectively argued that ECD is the most sensitive and critical stage in human development. During this stage, people develop their intellectual, social, emotional, speech, numeracy, and literacy skills.	Although participants shared varied experiences regarding support for cultural games, they collectively emphasised the critical role of stakeholders in ECD. For instance, T3S3 highlighted that development begins at home, where children spend most of their time, particularly for speech and emotional growth. In contrast, literacy and numeracy skills are primarily cultivated in schools. This perspective underscores the importance of collaboration among parents, the community, and teachers, working hand-in-glove to achieve comprehensive and effective ECD outcomes.
Chesloff (2013) Gifford (2015)	Human development is a holistic process involving multiple stakeholders, with teachers playing a pivotal coordinating role. Support for ECD begins at the family and community levels and extends to institutional and governmental levels, including resource provision, as highlighted in Table 6.4.	
Van Oers (2013)	While contributions come from diverse fronts, teachers remain central to teaching mathematical concepts to young children, fostering critical verbal, spatial, and memory skills. These skills form the foundation for success across various life domains, underscoring the importance of teacher-led instructional efforts.	Participants' ability to clarify and classify the nature of support needed for cultural games is a true testimony of their awareness of the dimensions of support in ECD. In addition, they are very clear about their role and how instrumental it is to coordinate all support structures for the betterment of ECD.

Table 6.6

Sixth Theme Concordant with the Literature

Theme 6: Training on the utilisation of cultural games		
Source	**Existing knowledge**	**Remarks**
Kamisli (2019) Kurniawan (2022) Kurniawan (2022) Nabie (2011)	Some sources have stressed the limited incorporation of games as instructional tools in teacher training programs. This gap partly explains why games are not widely integrated into teaching practices, tracing the issue back to the teacher training curriculum. Nabie argued that inadequate exposure during training leads to a lack of awareness about the pedagogical advantages of cultural games. Kamisli supported this observation with hard data, revealing that 96.35% of teachers had no training in gamification, game-based learning, educational games, or related technological tools, underscoring these challenges' scale.	Some participants attest to the general conclusion in accessible literature regarding inadequate exposure to game-based learning methods. For example, T2S2, said the following in her own words: *"I did not receive specific training in using Cultural games in my class. However, during my time at the training college, we were introduced to the general principles around incorporating cultural elements into our teaching practices"*. These observations highlight that some teacher training colleges do not adequately expose trainees to cultural games' theoretical and practical dimensions. Cultural issues are mentioned during training, likely due to the recent shift in the Zimbabwean higher education curriculum toward heritage-based approaches prioritising indigenised knowledge production (see Section 3.5). Some colleges may still be in the early stages of implementing this updated curriculum, or participants in this study may have been trained before the changes. However, innovative teachers often develop their strategies for incorporating cultural games, suggesting a generational transfer of these values over time.

Table 6.7

Seventh Theme Concordant with the Literature

Theme 7: Learners' attitude towards cultural games		
Source	**Existing knowledge**	**Remarks**
Essa (2014) Kamisli (2019) Kurniawan (2022)	Globally, numerous ECD training centres are using game-based approaches to train learners, considering their suitability for their age group. It has been concluded that EGLs are active explorers of their environments; they learn and construct their knowledge by doing and discovering through engaging in games. Since EGLs' learning largely depends on direct contact and play, the pupils enjoy it more than other teaching approaches. They tend to listen, concentrate, and discover more when they learn through games. So, they develop a positive attitude toward learning when exposed to learning material through cultural games.	All 12 participants unanimously agreed that learners develop a strong desire to participate when cultural games are used as teaching tools. This finding syncs very well with conclusions in accessible pedagogical literature on ECD. To further illustrate how this study's findings align with conclusions in the literature, two key narratives shared by participants are restated below for clarity and emphasis. *"Learners enjoy using games. They have a positive attitude towards them as they add variations to the games to make them more interesting" (T4S1).* *"My learners have a positive attitude towards using games for teaching and learning. They actively participate, share ideas, and enjoy the interactive nature of the activities" (T3S1).* There is overwhelming evidence regarding learners' positive attitude toward cultural games. Further cementing this evidence, I had numerous observations before and during this study of learners actively engaging and enjoying playing cultural games during their spare time (see Plates 5.1, 5.2, and 5.3).

6.3 FINDINGS DISCORDANT WITH LITERATURE

Discordant findings refer to a study's results that differ from, conflict with, or challenge conclusions from previous research (Denzin & Lincoln, 2018; Hartell & Bosman, 2016). Several sources (see Lincoln & Guba, 1985; Tracy, 2019) have concurred that these findings reveal variations in outcomes that might be attributed to differences in context, methodology, sample characteristics, or theoretical frameworks. One classical source noted that discordant findings are valuable because they prompt a critical re-evaluation of established knowledge, highlight gaps in understanding, and often point to the complexity or multifaceted nature of the phenomena under investigation (Lincoln & Guba, 1985). They can pave the way for new hypotheses and further exploration. Tables 5.8 to 5.11 summarise past studies' findings discordant with the seven themes generated by this study.

Table 6.8

First Theme Discordant with the Literature

Theme 1: Teachers' understanding of cultural games **Sub-theme 1: Teachers' general views on cultural games** **Sub-theme 2: Teachers' specific views on common Shona cultural games**		
Source	**Existing knowledge**	**Remarks**
Gedera and Williams (2016) Leont'ev (1981) Moloi (2015) Nabie (2015) Nkopodi and Mosimege (2009)	Most cultural games are associated with singing and dancing. Language development is central to these games. In addition to its role as a communication tool, language also serves as a repository of culture and heritage, keeping collective identity and traditions. This is because cultural games are rooted in a group's heritage and evolve through generations. Teachers are pivotal in bridging learners with the knowledge embedded in cultural games.	Acknowledging that cultural games are a repository of the culture and heritage of a given social group is not enough to preserve it and pass it to future generations. Most teachers confirmed the important role cultural games play, but their actions speak otherwise, since some do not use cultural games as teaching tools or use them to a lesser extent for diverse reasons. Even though literature suggests that teachers are key in guiding EGLs to derive cultural values from cultural games, gathered evidence revealed limited use of cultural games as teaching tools. My findings showed that teachers were involved and did not want to use cultural games in the classroom to promote learner identity.

Table 6.9

Literature Discordant With the Second Theme

Theme 2: ECD curriculum and cultural games		
Source	**Existing knowledge**	**Remarks**
Gedera and Williams (2016) Moloi (2015) MPSE (2015) Nkopodi & Mosimege (2009) Nabie (2011) Sulistyaningtyas and Fauziah (2019)	Clarity of an educational curriculum is the foundation for realising the desired end. Past studies have concluded that the end refers to improving EGLS' knowledge, and the means refers to the curriculum that specifies the skills they must attain at the end of the learning process and how to attain the desired skills. Section 4.1 of the reviewed ECD curriculum states that *"teachers should provide* ***stimulating environments*** *that allow the child to build on their existing knowledge, skills, and experiences through enjoyable exploration and experimentation that lead to effective learning."* The CHAT argues that tools shape how an activity must be carried out by having complementary instructions on how the subject should engage with the object. It has been concluded that tools can transform both the subject and the object.	Contrary to some conclusions in the literature regarding the clarity of the curriculum, the reviewed ECD curriculum does not provide any hints, cues, or detailed steps on how to create pathways for the ease of realisation of the end. This study uncovered findings that contradict the CHAT framework. While CHAT emphasises that tools should include explanatory information to complement the main provisions, the reviewed ECD curriculum provides only broad goals, lacking detailed explanations or examples on effectively implementing its provisions. The inadequacy of the curriculum can be partly attributed to varying interpretations by different teachers, as evidenced by inconsistencies between lesson plans, schemes of work, and classroom presentations. To some extent, these findings contradict conclusions drawn in parts of the literature and the CHAT framework, suggesting that the curriculum lacks clarity.

Table 6.10

Third Theme Discordant With the Literature

Theme 3: Cultural games as a teaching tool **Sub-theme 1: Use of cultural games in teaching and learning** **Sub-theme 2: Incorporation of cultural games in lessons** **Sub-theme 3: Adequacy of cultural games in teaching mathematics**		
Source	**Existing knowledge**	**Remarks**
Gasteiger and Moeller (2021) Fouze and Amit (2018) Feza (2018)	Cases drawn from countries such as Ghana, Germany, South Africa, and Israel have emphasised the importance of using games native to those countries. It was argued that this is important in creating learning supported by relevant teaching material. Fouze and Amit (2018) and Feza (2018) conducted prescriptive analyses demonstrating how native games can be effectively used as mathematics teaching tools. They detailed the most commonly played games, including their contexts, foundational rules, and alignment with mathematical principles. Their findings emphasised that countries aiming to enhance their curricula should integrate cultural values and adapt them to local contexts. These scholars recommended the development of supporting manuals that provide practical guidance for incorporating these games into mainstream pedagogy.	Contrary to the conclusions drawn by related sources, as far as it can be ascertained, there are no accessible manuals that give practical guidance on teaching mathematics using native cultural games in Zimbabwe. The Zimbabwean ECD curriculum gives broad goals around the use of GGs, devoid of their foundational rules and contexts. Against this background, many teachers incorporate cultural games into their teaching practices based on their creativity without guidance from the curriculum and its supporting manuals. This demonstrates the inadequacy of cultural games as a teaching tool since they depend on teachers' ability to direct, guide, and assess learners using cultural games. Not many manuals are provided on the use of cultural games in teaching practices.

Table 6.11

Fourth And Fifth Themes Discordant with the Literature

Theme 4: Resources for cultural games **Theme 5: Support for cultural games**		
Source	**Existing knowledge**	**Remarks**
Engeström (2009)	Available research emphasises the critical role of resource availability and effective utilisation in employing cultural games as teaching tools. Since cultural games heavily rely on proper materials' availability, ensuring that all necessary resources are readily available is essential for their successful implementation.	All teachers agreed to this position regarding the resources and support needed for the effective use of cultural games. Nonetheless, some noted that their schools' administration is not fully supportive of securing artefacts that can be used in classroom teaching, leaving teachers with no choice but to improvise if they decide to use cultural games.
Leont'ev (1981)	According to the central tenets of the CHAT, the activity-based model is actualised by obtaining relevant and adequate resources. These resources can be material or intellectual assets, tangible or intangible, or a combination.	When improvising, teachers largely rely on support from parents with materials and artefacts that can be used to facilitate conducting cultural games. It was revealed that some parents do not cooperate or join hands with others in providing this support. Though literature assumes that this support is readily available, some parents or guardians take teachers' requests for granted.
Trawick-Smith et al. (2016)	Human development is a catch-all process involving multiple stakeholders, with teachers playing a pivotal coordinating role. Support for ECD begins at the family and community levels and extends to institutional and governmental levels, including resource provision, as highlighted in Table 6.4.	Therefore, this study revealed that teachers suffer a double blow from teaching administration and parents. On one hand, some teachers reported not getting adequate support regarding material and financial resources from the teaching administration. On the other hand, it has been reported that some parents do not support with improvisational material when ideal resources are not available.

6.4 NEW INSIGHTS FROM THE FINDINGS

This study generated one instrumental finding redefining the relational set-up of the constructs of the CHAT (subject, object, tools, community, division of labour, and rules). From the teachers' sentiments, it can be deduced that these six constructs can be grouped into three levels, considering how they shape knowledge production. These are the strategic, tactical, and operational levels as expanded in Section 7.3, which summarises this study's implications, applications, and limitations. Rules and object policy issues are dealt with at the strategic level, where government ministries (MHTESTD and MPSE) define the objectives and parameters of teacher training and education of EGLS. Then, the subject (teachers) are part of the community where cultural games originate from, and they are responsible for exposing learners to cultural games. Finally, at tactical levels, tools are designed by integrating the input of the community, subjects, and administrators working at the strategic level (see Figure 7.1, Section 7.3).

6.5 CHAPTER SUMMARY

This chapter positioned this study in relation to the existing literature by discussing findings that are concordant and discordant with accessible past findings. Furthermore, new insights from this study have been briefed, setting the scene for their detailed discussion in the concluding chapter. Therefore, the next chapter summarises study findings in line with set objectives, discusses the study's limitations and applications, and how it shapes future and further research. .

CHAPTER SEVEN: CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

In the previous chapter, I presented the findings of my study against the background of existing literature related to cultural games among early-grade children and teacher pedagogy. This chapter presents a comprehensive interpretation and summary of this study's findings. It is structured to first give key conclusions through revisiting the research problem and discussing answers to the research questions. This is followed by reflecting on the study's findings and implications, applications, and limitations. Then, the recommendations and areas for further research are discussed before a chapter summary is given.

7.2 RESEARCH CONCLUSIONS

In this section, conclusions about the research problem, objectives, and questions, as outlined in Chapter 1, are discussed. This discussion is important in showing whether the study addressed the research problem, attained the set objectives, and answered the research questions.

7.2.1 Revisiting the Research Problem

This study emanated from a knowledge gap around the use of cultural games in the teaching and learning of numeracy competencies at the early childhood level. Central to this problem is the observation that there is a consensus in pedagogical literature on the role of teachers in imparting numeracy competencies to learners. However, this study only answered the what and why questions and the desired research findings on teachers' experiences and views on cultural games are not discussed in detail. So, most accessible sources answer the *what* question (by giving a general description of what is expected of teachers) and the *why* question (by giving reasons for doing so), but they do not answer the *how* question (by giving procedural steps that must be followed in using such approaches). Growing evidence has shown that, based on answers to the what and why questions, the Zimbabwean ECD mathematics curriculum strongly emphasises using play-based methods in teaching. However, teachers rarely use such approaches in teaching numeracy competencies for reasons not examined in the literature. So, I was motivated by the presence of the knowledge

gap between traditional pedagogy and cultural relevance. The question arose: Could this observation be partly explained by the fact that some teachers still find themselves trapped in the colonial pedagogic practice that undervalues the importance of using cultural activities in the teaching and learning of mathematics? Several studies explored the value of cultural games in teaching and learning in general. However, there has been no engagement or discussion with teachers regarding their views on their use for teaching and learning purposes.

I believe that there has been sufficient reflection on the research problem that this study sought to address. This reflection was accomplished by the provision of a comprehensive overview of teachers' knowledge, perceptions, and attitudes towards the use of cultural games in teaching numeracy competencies to EGLs. Thick descriptions around teachers' views were guided by the CHAT, with a greater inclination towards one pillar, that is, the teachers (subjects). Most accessible past studies on the use of cultural activities to impart numeracy competencies to EGLs have focused on the other five determinants of the CHAT (tools, object, community, division of labour, and rules), leaving a void in teachers' views. Therefore, I believe that this study has closed this gap by examining teachers' knowledge of cultural games, their use as mediating tools, how they align with the ECD updated curriculum, and the challenges and experiences they are having regarding using cultural games as teaching tools. The study was guided by objectives set ahead of the study to address this research problem. Importantly, the attainment of the objectives can easily be assessed using the main research question and seven secondary research questions set as indicators of the attainment of objectives. As such, the next section revisits the research questions to show how they have been answered.

7.2.2 Discussion on Answers to Research Questions

As stated in Section 1.4.3, the address to the research problem was partly enabled by the main research question and seven secondary research questions. Answers to the research questions form the topics of Sections 7.2.2.1 to 7.2.2.8. It must be noted that these answers are discussed in the context of whether they are unexpected, concordant, or discordant with past findings, showing how and why they revealed a pattern established by the study. So, forthcoming sections are structured to first re-

state the questions, followed by the answers given by this study and how those answers relate to past findings.

7.2.2.1 Secondary Research Question 1

SRQ1 was: How do the main tenets of the CHAT explain approaches used to teach EGLs?

In Chapter Two, this study explained the key pillars of the CHAT by underlining that the subjects (teachers) use tools (cultural games) to impart knowledge (object) in a given setting (community) governed by specific policies (rules), and in so doing, sharing of tasks is inevitable since there are many players in a community (division of labour). It was argued that the broadness of the theory allows one to focus on specific determinants depending on the issue under examination. In this study, a specific focus was placed on teachers' views on how cultural games can be used to impart numeracy competencies to EGLs. In as much as the focus was on teachers' views, other determinants, tools (cultural games), and objects (numeracy competencies) were constantly referred to, showing the complementarity of the pillars of the theory. Therefore, answers to this question have shown that teachers are knowledgeable about the most widely played cultural games in Zimbabwe and the latent value they have in transferring numeracy skills to learners. However, they are confronted with time constraints and other resource challenges in trying to use cultural games as teaching tools in their daily mathematics lessons.

Among the other challenges most widely referred to were references to the community and parental support in engaging learners in plays at home, as well as institutional support given by schools and the MPSE. Specifically, there were mixed responses regarding the training teachers received on using cultural games at the teachers' college. What I discovered is that, as a researcher, one can choose to focus on one or a few pillars of the CHAT, but reference to other pillars is inevitable because they work hand-in-glove with the other pillars. This discovery is in concordant with conclusions reached by scholars such as Koszalka et al. (2021), Fleer and Van Oers (2018), and Engeström (2009), who voiced that social interaction governed by social norms and division of labour is exercised in the transfer of knowledge between people. However, their studies used secondary data whilst this study mainly used primary

data, the conclusions reached are somewhat similar. This is a true reflection that the pillars of the CHAT are interdependent, regardless of the sources of data one uses to answer the research questions. The point of emphasis may be different between and within studies, but the pillars of the CHAT are complementary to each other. Since this study was shaped by the CHAT, it must be noted that answers to the other questions drew their inspiration from the main tenets of the theory. One of the tenets of the CHAT speaks to the use of mediating tools in transferring knowledge. One important pillar is the teacher herself and her readiness to use cultural games, and this important pillar was not fully developed in my findings. The teacher was not willing to teach due to work pressures and also due to lack of preparation. Resources and time are important to get children excited about learning and learning mathematics with fun, So, the next question seeks to examine how teachers use cultural games in teaching numeracy competencies.

7.2.2.2 Secondary Research Question 2

SRQ2 was: How do early-grade teachers use cultural games in operationalising the updated ECD mathematics and science competence-based curriculum?

This question was answered by most teachers explaining that they hardly use cultural games in teaching numeracy competencies. Instead, they said they find it easier to use cultural games in teacher literacy competencies than numeracy competencies. They mainly use them to introduce new concepts in mathematics lessons. The main reason for doing this is the limited lesson time they have, yet cultural games require a considerable amount of time to be completed. In addition to the accounts given by teachers, I observed some inconsistencies in the interpretation of the syllabus, lesson planning, and the actual practices in class and outdoors. I, therefore, discovered that some teachers take cultural games as a mere pastime, games that cannot fit into the timetable, while others expressed ignorance of the inclusion in the syllabus. Furthermore, other teachers indicated a general lack of skill in interpreting the syllabus in their daily mathematics class teaching using cultural games.

In an attempt to explain the limited use of ethnomathematical games native to the Negev Bedouin people of Israel in the Middle East, Fouze and Amit (2018) gave a prescriptive analysis of three different plays (*'ta ab'-the stick game', the 'mozkat-5*

stone game', and the 'seega game') to propose parameters for developing an ethnomathematical curriculum. So, the limited use of cultural games in Zimbabwe could be partly attributed to the fact that there are no manuals that explain cultural games native to Zimbabwe. This omission is a wake-up call to the development of such manuals for use in teacher training so that graduates can subsequently use them in practice. The similarity in these conclusions could be partly attributed to the core of both studies, which promotes the use of cultural games in teaching mathematics to EGLs. The difference in the study designs, one using a prescriptive analysis and the other using qualitative methods, did not lead to dichotomous conclusions. Instead, the conclusions are similar, both calling for the development of teaching manuals to ease the teachers' jobs. The previous literature also revealed challenges akin to those identified by Sulistyaningtyas and Fauziah (2019), indicating teachers' struggles with implementing cultural games due to a lack of understanding. Though Sulistyaningtyas and Fauziah (2019) used the questionnaire survey to assess the experience of 40 teachers in Indonesia, and this study used qualitative methods to interview 12 teachers in Zimbabwe, the same conclusion around teachers' inability to interpret the curriculum stood out as the main reason behind limited use of cultural games in teaching mathematics. A uniform conclusion was reached despite the difference in context, geographic location, and research methods used. Therefore, the next sections explore the question of whether these conclusions could be a function of teachers' psychographics given Cultural games regardless of location.

7.2.2.3 Secondary Research Question 3

SRQ3 was: How do teachers' knowledge, attitude, and perception explain their level of incorporation of cultural games in their pedagogical approaches?

I strongly believe that this question was well answered by the cross-examination of teachers' views regarding using cultural games in teaching mathematics. This cross-examination was broad enough to assess their psychographics, specifically, knowledge, attitude, and perceptions. An examination of their attitude, that is, individual teachers' evaluation of cultural games, revealed that they have a positive view towards cultural games. This was evident from their willingness to learn more about the conceptual usage of cultural games since most of them appreciate them as games rich in educational content, but they lack a strategy to extract that value.

Through FGIs, I managed to assess individuals' perceptions of general social pressure to use (or not use) Cultural games in teaching. It came to my attention that the intention to act in a particular way depends on one's perception or knowledge that some significant others will approve or disapprove of the intended act. In the context of teachers, general social pressure is likely to come from other teachers who are likely to motivate the approval or disapproval of cultural games. Therefore, an inquiry into teachers' familiarity with cultural games revealed that their understanding and perceptions varied across schools, but the common theme of cultural heritage preservation emerged, emphasising the use of traditional elements to engage students in learning and play.

Cultural games were also understood as educational tools intertwined with the Shona cultural heritage, customs, and traditions, which play a crucial role in preserving the cultural identity of the ECD people. The study further found that incorporating native languages within these games empowers local cultures and challenges the dominance of colonial languages in educational settings, as evidenced by the alignment with decolonial theories in pedagogy. This aligns with Ngũgĩ wa Thiong'o's assertion that language is more than just a communication tool; it serves as a repository of cultural heritage and a window into a community's worldview (wa Thiong'o', 1986). This finding is supported by Feza's (2018) observation in South Africa that exclusionary models negatively affect the capacity of EGLs to utilise language and understand the meaning of spoken and written words, as this is linked to letter reading, writing, and spelling proficiency. The conclusion about exclusionary systems reached by this study mirrors Feza's (2018) conclusion in South Africa because the studied countries share a similar colonial history that undermined the importance of native games and promoted the use of foreign games in education. Despite the difference in the subject area of focus, for example, Feza's study focused on literacy skills while this study focused on numeracy skills; both studies have concurred that cultural games can play a vital role in preserving and promoting native languages, contributing to the richness of diverse cultures.

The conclusion about the role of native games and language in imparting numerical competencies reached by this study extends what has been dubbed ethnomathematics by Fouze and Amit (2018) using case data from the Middle East.

Fouze and Amit used a prescriptive analysis of three native games to demonstrate how native language can be used to teach EGLs numerical concepts using artefacts and things with which they are familiar. Theoretically, such findings extend the propositions of Lev Vygotsky's CHAT by emphasising the use of students' native languages to challenge colonial language dominance and promote inclusive learning environments. CHAT underscores the significance of mediating tools and community norms in shaping learning experiences, supporting the integration of cultural games into education to enrich students' understanding of mathematics within diverse cultural contexts. Additionally, in keeping with CHAT, integrated learning opportunities made possible by cultural games can be extremely important for developing critical thinking techniques and basic skills. The integration of theoretical and experiential learning in cultural games reinforces the justification for their inclusion in the curriculum. Notably, games encourage the use of native languages and help to bridge the gap between home and school experiences. It has been found that games offer a distinctive and captivating approach to learning across various subjects and provide useful resources for educators looking to incorporate these effective tools into their classrooms. Following this realisation, I found it prudent to inquire about the cultural games that were played the most in the study area because the reviewed literature pointed out that cultural games played differed between and within regions and political and administrative boundaries.

7.2.2.4 Secondary Research Question 4

SRQ4 was: Which cultural games did teachers observe EGLs engaging in during free play?

This question sought to establish teachers' observation of learners when they naturally play during break or free time. I then probed the participants to ascertain whether they used some of the identified games as teaching tools. This question was well-answered by all participants because they each identified at least three games, and most of the games were mentioned multiple times, showing their commonality within the study areas. Some of the identified games include "nhodo", "pada", "chihwande-hwande", "zai-rakaora", and "tsoro". Frequency analysis of the mentioned games revealed that the top three games are "pada", "tsoro", and "nhodo". Details on how these games are played are discussed in Section 3.6. While the teachers demonstrated awareness of

these games, observations revealed learners' limited participation in them during mathematics lessons. This highlights a gap between teachers' knowledge and classroom practice.

The recurrent mention of "pada", "tsoro", and "nhodo" by teachers suggests these games hold particular promise due to their inherent mathematical concepts. This reinforces the interconnectedness between cultural heritage and mathematical learning, positioning these games as valuable pedagogical tools. Suggestions by scholars such as Gasteiger and Moeller (2021), Feza (2018), and Fouze and Amit (2018) to identify the most widely played games in a given culture and develop learning manuals can be easily implemented in Zimbabwe since details on the most widely played games have been made visible for all to see. For example, Fouze and Amit (2018) provided a step-by-step manual on how the three games, "ta'ab"-the stick game, 'mozkat-5", the stone game', and the "seega" game, can be used in teaching the EGLs of the Negev Bedouin people of Israel in the Middle East. Feza (2018) did the same with "upuca', "black toti", "umrabaraba", and "itreyini" games played by Xhosa children in South Africa. Since Zimbabwe has 16 official languages (ZIMSTATS, 2022), all recognised by the MPSE, manuals with the most played games associated with each language can be developed.

7.2.2.5 Secondary Research Question 5

SRQ5 was: Which were the most important mathematical concepts children learnt while playing cultural games from teachers' perspectives?

I used the question around mathematical concepts embedded in Zimbabwean cultural games as a follow-up to the question on the most widely played games. Most of the teachers identified concepts such as counting, addition, subtraction, pattern recognition, and classification. Interestingly, most teachers identified concepts stated in the ECD curriculum (see Section 3.5) as key competencies that EGLs must acquire throughout the learning process. This is a true testimony that Zimbabwean cultural games are rich in numerical concepts that are expected of learners at the ECD level.

Gasteiger and Moeller (2021) used case data from Germany to conclude that a game is said to be rich in content if it meets the basic requirements of an educational

curriculum. For example, they assessed the performances of learners in board games developed using their native language and traditional dot dice. They concluded that the game was effective because learners were able to recognise numbers 0 to 9. This was a critical aspect of their intervention since number recognition and associated skills are critical in early education. The ability to recognise numbers in base 10 (that is, 0 to 9) gives a strong foundation for developing counting skills, as is supported by Gasteiger and Moeller (2021). Despite the difference in the pillar of focus, for example, Gasteiger and Moeller focused on learners themselves, and this study focused on teachers' views; they both produced similar results. This may be partly attributed to the fact that both studies employed play-based methods to help learners improve their numeracy skills.

7.2.2.6 Secondary Research Question 6

SRQ6 was: What are some of the teachers' experiences in using cultural games as part of their pedagogical approaches?

I posed this question to assess teachers' experiences, whether positive or negative, around the use of cultural games as a teaching tool. Arguably, I found that teachers were best to answer this question because they interact with learners daily by helping them connect with mathematical concepts embedded in games. I am convinced that this question was well-answered by Themes 3, 4, 5, and 6 (see Sections 5.6 to 5.9). Theme 3 compiled teachers' daily experiences in using cultural games, and the majority of them explained that they cannot rely solely on them because of time constraints and the absence of cultural artefacts that can be used in class. The teachers using cultural games use them mainly to introduce certain topics or explain complex concepts that are best reduced to familiar language using games. I found that while some schools benefit from resources, supportive administration, and supportive environments, others face challenges such as uncooperative leadership, limited allocation of resources, and lack of community support. Notably, I also discovered that teachers play a crucial role in maximising available resources and leveraging local contexts to enrich learners' cultural learning experiences through games and activities.

From teachers' sentiments, I also discovered that cultural games present themselves with both benefits and challenges. Henceforth, they demand some level of experience

and wisdom to minimise the negatives and maximise the benefits. Themes 4, 5, and 6 brought the assortment of resources needed to embrace cultural games fully and the current level of support teachers are getting from the community, the schools' administration and the MPSE to light. Answers to this question confirmed the richness of the CHAT in explaining the interrelated nature of educational stakeholders. This observation confirms what Leont'ev (1981) described as the dialogic nature of interactions that emphasise the role of the community, not only in collaboration but also in providing access to environmental resources, land, and human support for cultural games. For example, the community supports learners with some artefacts and materials needed to operationalise games, and at times, they orient learners to some games at home. Then, teachers use resources mobilised by the schools and the community to translate games into concepts. The MPSE also plays an overseeing role in ensuring that the right policies and curriculum are in place. The participation of numerous stakeholders working in different spaces presents challenges to teachers in their quest to coordinate, since they are responsible for connecting the dots. At a higher level, some teachers did not receive formal training on using cultural games as a mediating tool, yet they are expected to use it daily.

7.2.2.7 Secondary Research Question 7

SRQ7 was: What characterises an effective teaching approach based on cultural games to develop EGL's mathematical skills?

I modelled this question on a philosophical adage that says a solution to a problem is best prescribed by, with, and through the involved parties. So, this question sought to tap into teachers' views on the best way to use cultural games as a teaching tool based on their experiences. I also believe that this question was well-answered because the participants proposed numerous solutions, some of which I used to prescribe a conceptual model presented in Section 7.3. Since I used cross-examination to gather data, the solutions came randomly, and I then packaged them into three levels: teachers, community, and ministry levels.

First, the MHTESTD and the MPSE must take the lead in making this initiative a success. For example, the MHTESTD, under their overseeing role in teacher training, must make modules on cultural games compulsory during teacher training and

develop learning material that can support teachers during training and practice. In conjunction with the MHTESTD, the MPSE must revise the ECD curriculum to ensure the clear inclusion of cultural games to guide teachers in practice. Second, the community, mainly the parents, must always support learners with the resources needed at school to facilitate learning processes. Third, teachers explained that they are the major stakeholders in this initiative since they translate all policies and aspirations into reality. They expressed willingness to undergo continuous professional development and assume a coordinating role, serving the interface between the community, learners, schools, and the MPSE. This finding further reinforces the dialogic nature of interactions central to the CHAT (Leont'ev, 1981); stakeholders succeed through and with each other.

7.2.2.8 Main Research Question

The main research question was: What are teachers' views regarding the use of cultural games in early-grade mathematics?

The answers to the seven secondary research questions culminated in an answer to the main research question. The main question has been answered because teachers' views were missing in the literature around the incorporation of cultural games in teaching early-grade mathematics (see the gap analysis presented in Section 3.7 and the research problem presented in Section 1.4.1). As such, the significant implication of this study is the inclusion of teachers' views in clarifying and specifying specific issues around the use of cultural games as a tool for teaching numeracy competencies to EGLs. Incorporating teachers' views has completed the puzzle by plugging a missing piece because details about how and why teachers are using cultural games in a current manner have been supplied. They shared their knowledge, perceptions, attitudes, and experiences, all bringing clarity to assumed knowledge.

One philosopher argued that reported reality is way better than assumed reality. Policy-makers can now make decisions from an informed viewpoint. In addition, this study has shown that, of the six pillars of the CHAT, teachers stood out as the key pillar because they are responsible for coordinating and operationalising other pillars. This is not to over-emphasise individual importance but rather to say that set rules, community engagement, mediating tools, and curriculum content are all put together

and transformed into practice by teachers. So, answers to this question recognise the dialogic nature of interactions but emphasise the central role of teachers in improving mathematical teaching methods.

7.3 IMPLICATIONS, APPLICATIONS, AND LIMITATIONS

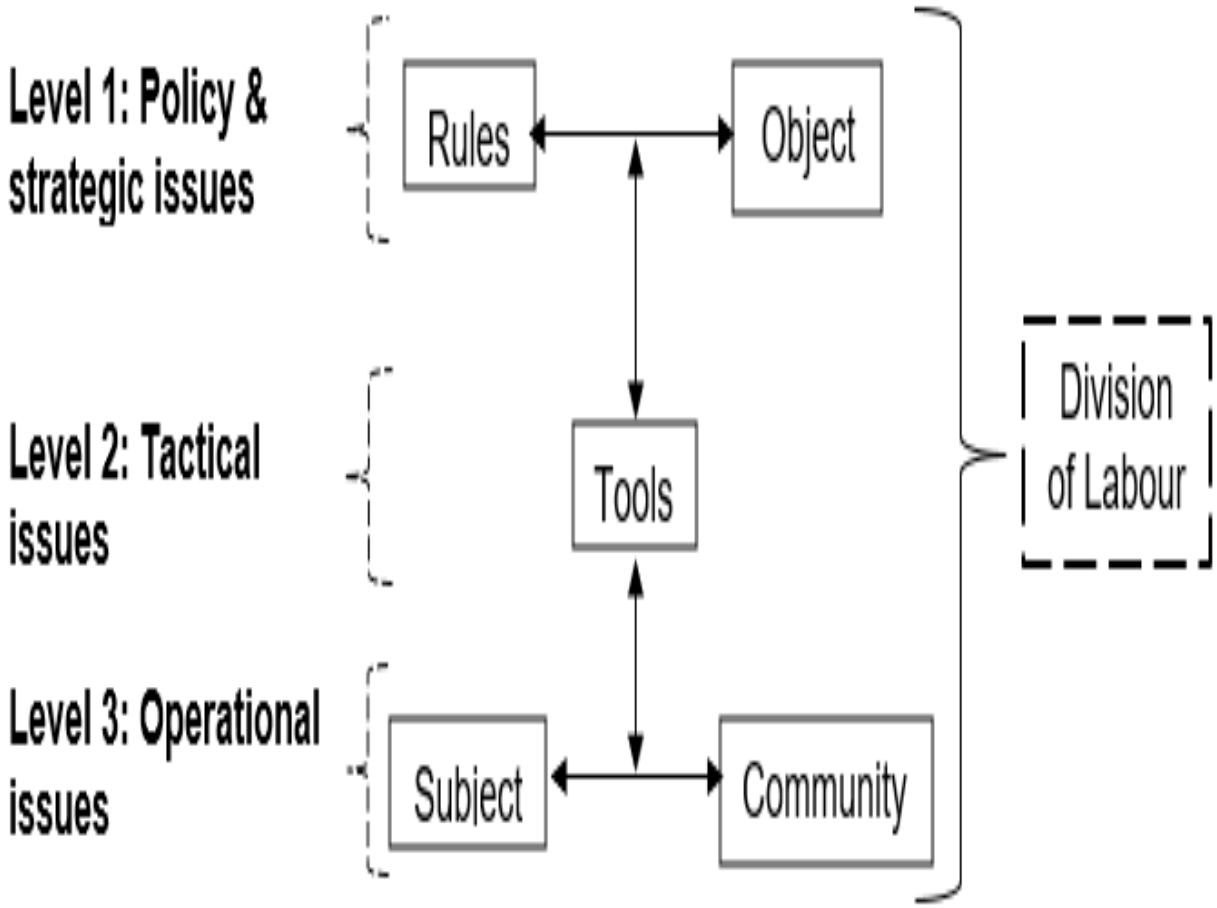
This study's unique contribution has been stated in its main objective, aimed at developing a conceptual model for infusing cultural games into teaching and learning early-grade mathematics to improve pedagogical approaches and develop numerical skills by EGLs (see Section 1.4.2). So, its main implication is bringing teachers' perspectives to the debate on using cultural games in teaching numeracy competencies to EGLs since they are responsible for connecting learners with the content embedded in games. Adding this voice to the debate has clarified some assumptions in literature, leading to the development of the Cultural Games Integration Framework for Zimbabwe (CGIFZ), which has the potential to be adapted elsewhere. The proposed framework is rooted in Lev Vygotsky's CHAT but hierarchically classifies its pillars into three categories (strategic, tactical, and operational levels), as shown in Figure 7.1.

First, rules of engagement and the object are mainly dealt with at the policy and strategic level. At this level, educational policies are designed and implemented; for example, teachers' education and learners' curricula are under the custodianship of the MHTESTD and MPSE, respectively. In this study, the object was defined as imparting numeracy competencies to EGLs (see Chapter Two). Second, at the tactical level, appointed authorities, working hand-in-glove with teachers, the community, and the curriculum development unit under the MPSE, come together to develop tools for the effective impartation of EGLs. This is important because cultural games as a teaching tool are embedded in cultural values that bind a community together, but they must be structured pedagogically since they are used for teaching EGLs. Third, at the operational level, parents, representing the community, provide supporting resourcing and develop new games. Teachers depend on parents for resources and new cultural games. Therefore, teachers operationalise cultural games using the support they get from parents, pedagogically structured tools from content developers, and guidance from policies designed by their parent ministry. It must be noted that the *"division of*

labour" pillar of the CHAT is cross-cutting across the three levels of the CGIFZ because players in the three levels interact and exchange ideas and experiences.

Figure 7.1

The Cultural Games Integration Framework for Zimbabwe (CGIFZ)



(Researcher's analysis, 2024)

The CGIFZ is comprehensive and supports teachers in effectively integrating cultural games into teaching and learning practices. It shows how different actors and factors infuse cultural games into teaching and learning early-grade mathematics to improve pedagogical approaches and develop numerical skills in EGLs. The CGIFZ emphasises the importance of leveraging cultural games as a mediating tool to enhance learners' educational experiences while promoting cultural appreciation in

the classroom. So, Sections 7.3.1, 7.3.2, and 7.3.3 discuss the principles underlying the CGIFZ, its implementation strategy, and the overall limitation of the study's outcomes, respectively.

7.3.1 Key Principles of the CGIFZ

The seven principles explained in Sections 7.3.1.1 to 7.3.1.7 must be upheld and adhered to utilise the proposed model effectively.

7.3.1.1 Foundational Blueprint

The CGIFZ acknowledges the CHAT as its foundational blueprint, directing the study's structure within existing knowledge. Adopting the second generation of the CHAT (see Section 2.2.2) helps the CGIFZ align with Leont'ev's perspective, highlighting learning through practice within a socio-cultural context. This is so because this study's findings, to a larger extent, support and extend past findings on the interplay between cultural games and early-grade mathematics. As such, the conceptual model resulting from this study builds up existing frameworks and models.

7.3.1.2 Knowledge Acquisition

Incorporating teachers' voices into the debate on infusing cultural games into teaching and learning early-grade mathematics has brought to light the crucial role teachers play in the puzzle. They are responsible for utilising cultural games to impart knowledge while appreciating students' cultural identities. To this effect, the CGIFZ emphasises active, co-constructed knowledge acquisition, wherein cultural games serve as vehicles for facilitating the acquisition of mathematics skills among students, and teachers connect learners with these skills.

7.3.1.3 Integration Strategies

The third principle on integration strategies is composed of three pillars identified as:

1. **Understanding Cultural games**: First, the CGIFZ suggests organising workshops and seminars and providing resources to enhance teachers' understanding of traditional games' cultural significance and educational value.
2. **Familiarity with Cultural games**: Second, it also involves encouraging teachers to explore and experience a wide range of cultural games first-hand and build familiarity and confidence in incorporating them into the classroom.
3. **Use of Cultural games in class**: Third, the framework proposes developing guidelines and creating repositories of culturally relevant teaching materials to

facilitate the seamless integration of cultural games into different subject areas and learning objectives.

7.3.1.4 Curriculum Alignment

The CGIFZ advocates for a periodic review of existing curriculum frameworks and policies to ensure alignment with the integration of cultural games across subject areas, particularly in mathematics. This is important because some teachers exposed the gaps in the current curriculum concerning the use of cultural games. It is envisioned that such reviews will specify and clarify what is expected of teaching concerning using cultural games in teaching mathematics. The CGIFZ further emphasises the need to advocate for including cultural games in official curriculum documents.

7.3.1.5 Resource Allocation

This study revealed a need for more cultural artefacts for use in class; the CGIFZ underscores the importance of allocating funding to acquire culturally appropriate materials and establish partnerships with cultural institutions to access diverse cultural game resources.

7.3.1.6 Support and Training

Considering that some teachers did not acquire skills to use cultural games during teacher training, the CGIFZ recommends offering professional development opportunities to teachers. This training can take the form of workshops and training sessions using specialised training modules tailored to different grade levels and subject areas.

7.3.1.7 Learner Engagement

The CGIFZ emphasises the importance of engaging students in discussions, surveys, and reflective activities to understand their perspectives and preferences regarding using cultural games in the classroom. Fostering a positive learning environment that values and celebrates cultural diversity encourages active participation and enthusiasm among students. Teachers have already collectively indicated that learners have a positive attitude toward using cultural games in learning.

If teachers and other stakeholders adhere to the principles outlined in CGIFZ, pedagogical approaches will improve, and EGLs will develop numerical skills equally. If all stakeholders effectively play their part, learners' educational experiences will be

enhanced. The following section discusses how these principles can best be operationalised conjointly to achieve the desired end.

7.3.2 Strategy for Implementing the CGIFZ

The CGIFZ implementation plan involves four stages: planning and preparation, professional development, implementation in the classroom, and monitoring and evaluation. In addition to these steps, the supporting secondary steps and action activities are summarised in Table 7.1. For these steps to be successful, supporting structures such as mentorship programmes, resource libraries, and digital platforms for cultural games have been proposed. The table summarises the implementation steps for the CGIF framework.

Table 7.1

Strategy for Implementing the CGIFZ

Implementation Steps	Actions
Phase 1: Planning and preparation	
Stakeholder meetings	Meet with education authorities, school administrators, teachers, and cultural experts to discuss the CGIFZ implementation plan.
Resource identification	Identify and secure funding for purchasing materials, organising professional development programmes, and possibly partner with cultural institutions and local communities to source cultural games.
Curriculum review	Form a committee to review and refine the existing curriculum to improve clarity around cultural games.
Phase 2: Professional development	
Workshops & seminars	Organise workshops and seminars for teachers to enhance their understanding of cultural games and their educational value. Provide hands-on experiences with various cultural games to build familiarity and confidence.
Training modules	Develop and distribute training modules tailored to different grade levels and subject areas.
Phase 3: Implementation in the classroom	
Guidelines & materials	Develop and distribute guidelines and repositories of culturally relevant teaching materials. After that, create lesson plan templates that integrate cultural games for teaching mathematical concepts.
Pilot programmes	Implement pilot programmes in selected schools to test and refine the integration strategies.

(Table 7.1 Continued)

Implementation Steps	Actions
Phase 4: Monitoring and evaluation	
Feedback mechanisms	Establish feedback mechanisms, such as monitoring surveys and reflective activities, to gather input from teachers and students.
Impact assessment	Develop strategies to assess the impact of integrating cultural games on learning outcomes and cultural awareness.
Continuous improvement	Use feedback and assessment outcomes to refine and improve the implementation process.
Support structures	
Mentorship & collaboration	Establish mentorship programmes and online forums for teachers to share best practices and support each other.
Resource library	Create a library of exemplary lesson plans and content-specific resources linking cultural games to various mathematical concepts.
Digital platforms	Develop digital platforms or applications to document and promote cultural games.

(Researcher's analysis, 2024)

7.3.3 Limitations of the Study

The model resulting from this study is the first to provide a comprehensive overview of the use of cultural games as a teaching tool because it incorporates teachers' views that are missing in past studies. However, the conceptual model has limitations, considering the study's approach, geographical skewness, and disciplinary bias. As such, it has three major limitations.

Firstly, this study is qualitative, using interpretative research design to assess teachers' views. This approach enabled it to explore rich insights into teachers' experiences, attitudes, perceptions, and knowledge but failed to back its findings numerically. A numerical approach, based on educational psychology measurement theory, would have enabled ease of analysis of hidden relationships in terms of their significance and correlation. Despite this weakness, this study used thick descriptions and cross-examination to assess underlying relationships to ensure the confirmability and transferability of the findings. Furthermore, the absence of numerical measures that normally rely on large sample sizes was compensated by using a small sample

size of 12 participants. Such a sample size gave room for in-depth and cross-examination of units of participants to generate thick descriptions.

Secondly, this study's conclusions are geographically skewed towards one educational district, Seke Rural, yet many districts in Zimbabwe have a unique setting characterised by diverse cultural games. As such, the findings and model presented in this study are contextual to that specific district. However, considering the thick descriptions used to present the research process, the findings can be transferred and contextualised to other districts in Zimbabwe and elsewhere. The study provides the basis for understanding issues around the use of cultural games as a teaching tool from the teachers' perspective.

Thirdly, this study is monomaniac in nature, focusing on one discipline only. However, the subject under review is at the intersection of several disciplines, demanding a multi-disciplinary approach. The study has a disciplinarian bias because it was designed from an educational viewpoint without the input of historical and cultural perspectives. The input of historians and cultural experts would have brought a new twist to the debate and changed the nature of the findings since they are better positioned to comment on and interpret some of the issues discussed in this study.

7.4 RECOMMENDATIONS

The following recommendations are based on the literature and empirical findings resulting from this study. Most recommendations were derived from answering research questions and the significance of the study towards a conceptual model for incorporating cultural games in the teaching of early-grade mathematics. The findings from the study have shown that there is a need to embrace cultural games to improve pedagogical methods for early-grade mathematics fully. Therefore, the recommendations for policy, practice, theory, and research proffered in the study may help improve pedagogical approaches and develop numerical skills in EGLs. Interestingly and in summary, the findings from the study revealed that the study participants are willing to be part of the change process in their capacity as teachers. As such, some of the suggestions given by study participants were informed by their experiences in teaching early-grade mathematics.

7.4.1 Policy and Strategy Level Recommendations

These recommendations target government ministries mandated to coordinate, oversee, and implement teacher training and curriculum development in Zimbabwe.

- ***Updating the teacher education curriculum***

  In Zimbabwe, all teachers' colleges fall under the MHTESTD. As such, it has the mandate to direct the operations of individual colleges through policy pronouncements. This study revealed that teachers receive different levels of exposure to training on the use of cultural games, implying that there is a need to make this training compulsory so that, upon graduating, teachers would have attained the same level of skills. This can be done through the appointment of a commission that looks into the teacher curriculum review and comes up with one policy document that binds together all teachers' colleges to ensure uniformity in terms of their training and the quality of graduates they release.

- ***Updating the ECD curriculum***

  The MPSE can do the same by appointing a commission of specialists to review the ECD curriculum. The review's outcomes must develop a draft curriculum that juxtaposes mathematical concepts with specific cultural games to clarify the type of games that can be used to impart particular skills. This study has revealed that some teachers are failing to interpret the syllabus and relate cultural games to topics in mathematics.

- ***Developing teachers' training and practice manuals***

  There might be a disconnect since Zimbabwe has two stand-alone ministries that are mandated to deal with educational matters. For example, the MHTESTD is responsible for training teachers, and the MPSE is responsible for teachers' practice with EGLs. It is, therefore, recommended that the two ministries work hand-in-glove in developing and designing the games to be included as compulsory games during teacher training, as well as developing learning materials that can be used during training and practice to avoid a disconnect. Since each ministry has a Curriculum Development Unit (CDU), the

two units can join hands on this task to ensure coherence in the material used to train teachers and the material used by teachers to train learners.

- ***Using games drawn from diverse cultures***

  According to the 2022 census report, Zimbabwe has 16 official languages, each rich with diverse games. The curriculum review commission must prioritise incorporating selected games from each culture to ensure coverage and inclusivity. The inclusion of diverse examples and languages reflects diverse learners' backgrounds, allowing them to see their culture represented in the learning materials. By demonstrating how these games can be used to teach concepts across the curriculum, teachers can be better equipped to incorporate them into their lessons effectively.

7.4.2 Tactical Level Recommendations

This set of recommendations targets government ministerial agencies mandated to translate policies into practices. For example, the MPSE works through and with provincial and district offices, and, at times, it works with non-governmental organisations that support government programmes.

- ***Creating teacher professional development programmes***

  The MPSE, through its provincial and district offices, should organise workshops to enhance teachers' understanding of cultural games and how to integrate them effectively into lesson plans. Professional development programmes should include hands-on training, collaborative planning sessions, and opportunities for teachers to share best practices. Training should widen to cover game mechanics and pedagogical strategies for maximising learning outcomes during gameplay, ensuring that teachers are well-prepared to implement these techniques. This approach aligns with Nabie's (2011) research, highlighting the importance of teacher familiarity and confidence in using new teaching methods for successful implementation.

- ***Creating lesson plan templates***

  Districts' ECD specialists should develop lesson plan templates that

integrate cultural games as a teaching tool. Such templates can be used to share ideas during professional development workshops. They can serve as a practical guide for teachers, providing a structured approach to incorporating cultural games into their lessons. They can also assist teachers in ensuring consistency in their use, making it easier to measure their effectiveness and check on progress.

- ***Establishing a library of exemplary lesson plans***

  Since the Zimbabwe educational management system is structured in such a way that individual schools feed into a district, several districts feed into a province, and all provinces feed into the national system, exemplary libraries can adopt the same structure. These libraries can be set at the district level to serve as repositories of lesson plans to provide teachers with practical examples and inspiration for their lesson design. For example, I used Seke district as a geographical area of study, implying that Seke rural can have its own library, and so on. This library should be easily accessible and regularly updated to include new ideas and successful practices from different educators. Such a resource can help teachers have a feel of the application of cultural games in their teaching and adapt these ideas to their unique classroom contexts.

- ***Promoting clarity in curriculum communication***

  After the refinement of the curriculum and its supplementary resources, a robust dissemination exercise should be carried out. Clear guidelines and examples should be used to help teachers understand the structure of the refined curriculum. This approach aligns with the emphasis on clear communication within the curriculum framework observed in the study, ensuring that teachers get renewed attention from cultural games.

- ***Advocating for culturally responsive teaching***

  Facilitators should continuously promote the use of cultural games in classrooms during workshops, seminars, and professional teacher assessments. This is essential for creating inclusive learning environments that value ECD learners' cultural backgrounds. Culturally responsive

teaching acknowledges and incorporates learners' cultural references in all aspects of learning. Integrating cultural games can help educators make learning more relevant and engaging, fostering a more inclusive classroom environment where students feel respected and understood.

7.4.3 Operational Level Recommendations

This set of recommendations targets teachers who connect learners with numerical concepts hidden in cultural games.

- ***Adapting games for diverse learners***

  Teachers should explore and adapt cultural games for diverse learning styles and abilities because learners and learning environments differ. This approach ensures that all learners can participate and benefit from the learning experience, making education inclusive and effective for every learner.

- ***Enhancing time management strategies***

  Most teachers revealed that they do not fully use cultural games as a teaching tool because of time constraints. As such, they must master the skill of developing and implementing lesson plan templates based on cultural games; this will help them manage their time effectively while maintaining the quality of instruction. So, practical time management strategies are necessary to effectively integrate cultural games without compromising curriculum coverage.

- ***Collaborating for knowledge sharing***

  From my experience as a supervisor of teachers in practice, most public schools in Zimbabwe have at least five ECD teachers per school. Teachers can capitalise on this to establish strong communication channels and collaborative platforms to encourage knowledge sharing, resource exchange, and problem-solving among teachers, administrators, and the broader community. This collaborative spirit is essential for ensuring the sustainability and growth of cultural games within the ECD mathematics curriculum.

- ***Prioritising learners' voices***

  Interestingly, all the participants who took part during the fieldwork concurred that learners always express a positive attitude towards cultural games when they are used as a teaching tool. Considering this observation, teachers must prioritise learners' voices to create a positive learning environment that celebrates cultural diversity and encourages active participation, making education more responsive to learners' needs and interests. This can be done through conducting child-friendly surveys, discussions, and reflective activities to understand learners' perspectives and preferences regarding cultural games.

7.4.4 Recommendation for Further Research

Considering the limitations of this study in terms of design and approach, it used qualitative methods to assess teachers' views on using cultural games as a teaching tool; as such, it lacks numerical data to back its conclusions. Future studies on this subject can attempt to quantify what has been described in this study. Measuring teachers' views using educational psychology measurement theory enables one to measure variables such as attitude, perception, and knowledge. Resultant numerical conclusions can be used to illuminate qualitative findings by showing their statistical significance, relationship, and strength of the identified relations.

Conclusions from this study are geographically skewed towards one educational district in Zimbabwe, yet each district has its unique setting characterised by diverse cultural games. Future research can carry out the same study in a different setting to check for coherence or differences in conclusion due to contextual differences. For example, some studies can be carried out in educational districts in the Matabeleland and Masvingo provinces.

This study has a disciplinarian bias because it was designed from an educational viewpoint without the input of historical and cultural perspectives. Against this background, future studies can be designed using a collaborative approach with the input of educators and cultural experts. This is essential to ensure the accurate

interpretation and implementation of cultural games in the curriculum. Cultural experts can provide invaluable support and guidance to teachers, helping them understand the cultural significance and educational value embedded in different games. This collaboration ensures that cultural games are used effectively and respectfully in educational settings.

This study has pointed out the need for professional development of teachers, not to say that there are no existing professional development programmes but rather to say they are ineffective in infusing cultural games in pedagogy. To this effect, future studies can examine the prospects and challenges of teacher training programmes to help bridge the gap between theoretical exposure and practical application. Examining different training approaches and their long-term effects on teaching practices can reveal the most effective methods for integrating Cultural games. This focus on practical application ensures that teachers are well-prepared to use cultural games in their classrooms. So, a thesis titled “The benefits of training teachers in using cultural games in early-grade Mathematics” or ‘Adding a South African flavour to early-grade Mathematics- voices of the teachers and children”.

This study has highlighted that further research in these domains will help link mathematical knowledge with daily cultural activities. Another possible future research would be an experimental study employing games as an intervention to assess whether students' mathematical competence would increase. It will give students' learning empirical proof of the benefit of interacting with culture. Future studies on intentional efforts to gather games from the region will validate the teachers' favourable reaction to the cultural setting and student learning autonomy and boost their self-efficacy with mathematics teaching.

7.5 CHAPTER SUMMARY

This chapter summarised and concluded all issues deliberated in this thesis. Much emphasis was placed on revisiting the research problem and answering the research questions. This chapter also recommended what is needed to enhance the appreciation of issues around using cultural games as a tool for teaching early-grade mathematics. The recommendations and other concerns in the thesis pointed toward future and further research. Cultural games and early-grade mathematics concepts

are complex; however, this study's analysis of their relationship from teachers' perspectives sheds light on the underlying issues that connect the two concepts. Overall, this thesis sought to understand teachers' views and experiences in using cultural games as a teaching tool. It was discovered that there are numerous reasons why teachers do not fully use cultural games in teaching. The CGIFZ has become an important priority with the government so that teachers will be more confident in using cultural games as a teaching tool in mathematics in early grades.

REFERENCES

Aguilar, J. J. (2021). High school students' reasons for disliking mathematics: The intersection between teacher's role and student's emotions, belief and self-efficacy. *International electronic journal of mathematics education*, *16*(3), em0658. https://doi.org/10.29333/iejme/11294

Aldemir, J., & Kermani, H. (2017). Integrated STEM curriculum: Improving educational outcomes for Head Start children. *Early Child Development and Care*, *187*(11), 1694–1706.

Algozzine, B., & Hancock, D. (2016). *Doing Case Study Research. A practical Guide for Beginning*. Columbia University Teachers College.

Allsop, D. B., Chelladurai, J. M., Kimball, E. R., Marks, L. D. & Hendricks, J. J. (2022). Qualitative methods with Nvivo software: A practical guide for analyzing qualitative data. *Psych*, *4*(2), 142–159. https://doi.org/10.3390/psych4020013

Alsina, Á., & Salgado, M. (2022). Understanding early mathematical modelling: First steps in the process of translation between real-world contexts and mathematics. *International Journal of Science and Mathematics Education*, *20*(8), 1719-1742. https://doi.org/10.1007/s10763-021-10232-8

Anders, Y., & Rossbach, H. G. (2015). Preschool teachers' sensitivity to mathematics in children's play: The influence of math-related school experiences, emotional attitudes, and pedagogical beliefs. *Journal of Research in Childhood Education*, *29*(3), 305–322. https://doi.org/10.1080/02568543.2015.1040564

Anyidoho, A. (2018). Shifting sands: Language policies in education in Ghana and implementation challenges. *Ghana Journal of Linguistics*, 7(2), 225–243. https://doi.org/10.4314/gjl.v7i2.10

Aras, A., & Zahrawati, F. (2021). Fostering students' interest in mathematics learning with the utilization of ethnomathematics through makkudendeng traditional game. *MaPan: Jurnal Matematika dan Pembelajaran*, *9*(1), 27–39.

Arlinkasari, F., Cushing, D. F., & Miller, E. (2020). Play, work, and rest: The developmental affordances of designated child-friendly public spaces in Jakarta, Indonesia. *Children, Youth and Environments*, *30*(2), 119–146. https://doi.org/10.7721/chilyoutenvi.30.2.0119

Ashari, Z. M., Kosnin, A. M., & Jiar, Y. K. (2013). The effectiveness of learning through play module on the understanding of number concept among preschool children. *Journal of Education and Practice*, *9*.

Aunio, P., Heiskari, P., Van Luit, J. E., & Vuorio, J. M. (2015). The development of early numeracy skills in kindergarten in low-, average-and high-performance groups. *Journal of Early Childhood Research*, *13*(1), 3-16. https://doi.org/10.1177/1476718X14538722

Ayala-Perez, T., & Joo-Nagata, J. (2019). The digital culture of students of pedagogy specialising in the humanities in Santiago de Chile. *Computers & Education*, *133*, 112.https://doi.org/10.1016/j.compedu.2019.01.002

Akayuure, P. (2021, August). Use of vclass in mathematics education delivery: The UEW experience. In *Open Conference on Computers in Education* (pp. 179-191). Springer International Publishing.AkayBahrami, F., Chegini, Z., Kianzadeh, A., Emami, F., & Abdi, H. (2012). *A comparison of the effectiveness of game-based and traditional teaching on learning and retention of first grade mathematics concepts.* https://api.semanticscholar.org/CorpusID:17461311

Ball, J. (2010). *Enhancing learning of children from diverse language backgrounds: Mother tongue-based bilingual or multilingual education in early childhood and early primary school years*. Policy Commons, Canada.

Berk, L. E. (2017). *Child development*. Pearson.

Berryman, D. R. (2019). Ontology, epistemology, methodology, and methods: information for librarian researchers. *Medical Reference Services Quarterly, 38*(3), 271-279. https://doi.org/10.1080/02763869.2019.1623614

Berti, F., & Zingari, V. L. (2019). Between similarities and cultural diversities: Intangible Cultural Heritage meets intercultural education. The example of Traditional Sports and Games. In *Proceedings of the 1st International Conference of the Journal Scuola Democratica. Education and post-democracy. Volume III: Governance, Values, Work and Future.* (pp. 70-75). Associazione “Per scuola democratica”.

Bhuda, M. T., & Marumo, P. (2021). CHAPTER THIRTEEN. In *Proceedings on the Conference on the Implications of Covid-19 on Gender and Behaviour in Africa*.

Biehler, R. F. & Snowman, J. (2017). *Psychology applied to teaching*. 7th Edition Mifflin Company. Houghton

Björklund, C., van den Heuvel-Panhuizen, M., & Kullberg, A. (2020). Research on early childhood mathematics teaching and learning. *ZDM*, *52*(4), 607-619. https://doi.org/10.1007/s11858-020-01177-3

Bonne, L., & Higgins, J. (2022). Game playing and fluctuations in emotional climate. *Cultural Studies of Science Education*, *17*(4), 1063–1079.

Bose, K. & Seetso, G. (2016). Science and mathematics teaching through local games in preschools of Botswana. *South African Journal of Childhood Education, 6(2),* 1–9. https://doi.org/10.4102/sajce.v6i2.453.

Boyer, C. B., & Merzbach, U. C. (2011). *A history of mathematics*. John Wiley & Sons.

Boyle, E. A., Hainey, T., Connolly, T. M., Gray, G., Earp, J., Ott, M., & Pereira, J. (2016). An update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games. *Computers & Education*, *94*, 178–192. https://doi.org/10.1016/j.compedu.2015.11.003

Braun, V., & Clarke, V. (2013). *Successful qualitative research: A practical guide for beginners.* Sage.

Braun, V., & Clarke, V., Hayfield, N. & Terry, G. (2018). Thematic analysis. In: P. Liamputtong, Ed., *Handbook of research methods in health social sciences,* pp. 843-860. Springer Singapore.

Browne, B. C. (2013). Recording the personal: the benefits in maintaining research diaries for documenting the emotional and practical challenges of fieldwork in unfamiliar settings. *International Journal of Qualitative Methods*, *12*(1), 420–435. https://doi.org/10.1177/160940691301200121

Bruce, T. (2015). *Early Childhood Education 5th Edition*. Hachette UK.

Bryman, A. (2016). *Social research methods*. Oxford University Press.

Bulotsky-Shearer, R., McWayne, C. M., Mendez, J. L., & Manz, P. H. (2016). Chap. 10. Preschool peer play interactions, a developmental context for learning for all children. In K. E. Sanders, & A. W. Guerra (Eds.), *The culture of child care: attachments, peers, and quality in diverse communities* (pp. 179–202). Oxford Academic. https://doi.org/10.1093/acprof:oso/9780190218089.003.0010

Burns, M. S., Donovan, M. S., & Bowman, B. T. (Eds.). (2001). *Eager to learn: Educating our pre-schoolers*. National Academies Press.

Burton, D. M. (2011). *The history of mathematics: an introduction*, Seventh edition. The McGraw-Hill Companies

Caledòn-Pattichis, S., Pape, S. J., & Clements, D. H. (2018). Asset-based approaches to equitable mathematics education research and practice. *Journal for Research in Mathematics Education, 49*(4), 373–389.

Carneiro de Sousa, I. (2014). *Culture as a Play*: *Johan Huizinga 'Homo Ludens'.* RsearchGate. https://doi.org/10.13140/RG.2.1.4301.3844/1.

Chen, J. Q., & McNamee, G. D. (2011). Positive approaches to learning in the context of preschool classroom activities. *Early Childhood Education Journal*, *39*, 71–78.

Chesloff, J. D. (2013). STEM education must start in early childhood. *Education Week*, *32*(23), 27-32.

Chikodzi, I., & Nyota, S. (2010). The interplay of culture & mathematics: The rural Shona classrooms. *The Journal of Pan African Studies, 10*(3) 3-17*,* https://www.jpanafrican.org.

Chisaka, B. C. (2013). The qualitative research paradigm. In B. C. Chisaka, B. A. Mamvuto, S. Matiure,. M. T. Mukabeta, T. Shumba, & D. Zireva (eds). *Action research: Some practical ideals for educational practice*. Save the children.

Clements, D. H., & Sarama, J. (2020). *Learning and teaching early math: The learning trajectories approach*. Routledge. https://doi.org/10.4324/9781003083528

Clerkin, A., & Gilligan, K. (2018). Pre-school numeracy play as a predictor of children's attitudes towards mathematics at age 10. *Journal of Early Childhood Research*, *16*(3), 319-334. https://doi.org/10.1177/1476718X18762238

Cohen, L., Manion, L., & Morrison, K. (2010). *Research Methods in Education*, 6th ed. Routledge.

Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education,* (8th ed.). Routledge. https://doi.org/10.4324/9781315456539

Cole, M. (1996). Cultural Psychology: A Once and Future Discipline. Cambridge: Harvard University Press.

Cole, M. W., Bagic, A., Kass, R., & Schneider, W. (2010). Prefrontal dynamics underlying rapid instructed task learning reverse with practice. *Journal of Neuroscience*, *30*(42), 14245-14254. https://doi.org/10.1523/JNEUROSCI.1662-10.2010

Cooksey, R., & McDonald, G. (2019). *Surviving and thriving in postgraduate research*. Singapore: Springer Singapore.

Creswell, J. W. (2014). *Research design qualitative, quantitative and mixed methods approaches.* Pearson.

Creswell, J. W. (2021). *Research design: Qualitative, quantitative, and mixed methods approach* (10th ed.). Sage.

Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: qualitative, quantitative and mixed methods approach*. 5th Edition. Sage.

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage.

Cropley, A. J. (2019). *Mixed methods research in the social sciences: A practical guide.* Palgrave Macmillan.

Cross, C. T., Woods, T. A., & Schweingruber, H. E. (2009). *Mathematics learning in early childhood: Paths toward excellence and equity*. The National Academies Press.

Crowe, M. (1998). The power of the word: Some post-structural considerations of qualitative approaches in nursing research. *Journal of Advanced Nursing*, *28*(2):339-344. https://doi.org/10.1046/j.1365-2648.1998.00780.x

Cutter-Mackenzie, A., & Edwards, S. (2013). Toward a model for early childhood environmental education: Foregrounding, developing, and connecting knowledge through play-based learning. *The Journal of Environmental Education*, *44*(3), 195-213. https://doi.org/10.1080/00958964.2012.751892

D'Ambrosio, U. (2016). The ethnomathematics program and a culture of peace. *Journal of Mathematics and Culture*, *10*(2), 1–11.

Daniels, H., Edwards, A., Engeström, Y., Gallagher, T., & Ludvigsen, S.R. (2013). *Activity theory in practice*. Routledge.

Dawson, S. M. (2019). *Interviewing for data collections: A practical guide for social scientists.* Palgrave Macmillan.

Delen, D., & Zolbanin, A. (2018). The importance of using personal interviews in qualitative research. In G.R. Gibbs & J.A. Seale (Eds). *The Blackwell companion to qualitative research*, pp. 327-346. John Wiley & Sons.

Denscombe, M. (2014). *The good research guide for small–scale social research projects*. Open University Press.

Denzin, N. K., & Lincoln, Y. S. (Eds) (2018) S*AGE handbook of qualitative research,* 5th Ed. Sage.

Dewah, C., & Van Wyk, M. M. (2014).The place of indigenous cultural games by educators in the teaching and learning of mathematics, *Journal of Human Ecology, 48 (1), 189-197.* https://doi.org/10.1080/09709274.2014.11906788

Douglas, A. S. (2018). Learning on the job: A cultural-historical activity theory approach to initial teacher education across four secondary school subject departments. *Teaching and Teacher Education*, 74, 145-155

Dziva, D., Mpofu, V., & Kusure, L. P. (2011). Teachers' conceptions of Indigenous knowledge curriculum in the context of Mberengwa District, Zimbabwe*. African Journal of Education and Technology, 1(3), 88-102.* https://www.researchgate.net/publication.242022649

Ekeh, M. & Venketsamy, R. (2020). Ensuring a child-friendly learning environment in early childhood centres in Nigeria. In K. S. Adeyemo (eds.), *The Education Systems of Africa.* Global Education Systems. Springer, Cham. https://doi.org/10.1007/978-3-030-44217-0_37

Ekonesi, O. R. & Ekwueme, C. O. (2011). The roles of games in teaching and learning of mathematics in junior secondary schools. *Global Journal of Educational Research, 10(2)*, 121-124.www.globaljurnalseries.com

Engeström, Y. (1987). Learning by Expanding: An Activity-Theoretical Approach to Developmental Research. Helsinki: Orienta-Konsultit.

Engeström, Y. (2001). Expansive learning at work: Toward an activity theoretical reconceptualization. *Journal of education and work*, *14*(1), 133-156.

Engeström, Y. (2009). Expansive learning: Toward an activity-theoretical reconceptualization. In I. Knud, (ed.). *Contemporary theories of learning: Learning theorists in their own words*. Routledge.

Engeström, Y. (2018). *Expertise in transition: Expansive learning in medical work*. Cambridge University Press.

Engeström, Y. (2020). Activity theory as a framework for analyzing learning and development in work settings. In Smith, A. B. (ed.) *The Cambridge handbook of workplace training and employee development.* Cambridge: Cambridge University Press, pp. 45–68.

Engeström, Y. (2023). Writing for stabilization and writing for possibility: The dialectics of representation in everyday work with vulnerable clients', in Rogers, P. M., Russell, D. R., Carlino, P. and Marine, J. M. (eds.) Writing as a Human Activity: Implications and Applications of the Work of Charles Bazerman. Denver: University Press of Colorado, pp. 293–314.

Engeström, Y., & Sannino, A. (2016). Expansive learning at work: Toward an activity-theoretical reconceptualization. *Journal of Education and Work*, 29(3), 328–356. https://doi.org/10.1080/13639080.2016.1146434

Erhel, S., & Jamet, E. (2013). Digital game-based learning: Impact of instructions and feedback on motivation and learning effectiveness. *Computers & education*, *67*, 156– 167. https://doi.org/10.1016/j.compedu.2013.02.019

Essa, E. L. (2014). *Introduction to early childhood education*. Wadsworth.

Farrell, T. S. C. (2013). Reflective writing for language teachers. *TESL Canada Journal, 31.* https://doi.org/100.10.18806/tesl.v31i1.1170.

Feza, N. N. (2016). Teaching 5-and 6-year-olds to count: Knowledge of South African educators. *Early Childhood Education Journal*, *44*, 483–489.https://doi.org/10.1007/s10643-015-0736-z

Feza, N. N. (2018). Black students' rich mathematical experiences: Mathematics concepts and Xhosa cultural games for reception class. In D. Farland-Smith,. (Ed) *Early Childhood Education*. http//dx.doi.org/10.5772/intechopen.81039

Fleer, M. & Van Oers, B. (2018). *International Handbook of Early Childhood Education.* Springer international handbooks of education. https://www.springer.com/series/6189

Fleer, M. (2015). *Learning science in everyday life: A cultural historical framework.* Cambridge University Press.

Fleer, M., & Veresov, N. (2018). *Cultural-historical activity theory: A framework for understanding early childhood education*. ResearchGate.

Fletcher, A. (2018). Classroom assessment as a reciprocal practice to develop students' agency: A social cognitive perspective. *Assessment Matters*, *12*, 34–57. https://doi.org/10.18296/AM.0032

Foot, K. A. (2013). Cultural-historical activity theory: Exploring a theory to inform practice and research. *Journal of Human Behavior in the Social Environment, 24*(3), 329–347. https://doi.org/10.1080/10911359.2013.831011

Fouze, A. Q. & Amit, M. (2018). Development of mathematical thinking through integration of ethno-mathematics folklore game in mathematics instruction. *EURASIA Journal of Mathematics, Science and Technology Education*, *14*(2), 617–630. https://doi.org/10.12973/ejmste/80626

Frost, J. L. (2010). *A history of children's play and play environments: toward a contemporary child-saving movement.* Taylor and Francis

Fuson, K. C., Clements, D. H., & Sarama, J. (2015). Making early math education work for all children. *Phi Delta Kappan*, *97*(3), 63–68. https://doi.org/10.1177/0031721715614831

Garraway, J. W., & Van Graan, J. P. (2023). Using a change laboratory approach as a change tool for academic staff development. *Alternation*, 41, 257–328, https://doi.org/10.29086/2519-5476/2023/sp41a11]

Gasteiger, H., & Benz, C. (2018). Mathematics education competence of professionals in early childhood education: a theory-based competence model. In *Mathematics Education in the Early Years: Results from the POEM3 Conference, 2016* (pp. 69-91). Springer International Publishing.

Gasteiger, H., & Moeller, K. (2021). Fostering early numerical competencies by playing conventional board games. *Journal of Experimental Child Psychology*, 204, 105060. https://doi.org/0.1016/j.jecp.2020.105060

Gedera, D. S. P., & Williams, P. J., (2016). *Activity theory in education: Research and practice*. Sense Publishers

Gifford, S. (2015). *The importance of shape and space in the early years.* University of Cambridge. https://nrich.maths.org/articles/importance-shape-and-space-early-years

Ginsburg, H. P., Uscianowski, C., Caraza, C., & Levine, S. C. (2019). Print and digital picture books in the service of young children's mathematics learning. In *Handbook of research on the education of young children* (pp. 83-98). Routledge.

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Routledge.

Grimalt-Álvaro, C., & Ametller, J. (2021). A cultural-historical activity theory approach for the design of a qualitative methodology in science educational research. *International Journal of Qualitative Methods, 20,* 16094069211060664. https://doi.org/10.1177/16094069211060664

Grand Fun Alley Learning Center. (2014), *The importance of play.* http://www.gfalc.com/#!The-Importance-of-Play/c1pou/1

Grant, C., & Osanloo, A. (2014). Understanding, selecting, and integrating a theoretical framework in dissertation research: Creating the blueprint for your "house". *Administrative Issues Journal*, *4*(2), 4. http://www.swosu.edu/academics/aij/guidelines.aspx

Gray, A. (2019). *Freedom of speech in practice: controversial applications of law and theory*. Rowman & Littlefield.

Gupta, A. (2021). Teacher-entrepreneurialism: A case of teacher identity formation in neoliberalizing education space in contemporary India. *Critical Studies in Education*, *62*(4), 422–438.

Hachey, A. C. (2013). The early childhood mathematics education revolution. *Early Education & Development*, *24*(4), 419–430. https://doi.org/10.1080/10409289.2012.756223

Hardy, J. (2012). Narrative theory versus truth: A poststructuralist reading in environmental education. *The International Journal of Interdisciplinary Social Sciences*, *6*(8), 167–173. https://doi.org/10.18848/18331882/CGP/v06i08/52135

Harris, B., & Petersen, D. (2017). *Developing math skills in early childhood. Issue brief*. Mathematica Policy Research, Inc.

Hartell, C., & Bosman, L. (2016). Beplanning van 'n navorsingsvoorstel vir nagraadse studie. *Joubert, Hartell, & Lombard, eds. Navorsing: 'n gids vir die beginnernavorser. Pretoria: Van Schaik Uitgewers*, 19.

Hedegaard, M., & Fleer, M. (2013). *Play, Learning and children's development: Everyday life in families and transition to school*. Cambridge University Press.

Hendricks, G., Savahl, S., Mathews, K., Raats, C., Jaffer, L., Matzdorff, A., & Pedro, A. (2015). Influences on life aspirations among adolescents in a low-income community in Cape Town, South Africa. *Journal of Psychology in Africa*, *25*(4), 320–326. https://doi.org/10.1080/14330237.2015.1078089

Hennig, K., & Kirova, A. (2012). The role of cultural artefacts in play as tools to mediate learning in an intercultural preschool programme. *Contemporary Issues in Early Childhood*, *13*(3), 226-241. https://doi.org/10.2304/ciec.2012.13.3.226

Hunziker, S., & Blankenagel, M. (2021). Research design in business and management. *Wiesbaden: SpringerGabler*, *1*.

Hwang, G.-J. and Chang, C.-Y. (2024) 'Integrating Cultural-Historical Activity Theory and Authentic Learning with Technology in Teaching and Learning: A Case Study Analysis', Frontiers in Psychology, 15, Article 1307552. https://doi.org/10.3389/fpsyg.2024.1307552.

Johnson, K. E., & Golombek, P. R. (2011). *Research on second language teacher education: A socio-cultural perspective on professional development.* Routledge.

Kamid, K., Syaiful, S., Theis, R., Sufri, S., & Rohana, S. (2022). Cooperative learning model with process skills for mathematics learning in elementary school. *International Journal of Elementary Education*, *6*(1), 58–68. https://doi.org/10.23887/ijee.v6i1.38737

Kamisli, H. (2019). On primary school teachers' training needs in relation to game-based learning. *international Journal of Curriculum and Instruction*, *11*(2), 285-296. https://eric.ed.gov/?id=EJ1232773

Kane, T. J., Taylor, E. S., Tyler, J. H., & Wooten, A. L. (2011). Identifying effective classroom practices using learner achievement data. *Journal of Human Resources*, *46(3): 587-613.* https://cepr.havard.edu.

Kaptelinin, V., & Nardi, B. A. (2006). Activity theory in a nutshell. In *Acting with Technology: Activity Theory and Interaction Design*. MIT Press, 2006, pp. 29–72.

Kaptelinin, V., & Nardi, B. A. (2012). *Activity theory in HCI: Fundamentals and reflections* (Vol. 13). Morgan & Claypool Publishers.

Kaptelinin, V. & Nardi, B. A. (2017). Activity theory as a framework for human-technology interaction research. *Mind, Culture, and Activity, 25.* 1–3. https://doi.org/10.1080/10749039.2017.1393089.

Kazerooni, E. A. (2001). Fundamentals of clinical research for radiologists: Population and sample. *American Journal of Radiology (AJR)*,*177*, 993-1000.

Kazima, M. (2013). Students' preferences for contexts and their relevance to school mathematics in Malawi. *African Journal of Research in Mathematics, Science and Technology Education*, *17*(3), 244–254.

Kivunja, C., & Kuyini, A. B. (2017). Understanding and applying research paradigms in educational contexts. *International Journal of higher education*, *6*(5), 26-41.

Korstjens, I., & Moser, A. (2018). Practical guidance to qualitative research. Part 4: Trustworthiness & publishing, *European Journal of General Practice*, *24(1)*: 120-124. https://doi.org/10.108413814788.2017.1375092.

Koszalka, T. A., Pavlov, Y., & Wu, Y. (2021). The informed use of pre-work activities in collaborative asynchronous online discussions: The exploration of idea exchange, content focus, and deep learning. *Computers & Education, 161,* 104067. https://doi.org/10.1016/j.compedu.2020.104067

Kurniawan, M. S. (2022). The role of information technology in improving the effectiveness of education management. *Journal on Education*, *4*(4), 1658-1665. https://doi.org/10.31004/joe.v4i4.2421

Kylasov, A. V. (2014). *Traditional games and ethno sport: general classification, theory and practice of physical culture*. ethnosport.org.www.ethnosort.ru

Lektorsky, V. A. (1984). Activity Theory: A New Approach to Psychology. In Vygotsky's Legacy: A New Perspective on Children's Learning.

Leont'ev, A. N. (1981). *Problems in the development of the mind.* Progress

Leont'ev, A. N. (1978). Activity, Consciousness, and Personality. Englewood Cliffs: Prentice Hall.

Li, X., Brownlow, C. & Lee, M.T. (2021). Investigating students' self-efficacy and attitudes towards using mobile learning technologies in higher education. *Computers & Education*, *164*, 1-14.

Lincoln, Y. S. & Guba, E. G. (1985). *Naturalistic inquiry*. Sage.

Linder, S. M., Powers-Castello, B. & Stagelin, D. A. (2011). Mathematics in early childhood: Research-based rationale & practical strategies. *Early Childhood Education Journals, 39*(1), 29-37. http://www.springerlink.com

Lowenstein, L. (2011). Favorite therapeutic activities for children, adolescents, and families: Practitioners share their most effective interventions. *Lowenstein (Ed.), Creative Family Techniques*, 4-114.

Lucas, F. M. M. (2016). The game as an early childhood learning resource for intercultural education. Proceedings of 7th International Conference on Intercultural World, 15-17 June. Almeria, Spain. onlinewww.sciencedirect.com

Luky Atmaja, F., Sugiman, S., & Jun Fineldi, R. (2021, September). Designing learning trajectory: A case of data distribution using the context of congklak. In *Proceedings of the 5th International Conference on Learning Innovation and Quality Education* (pp. 1-7). https://doi.org/10.1145/3516875.3516959

Lysaght, Z. (2011). Epistemological and paradigmatic ecumenism in "Pasteur's Quadrant:" Tales from doctoral research. *Official Conference Proceedings of the Third Asian Conference on Education in Osaka, Japan.* http://iafor.org/ace2011_offprint/ACE2011_offprint_0254.pdf

Machaba, M. M. (2013). *Teacher challenges in the teaching of mathematics at foundation phase* (Doctoral dissertation, University of South Africa).

Macmillan, J. H. & Schumacher, S. (2010). *Research in Education*. 7th Edition. Pearson

Madondo, M. M. (2020). *Curriculum reform and classroom practice: teaching geography in the Zimbabwean Curriculum Framework 2015–2022* (Doctoral dissertation, University of the Free State).

Maher, C., Hadfield, M., Hutchings, M., & De Eyto, A. (2018). Ensuring rigor in qualitative data analysis: A design research approach to coding combining NVivo with traditional material methods. *International Journal Of Qualitative Methods*, *17*(1), 1609406918786362. https://doi.org/10.1177/1609406918786362

Maree, J.G. (2015). Research on life design in (South) Africa: A qualitative analysis. *South African Journal of Psychology, 45(3)*, 332–334. http:hdl.handle.net/2263/49691

Marshall, C., & Rossman, G. B. (2014). *Designing qualitative research*. Sage.

McAvinia, C. (2016). Cultural-Historical Activity Theory: A Framework for Understanding Learning. In The Handbook of Learning from Children.

McDonald, A. & Carmichael, C. (2016). *Early mathematics competencies and later outcomes: insights from the longitudinal study of Australian children*. McGraw-Hill

McInnes, K., & Birdsey, N. (2013). Defining play: the perceptions of children, adolescents, parents and professionals. Presented at: *2nd Global Conference: Making Sense of Play*, Oxford, 22 July - 24 July 2013. Published in: Barnett, Lynn A. ed. *Play of Individuals and Societies.* University of South Wales, pp. 105-116. 10.1163/9781848883277_012

Melero, J., & Hernández-Leo, D. (2014). A model for the design of puzzle-based games including virtual and physical objects. *Journal of Educational Technology & Society*, *17*(3), 192–207.

Mentz, E., & De Beer, J. J. (2021). Cultural-historical activity theory as a lens in mixed methods research on self-directed learning. *South African Journal of Higher Education, 35*(5), 163-183.

Mereku, K. (2013). Ghanaian educational institutions' capacity for, and approach to, ICT pedagogical integration. *International Journal of Technology and Management Research*, *1*(2), 27–30.

Merriam-Webster Online Dictionary. (2019). Teacher. [Online] www.merriamwebster.com/dictionary

Mertens, D. M. (2019). *Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative & mixed methods*. Sage.

Miles, M. B., Huberman, A. M. & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook,* 3rd ed. Sage.

Miles, R. (2020). Making a Case for Cultural Historical Activity Theory: Examples of CHAT in Practice. *Studies in Technology Enhanced Learning*, 1(1). doi:https://doi.org/10.21428/8c225f6e.c4feefa5.

Ministry of Higher and Tertiary Education, Science and Technology Development [MHTESTD]. (2017). *The modernisation and industrialisation of Zimbabwe through education, science and technology development*. https://www.zimche.ac.zw/wp-content/uploads/2019/04/The-Doctrine.pdf

Ministry of Primary and Secondary Education (MoPSE). (2015). *Curriculum Framework, 2015.* https://www.mopsemashwest.gov.zw/Site/Curriculum_Framework.html

Ministry of Primary and Secondary Education (MoPSE). (2024). Zimbabwe draft heritage based curriculum framework for primary and. Secondary education. https://www.scribd.com/document/740849957/1-Updated-Consolidated-Heritage-Based-Curriculum-2024-to-2030-31-May-2024

Moloi, T. J. (2013). An analysis of challenges in the teaching of problem solving in Grade 10 mathematics. *TD: The Journal for Transdisciplinary Research in Southern Africa*, *9*(3), 480–492.

Moloi, T. J. (2015). Using Indigenous games to teach problem-solving in mathematics in rural learning ecologies. *Council for the Development of Social Science Research in Africa, 13*(1-2), 1–12. https://www.jstor.org/stable/jhigheducafri.13.1-2.21

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

Morrison, G. S. (2016). *Fundamentals of early childhood education* (8th Edition). Pearson.

Mutema, F. (2014). An examination of the learning conditions in Zimbabwe's satellite schools: A case of Somabhula resettlement area. *International Journal Of Humanities And Social Sciences, 4 (8), 284–290.* www.ijhssnet.com/journals

Mweli, P. (2018). Indigenous stories and games as approaches to teaching within the classroom. In I. Eloff & E. Swart (Eds.), *Understanding Educational Psychology,* 94–101*.* JUTA

Nabie, M. J. (2011). Where cultural games count: The voices of primary classroom teachers. *International Journal of Education in Mathematics, Science & Teaching, 3*(3), 219–229. https://files.eric.ed.gov.

Nardi, B. A. (Ed.). (1996). *Context and consciousness: Activity theory and human-computer interaction*. MIT Press.

National Association for the Education of Young Children (NAEYC) (2009). Developmentally Appropriate Practice in Early Childhood Programs Serving Children from Birth through Age 8. http://www.naeyc.org/files/naeyc/file/positions/position%20statement%20Web.pdf

Neulip, J. W. (2012). The relationship among intercultural communication apprehension ethnocentrism, uncertainty reduction and communication satisfaction: an extension of anxiety and uncertainty management (AUM). *Journal of Intercultural Communication Research, 41*(1), 1-16. https://doi.org/10.10.1080/17475759.2011.623239

Neuman, W. L. (2014). *Social research methods: qualitative and quantitative approaches,* 7th Edition. Pearson Education Ltd.

Nieuwenhuis, J. (2016). Introducing qualitative research. In: Maree, K. (ed.) *First steps in research.* Van Schaik

Nkopodi, N., & Mosimege, M. (2009). Incorporating the indigenous game of morabaraba in the learning of mathematics. *South African Journal of Education*, *29*(3).

O'Donoghue, T., & Harford, J. (2020). Education in the Twentieth Century. In *A Cultural History of Education in the Modern Age* (pp. 1-12). Bloomsbury Academic.

Okyere, M. (2022). *Culturally responsive teaching through the adinkra symbols of Ghana and its impact on students' mathematics.* proficiency. (PhD Thesis, University of Alberta). https://doi.org/10.7939/r3-a38y-wx79

Owusu, P., & Obuo Addo, A. (2023). Alikoto: Mathematics instruction and cultural games in Ghana. *Cogent Education*, *10*(1), 2207045.

Parten, M. B. (1933). Social play among preschool children. *The Journal of Abnormal and Social Psychology*, *28*(2), 136.

Patten, M. L. & Galvan, M. C. (2019). *Proposing empirical research: a guide to the fundamentals.* Routledge.

Patton, M. Q. (2015). *Qualitative research and evaluation methods,* 4th Ed. Sage.

Punch, K. F. (2014). *Introduction to social research: Quantitative and qualitative approaches*, 3rd Ed. Sage

Pereira, A. S. M., & Venâncio, L. (2021). African and Indigenous games and activities: a pilot study on their legitimacy and complexity in Brazilian physical education teaching. *Sport, education and society*, *26*(7), 718–732. https://doi.org/10.1080/13573322.2021.1902298

Phillippi, J., & Lauderdale, J. (2018). A guide to field notes for qualitative research: Context and conversation. *Qualitative health research*, *28*(3), 381–388. https://doi.org/10.1177/1049732317697102

Prensky, M. (2003). Digital game-based learning. *Computers in entertainment (CIE)*, *1*(1), 21.

Qureshi, S. P. (2021). Cultural historical activity theory for studying practice-based learning and change in medical education. *Advances in Medical Education and Practice*, 923–935.https://doi.org/10.2147/AMEP.S313250

Rajagopalan, I. (2019). Concept of Teaching. *Shanlax International Journal of Education*, *7*(2), 5–8.

Ramani, G. & Eason, S. (2015). It all adds up. *Phi Delta Kappan, 96*(8), 27–32. https://doi.org/10.1177/0031721715583959.

Ramayenda, N. (2020, July). Social emotional development of early childhood through traditional games in PAUD Terpadu Hauriyah Halum City of Padang.

In *International Conference of Early Childhood Education (ICECE 2019)* (pp. 13-16). Atlantis Press. https://doi.org/10.2991/assehr.k.200715.003

Ranz-Smith, D. J. (2013). Explicating the place of play: Resolving dilemmas of research–to–practice. *Journal of Early Childhood Teacher Education, 33*(1), 85-101. https://www.tandf.co.uk/journals

Rehm, J. T., & Gadenne, V. (2013). *Intuitive predictions and professional forecasts: Cognitive processes and social consequences* (Vol. 20). Elsevier.

Restati Siregar, N., & Ilham, M. (2019). *Traditional Game As a Way for Healthy in Bajo's Children. KnE Life Sciences, 4 (11), 19–25*.

Roth, W.-M., & Lee, Y.-J. (2007). "Vygotsky's Neglected Legacy": Cultural-Historical Activity Theory. *Review of Educational Research, 77*(2), 186–232.

Roth, W. M., Radford, L., & LaCroix, L. (2012, May). Working with cultural-historical activity theory. In *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research* (Vol. 13, No. 2). https://doi.org/10.17169/fqs-13.2.1814

Roza, Y., Siregar, S. N., & Solfitri, T. (2020, February). Ethnomathematics: Design mathematics learning at secondary schools by using the traditional game of Melayu Riau. In *Journal of Physics: Conference* Series (Vol. 1470, No. 1, p. 012051). IOP Publishing.

Rupere, T., Zanamwe, N., Muzurura, O. & Munyaradzi, M. (2013). Use of a game in teaching early childhood learners in Zimbabwe. *International Journal of Computer and Information Technology, 2*(2), 247-254. https://www.ijcit.com

Ryder, L. & Yamagata-Lynch, L. (2014). Understanding tensions: Activity systems analysis of transpacific collaboration. *CALICO Journal, 31*(2), 201–220.

Sannino, A., & Engeström, Y. (2018). Cultural-historical activity theory: founding insights and new challenges. *Cultural-Historical Psychology, 14*(3), 43–56.

Saunders, M., Lewis, P., & Thornhill, A. (2016). *Research methods for business students*, (7th ed.). Pearson.

Scotland, J. (2012). Exploring the philosophical underpinnings of research: Relating ontology and epistemology to the methodology and methods of the scientific, interpretive, and critical research paradigms. *English language teaching*, *5*(9), 9–16.

Hussain, S. Y. S., Tan, W. H., & Idris, M. Z. (2014). Digital game-based learning for remedial mathematics students: A new teaching and learning approach in

Malaysia. *International Journal of Multimedia Ubiquitous Engineering*, *9*(11), 325-338.

Sailer, M., & Homner, L. (2020). The gamification of learning: A meta-analysis. *Educational psychology review*, *32*(1), 77–112.https://doi.org/10.1007/s10648-019-09498-w

Saldaña, J. (2016). *The coding manual for qualitative researchers*. (pp. 1–42). Sage.

Seabi, J. (2012). Using Feuerstein's mediated learning experience in enhancing cognitive functioning of remedial school learners. *e-international journal of educational research*, *3*, 1_15.

Seidman, I. (2013). *Interviewing as qualitative research: A guide for researchers in education & the social scienc*es, 3rd Ed. Teacher College Press

Seudib, E. N., Kwasi, S. A., & Dassah, F. T. (2020). Math-Phobia and mathematical performance challenges, a linguistic ramification of colonized nations of Africa: Evidence from Ghana. *International Journal of Education Humanities and Social Science*, *3*(4), 95-120.

Shizha, E. (2013). Reclaiming our Voices: The African school curriculum problem with post-colonial Sub-Saharan. *Journal of Indigenous Social Development, 2(1),* 1–18. https://scholarspace.manoa.hawaii.edu/handle/10/25/29811

Singh, N. K. & Reyhner, J. (2013). Indigenous knowledge and pedagogy for Indigenous children. *International journal of multicultural education 15*(1), 37–52. https://www.eric.ed.gov

Soedirgo, J., & Glas, A. (2020). Toward active reflexivity: positionality and practice in the production of knowledge. *PS: Political Science & Politics*, *53*(3), 527-531.

Starkey, G. S. (2014). *Investigating the Cognitive and Developmental Dynamics of Groupitizing*. Vanderbilt University.

Starman, A. B. (2013). *The case study as a type of qualitative research methods: A guide book and resource*, 4th Ed. Wiley

Stetsenko A. (2023). Cultural-historical activity theory and its contemporary import: ideas emerging in context and time. *Cultural-Historical Psychology, 19,*(1), 20–29.

Stronge, J. H., Ward, T. J. & Grant, L. W. (2011). What makes good teachers good? A cross-case analysis of the connection between teacher effectiveness and learner achievement. *Journal of Teacher Education*, *62*(4), 339–355. https://doi.org/10.1177/0022487111404241

Subhash, S., & Cudney, E. A. (2018). Gamified learning in higher education: A systematic review of the literature. *Computers in human behavior*, *87*, 192–206. https://doi.org/10.1016/j.chb.2018.05.028

Suherman, S., & Vidákovich, T. (2021). *Assessment of mathematical creative thinking using ethnomathematics content.* ResearchGate.

Sulistyaningtyas, R. E., & Fauziah, P. Y. (2019, June). The implementation of traditional games for early childhood education. In *the 3rd International Conference on Current Issues in Education (ICCIE 2018)* (pp. 431–435). Atlantis Press.

Sumbera, B. (2020). Cultural-Historical Activity Theory (CHAT): A Structure for examining justice-centered leadership outcomes. *Educational Leadership and Administration: Teaching and Program Development.*

Sumbera, B. (2023). Cultural-Historical Activity Theory (CHAT): A structure for examining justice-centered leadership outcomes. *Journal of the California Association of Professors of Educational Administration*, 19–30.

Tangkur, M., Nabie, M. J., & Ali, C. A. (2022). Mathematics teachers' knowledge of indigenous games in teaching mathematics. *Al-Jabar: Jurnal Pendidikan Matematika*, *13*(1), 165–174.

Tatira, L. (2014). Traditional games of Shona children. *Journal of Pan African Studies, 7(*4), 156–174.

Taylor, A. (2014). Community service-learning and cultural-historical activity theory. Canadian Journal of Higher Education, 44(1), 95–107. https://files.eric.ed.gov/fulltext/EJ1028760.pdf

Taylor, S. J., Bogdan, R., & DeVault, M. L. (2016). I*ntroduction to qualitative research methods: A guide book and resource,* 4th Ed. Wiley

Tenzer, H., & Schuster, T. (2017). *Language Barriers in different forms of international assignments.* Research Gate. https://doi.org/10.1057/978-1-137-57406-0_3

Tracy, S. W. (2019). *Qualitative research methods: Collecting evidence, organizing data, and drawing conclusions* (3rd ed.). Guilford Press.

Trajkovik, V., Malinovski, T., Vasileva-Stojanovska, T., & Vasileva, M. (2018). Traditional games in elementary school: Relationships of student's personality traits, motivation and experience with learning outcomes. *PloS one*, *13*(8), e0202172.

Trawick-Smith, J., Swaminathan, S., & Liu, X. (2016). The relationship of teacher–child play interactions to mathematics learning in preschool. *Early Child Development and Care*, *186*(5), 716–733. https://doi.org/10.1080/03004430.2015.1054818

Tsamir, P., Tirosh, D., & Levenson, E. (2011). Windows to early childhood mathematics teacher education. *Journal of Mathematics Teacher Education*, *14*, 89–92. https://doi.org/10.1007/s10857-011-9174-z

Tuck, D.A.K., & Tuck, K. M. (2019). Rules and norms in educational settings: A cultural-historical activity theory perspective. *International Journal of Educational Research,* 98, 101–112. https://doi.org/10.1016/j.ijer.2019.101112

Turner, K., & Theilking, M. (2019). Teacher wellbeing: Its effects on teaching practice and student learning. *Issues in Educational Research*, *29*(3), 938–960.

United Nations Economic Commission for Europe. (2011). *Education for sustainable development.* https://unece.org/environment-policy/education-sustainable-development

Venketsamy, R. (2024). Ethnomathematics: The use of cultural games in mathematics in the early grades - A South African case study. *Social Sciences and Education Research Review*, *11*(2), 189–196.

Van Oers, B. (2013). Learning mathematics as a meaningful activity. In *Theories of mathematical learning* (pp. 91–113). Routledge.

Vocaturo, E., Zumpano, E., Caroprese, L., Pagliuso, S. M., & Lappano, D. (2019, January). Educational games for cultural heritage. In *VIPERC@ IRCDL* (pp. 95-106).

Vygotsky, L. S. (1978). Mind in Society: The Development of Higher Psychological Processes. Harvard University Press.

Wa Thiong'o, N. (1986). *'Decolonising the Mind: The politics of language in African literature.* Decolonial Thoughts.

Wager, A. A. (2012). Incorporating out-of-school mathematics from cultural context to embedded practice. *Journal of Mathematics Teacher Education, 15,* 9-23. https://doi.org/1010071.10857-011-9199-3

Waitoller, F.R., & Kozleski, E.B. (2013). *Understanding and dismantling barriers for partnerships for inclusive education: A cultural-historical activity theory perspective. International Journal of Whole Schooling, 9*(1), 23–42.

Watts, T., Duncan, G., Sieglar, R., & Davis-Kean. (2014). What is past is prologue: Relations between early mathematics knowledge & high school achievement. *Educational Researcher, 43*(7), 352–360. https://org/10.3102/0013189x14553660

Wenger, E. (1998). Communities of practice: Learning as a social system. *Systems thinker*, *9*(5), 2–3.

Williams, J. P. (2015). Playing games. In *Popular Culture as Everyday Life* (pp. 115-124). Routledge.

Willig, C. (2013). *Introducing qualitative research in psychology*, 3rd Ed. Open University Press

Wood, E., Broadhead, P., & Howard, J. (2010). *Play and Learning in the early years.* Sage.

Wood, E., & Hedges, H. (2016). Curriculum in early childhood education: Critical questions about content, coherence, and control. *The Curriculum Journal, 27*(3), 387–405. https:// doi.org/10.1080/09585176.2015.1129981

Yin, R. K. (2018). *Case Study Research: Design and Methods*. 3rd Ed. Sage.

ZIMSTATS. (2022). Zimbabwe 2022 population and housing census report. https://www.zimstat.co.zw/wp-content/uploads/Demography/Census/2022_PHC_Report_27012023_Final.pdf

APPENDICES

Appendix One: School 1 Completed Observation Schedules

School 1: Class 1 Observations
Aim of observation: Utilisation of cultural games when teaching mathematics
Topic: Mathematical play
Subtopic: Shapes

Item	Guide	Checklist	Observed behaviour
1	The teacher is using cultural games in her lesson	✗	The teacher is not incorporating cultural games into the lesson
2	The teacher has appropriate resources (cultural games) in her class	✓	The classroom has cultural artefacts, providing a rich environment for incorporating cultural games.
3	The teacher is able to integrate cultural games into the mathematics lesson	✓	The teacher mentions the names of cultural games children play at home such as nhodo , but has not allowed children to play the games during lesson delivery.
4	The teacher uses play-based pedagogy in her class	✓	The teacher effectively employs play-based pedagogy by incorporating songs and rhymes in between the lesson for example 10 green paw paws on the tree top
5	The teacher uses a variety of cultural games to accommodate all learners in her class	✗	No observed instances of using a variety of cultural games during lesson delivery
6	Cultural games are planned for in each lesson in the class	✗	While cultural games are mentioned in the syllabus and scheme of work, they are not being incorporated during lesson planning
7	The teacher shows confidence in using cultural games in the class	✓	Shows confidence in mentioning them
8	Learners are excited to learn using play activities (cultural games)	✓	Learners display enthusiasm while engaging in play activities
9	Cultural games are adequately used in the class	✗	Not used at all

10	There are adequate resources to implement cultural games activities in the class	✔	There are plenty
11	The curriculum in Zimbabwe allows teachers to use cultural games in class	✔	The mathematics and science syllabus for Early Childhood Development (ECD) explicitly permits teachers to integrate cultural games into their lessons, aligning seamlessly with curriculum guidelines (Mathematics and Science syllabus page (sections 3.1 & 3.6. Pages 13, 16, 23; 31 and 48.).

School 1: Class 2 Observations
Aim of observation: Utilisation of cultural games when teaching mathematics
Topic: Number operations
Subtopic: Counting

Item	Guide	Checklist	Observed behaviour
1	The teacher is using cultural games in her lesson	✔	The teacher chanted dudu-muduri katswe when she was introducing her lesson as learners where naming the digits one who fail to name the next number sits down
2	The teacher has appropriate resources (cultural games) in her class	✔	The classroom has cultural artefacts, providing a rich environment for incorporating cultural games.
3	The teacher is able to integrate cultural games into the mathematics lesson	✔	The teacher only integrated dudu-muduri in her mathematics lesson.
4	The teacher uses play-based pedagogy in her class	✔	The teacher employs play-based pedagogy by incorporating a rhyme in between the lesson: finger up and 1 finger down
5	The teacher uses a variety of cultural games to accommodate all learners in her class	✘	There were no a variety of cultural games utilized during lesson delivery
6	Cultural games are planned for in each lesson in the class	✘	In the scheme-Cum plan the teacher indicated games not clearly articulating that they are cultural games or modern games

7	The teacher shows confidence in using cultural games in the class	✔	When chanting dudu-muduri the teacher was confident
8	Learners are excited to learn using play activities (cultural games)	✔	Learners display enthusiasm while engaging in play activities
9	Cultural games are adequately used in the class	✘	Not adequately used
10	There are adequate resources to implement cultural games activities in the class	✔	Plenty of locally available materials can be seen
11	The curriculum in Zimbabwe allows teachers to use cultural games in class	✔	The mathematics and science syllabus for Early Childhood Development (ECD) explicitly permits teachers to integrate cultural games into their lessons, aligning seamlessly with curriculum guidelines (Mathematics and Science syllabus page (sections 3.1 & 3.6. Pages 13, 16, 23; 31 and 48.).

School 1: Class 3 Observations
Aim of observation: Utilisation of cultural games when teaching mathematics
Topic: Number operations
Subtopic: Pre-mathematics addition

Item	Guide	Checklist	Observed behaviour
1	The teacher is using cultural games in her lesson	✘	The teacher just asks learners the cultural games they play at home and at school but never used them
2	The teacher has appropriate resources (cultural games) in her class	✔	The classroom has cultural artefacts, providing a rich environment for incorporating cultural games.
3	The teacher is able to integrate cultural games into the mathematics lesson	✔	The teacher mentions the names of cultural games children play at home such as nhodo and pada,
4	The teacher uses play-based pedagogy in her class	✔	The teacher effectively employs play-based pedagogy by incorporating rhymes in between the lesson.S he recited the rhym, madhadha 5 aripa mutsetse (5 little ducks on a line)

5	The teacher uses a variety of cultural games to accommodate all learners in her class	✗	No observed instances of using a variety of cultural games during lesson delivery
6	Cultural games are planned for in each lesson in the class	✗	While cultural games are mentioned in the syllabus and scheme of work, they are not being incorporated during lesson planning
7	The teacher shows confidence in using cultural games in the class	✔	confidently names some cultural games such as nhodo (pebble game), pada(Hop-Scotch), and tsoro but not utilized during lesson delivery
8	Learners are excited to learn using play activities (cultural games)	✔	Learners were so happy when they engaged in cultural games
9	Cultural games are adequately used in the class	✗	They are not adequately used
10	There are adequate resources to implement cultural games activities in the class	✔	There are plenty especially on outdoor play area
11	The curriculum in Zimbabwe allows teachers to use cultural games in class	✔	The mathematics and science syllabus for Early Childhood Development (ECD) explicitly permits teachers to integrate cultural games into their lessons, aligning seamlessly with curriculum guidelines (Mathematics and Science syllabus page (sections 3.1 & 3.6. Pages 13, 16, 23; 31 and 48.).

School 1: Class 4 Observations
Aim of observation: Utilisation of cultural games when teaching mathematics
Topic: Number operations
Subtopic: Pre-maths subtraction

Item	Guide	Checklist	Observed behaviour
1	The teacher is using cultural games in her lesson	✗	The teacher is not incorporating cultural games into the lesson
2	The teacher has appropriate resources	✔	The classroom has cultural artefacts

	(cultural games) in her class		
3	The teacher is able to integrate cultural games into the mathematics lesson	✔	The teacher mentions the names of cultural games children play at home such as nhodo, but did not let children engage in cultural games during lesson delivery.
4	The teacher uses play-based pedagogy in her class	✔	The teacher effectively employs play-based pedagogy by incorporating songs and rhymes in between the lesson
5	The teacher uses a variety of cultural games to accommodate all learners in her class	✘	No observed instances of using a variety of cultural games during lesson delivery
6	Cultural games are planned for in each lesson in the class	✘	The scheme-Cum plan just mentioned "…playing games" but not explaining which type of games whether they are modern or cultural games.
7	The teacher shows confidence in using cultural games in the class	✔	Since the teacher never planned for the cultural games, The teacher confidently confidently mentioned names of some cultural games such as nhodo (pebble game), pada(Hop-Scotch), and dunhu
8	Learners are excited to learn using play activities (cultural games)	✔	Learners display enthusiasm while engaging in play activities
9	Cultural games are adequately used in the class	✘	They are not adequately used at all
10	There are adequate resources to implement cultural games activities in the class	✔	There are plenty
11	The curriculum in Zimbabwe allows teachers to use cultural games in class	✔	The mathematics and science syllabus for Early Childhood Development (ECD) explicitly permits teachers to integrate cultural games into their lessons, aligning seamlessly with curriculum guidelines (Mathematics and Science syllabus page (sections 3.1 & 3.6. Pages 13, 16, 23; 31 and 48.).

Appendix Two: School 2 Completed Observation Schedules

School 2: Class 1 Observations
Aim of observation: Utilisation of cultural games when teaching mathematics
Topic: Measures
Subtopic: volume

Item	Guide	Checklist	Observed behaviour
1	The teacher is using cultural games in her lesson	✗	The teacher is not incorporating cultural games into the lesson
2	The teacher has appropriate resources (cultural games) in her class	✔	The classroom has cultural artefacts, providing a rich environment for incorporating cultural games.
3	The teacher is able to integrate cultural games into the mathematics lesson	✔	The teacher mentions the names of cultural games children play at home such as nhodo , however no child engaged in cultural game play
4	The teacher uses play-based pedagogy in her class	✔	The teacher effectively employs play-based pedagogy by incorporating songs and rhymes in between the lesson for example 10 green paw paws on the tree top
5	The teacher uses a variety of cultural games to accommodate all learners in her class	✗	No observed instances of using a variety of cultural games during lesson delivery
6	Cultural games are planned for in each lesson in the class	✗	While cultural games are indicated in the syllabus, they are not being incorporated during lesson planning
7	The teacher shows confidence in using cultural games in the class	✔	Not observed
8	Learners are excited to learn using play activities (cultural games)	✔	Learners display enthusiasm while engaging in play activities
9	Cultural games are adequately used in the class	✗	They are not used at all
10	There are adequate resources to implement cultural	✔	There are plenty

	games activities in the class		
11	The curriculum in Zimbabwe allows teachers to use cultural games in class	✔	The mathematics and science syllabus for Early Childhood Development (ECD) explicitly permits teachers to integrate cultural games into their lessons, aligning seamlessly with curriculum guidelines (Mathematics and Science syllabus page (sections 3.1 & 3.6. Pages 13, 16, 23; 31 and 48.).

School 2: Class 2 Observations
Aim of observation: Utilisation of cultural games when teaching mathematics
Topic: Measures
Subtopic: Volume

Item	Guide	Checklist	Observed behaviour
1	The teacher is using cultural games in her lesson	✘	During introduction, a Shona rhyme was recited
2	The teacher has appropriate resources (cultural games) in her class	✔	Cultural artefacts are in the class, but most resources for cultural games are outsideare in the outdoor play
3	The teacher is able to integrate cultural games into the mathematics lesson	✘	Cultural games were not integrated
4	The teacher uses play-based pedagogy in her class	✔	Yes they were repeating chanting the rhyme they sang during introduction
5	The teacher uses a variety of cultural games to accommodate all learners in her class	✘	No observed instances of using a variety of cultural games during lesson delivery
6	Cultural games are planned for in each lesson in the class	✘	Not included during lesson planning
7	The teacher shows confidence in using cultural games in the class	✔	Did not mention them during lesson delivery
8	Learners are excited to learn using play	✔	Very excited when playing during free play

	activities (cultural games)		
9	Cultural games are adequately used in the class	✗	They are not used at all
10	There are adequate resources to implement cultural games activities in the class	✔	Plenty but not utilised
11	The curriculum in Zimbabwe allows teachers to use cultural games in class	✔	The mathematics and science syllabus for Early Childhood Development (ECD) explicitly permits teachers to integrate cultural games into their lessons, aligning seamlessly with curriculum guidelines (Mathematics and Science syllabus page (sections 3.1 & 3.6. Pages 13, 16, 23; 31 and 48.).

School 2: Class 3 Observations
Aim of observation: Utilisation of cultural games when teaching mathematics
Topic: Shapes
Subtopic: Basic shapes

Item	Guide	Checklist	Observed behaviour
1	The teacher is using cultural games in her lesson	✗	Not used
2	The teacher has appropriate resources (cultural games) in her class	✔	The classroom has cultural artefacts
3	The teacher is able to integrate cultural games into the mathematics lesson	✔	Not used
4	The teacher uses play-based pedagogy in her class	✔	Yes a Shona rhyme was recited
5	The teacher uses a variety of cultural games to accommodate all learners in her class	✗	No observed instances of using a variety of cultural games during lesson delivery

6	Cultural games are planned for in each lesson in the class	✗	They are indicated under activities column
7	The teacher shows confidence in using cultural games in the class	✔	Not mentioned
8	Learners are excited to learn using play activities (cultural games)	✔	Learners display enthusiasm while engaging in play activities
9	Cultural games are adequately used in the class	✗	They are not used at all
10	There are adequate resources to implement cultural games activities in the class	✔	There are plenty
11	The curriculum in Zimbabwe allows teachers to use cultural games in class	✔	The mathematics and science syllabus for Early Childhood Development (ECD) explicitly permits teachers to integrate cultural games into their lessons, aligning seamlessly with curriculum guidelines (Mathematics and Science syllabus page (sections 3.1 & 3.6. Pages 13, 16, 23; 31 and 48.).

School 2: Class 4 Observations
Aim of observation: Utilisation of cultural games when teaching mathematics
Topic: Measures
Subtopic: Mass

Item	Guide	Checklist	Observed behaviour
1	The teacher is using cultural games in her lesson	✗	A Shona traditional rhyme was recited
2	The teacher has appropriate resources (cultural games) in her class	✔	Yes there are appropriate resources for cultural games
3	The teacher is able to integrate cultural games into the mathematics lesson	✗	There is no evidence that the teacher can integrate cultural games because she did not mention them

4	The teacher uses play-based pedagogy in her class	✔	Yes, the rhymes were being included in the lesson
5	The teacher uses a variety of cultural games to accommodate all learners in her class	✘	No observed instances of using a variety of cultural games during lesson delivery
6	Cultural games are planned for in each lesson in the class	✘	Indicated under activities column
7	The teacher shows confidence in using cultural games in the class	✔	They were never mentioned so there is no evidence to show whether the teacher can confidently use cultural games
8	Learners are excited to learn using play activities (cultural games)	✔	Learners display enthusiasm while engaging in cultural game activities
9	Cultural games are adequately used in the class	✘	They are not used at all
10	There are adequate resources to implement cultural games activities in the class	✔	There are plenty especially on outdoor play centre
11	The curriculum in Zimbabwe allows teachers to use cultural games in class	✔	The mathematics and science syllabus for Early Childhood Development (ECD) explicitly permits teachers to integrate cultural games into their lessons, aligning seamlessly with curriculum guidelines (Mathematics and Science syllabus page (sections 3.1 & 3.6. Pages 13, 16, 23; 31 and 48.).

Appendix Three: School 3 Completed Observation Schedules

School 3: Class 1 Observations
Aim of observation: Utilisation of cultural games when teaching mathematics
Topic: Number operations
Subtopic: Counting on

Item	Guide	Checklist	Observed behaviour
1	The teacher is using cultural games in her lesson	✔	During introduction and conclusion, the teacher and learners chanted dudu-muduri katswe
2	The teacher has appropriate resources (cultural games) in her class	✔	The classroom has cultural artefacts
3	The teacher is able to integrate cultural games into the mathematics lesson	✔	The teacher mentions the names of cultural games children play at home such as nhodo, pada and tsoro
4	The teacher uses play-based pedagogy in her class	✔	The teacher effectively employs play-based pedagogy by incorporating songs and rhymes in between the lesson
5	The teacher uses a variety of cultural games to accommodate all learners in her class	✘	No observed instances of using a variety of cultural games during lesson delivery
6	Cultural games are planned for in each lesson in the class	✘	They are just indicated in the syllabus but not schemed for
7	The teacher shows confidence in using cultural games in the class	✔	The teacher only asks children if they play cultural games at home or during break time
8	Learners are excited to learn using play activities (cultural games)	✔	Learners display enthusiasm while engaging in play activities
9	Cultural games are adequately used in the class	✘	They are not used at all
10	There are adequate resources to	✔	There are plenty

	implement cultural games activities in the class		
11	The curriculum in Zimbabwe allows teachers to use cultural games in class	✔	The mathematics and science syllabus for Early Childhood Development (ECD) explicitly permits teachers to integrate cultural games into their lessons, aligning seamlessly with curriculum guidelines (Mathematics and Science syllabus page (sections 3.1 & 3.6. Pages 13, 16, 23; 31 and 48.).

School 3: Class 2 Observations
Aim of observation: utilization of cultural games when teaching mathematics
Topic: Mathematical play
Subtopic: Basic Shapes

Item	Guide	Checklist	Observed behaviour
1	The teacher is using cultural games in her lesson	✘	Not utilizing games
2	The teacher has appropriate resources (cultural games) in her class	✔	The classroom has cultural artefacts, providing a rich environment for incorporating cultural games.
3	The teacher is able to integrate cultural games into the mathematics lesson	✘	Not mentioned
4	The teacher uses play-based pedagogy in her class	✔	Recitation of rhymes
5	The teacher uses a variety of cultural games to accommodate all learners in her class	✘	No observed instances of using a variety of cultural games during lesson delivery
6	Cultural games are planned for in each lesson in the class	✘	Not planned for but indicated under learning activities
7	The teacher shows confidence in using cultural games in the class	✔	Just mentioned in passing the cultural games learners can play during their free periods
8	Learners are excited to learn using play	✔	Learners display enthusiasm while engaging in play activities

	activities (cultural games)		
9	Cultural games are adequately used in the class	✗	They are not used at all
10	There are adequate resources to implement cultural games activities in the class	✔	There are plenty
11	The curriculum in Zimbabwe allows teachers to use cultural games in class	✔	The mathematics and science syllabus for Early Childhood Development (ECD) explicitly permits teachers to integrate cultural games into their lessons, aligning seamlessly with curriculum guidelines (Mathematics and Science syllabus page (sections 3.1 & 3.6. Pages 13, 16, 23; 31 and 48.).

School 3: Class 3 Observations
Aim of observation: Utilisation of cultural games when teaching mathematics
Topic: Measures
Subtopic: Money

Item	Guide	Checklist	Observed behaviour
1	The teacher is using cultural games in her lesson	✗	Not used
2	The teacher has appropriate resources (cultural games) in her class	✔	The classroom has cultural artefacts
3	The teacher is able to integrate cultural games into the mathematics lesson	✔	No integration was observed
4	The teacher uses play-based pedagogy in her class	✔	The teacher effectively employs play-based pedagogy by incorporating songs and rhymes during lesson introduction and conclusion
5	The teacher uses a variety of cultural games to accommodate all learners in her class	✗	No observed instances of using a variety of cultural games during lesson delivery
6	Cultural games are planned for in each lesson in the class	✗	While cultural games are indicated in the syllabus and scheme of work, they are not being incorporated during lesson planning

7	The teacher shows confidence in using cultural games in the class	✔	Since the teacher never planned for the cultural games, The teacher only mention them and confidently names some cultural games such as nhodo (pebble game), pada(Hop-Scotch), and tsoro.
8	Learners are excited to learn using play activities (cultural games)	✔	Learners display enthusiasm while engaging in play activities
9	Cultural games are adequately used in the class	✘	They are not adequately used
10	There are adequate resources to implement cultural games activities in the class	✔	There are plenty
11	The curriculum in Zimbabwe allows teachers to use cultural games in class	✔	The mathematics and science syllabus for Early Childhood Development (ECD) explicitly permits teachers to integrate cultural games into their lessons, aligning seamlessly with curriculum guidelines (Mathematics and Science syllabus page (sections 3.1 & 3.6. Pages 13, 16, 23; 31 and 48.).

School 3: Class 4 Observations
Aim of observation: Utilisation of cultural games when teaching mathematics
Topic: Number operations
Subtopic: Pre maths playing addition game

Item	Guide	Checklist	Observed behaviour
1	The teacher is using cultural games in her lesson	✘	The teacher incorporated cultural games into the lesson
2	The teacher has appropriate resources (cultural games) in her class	✔	The classroom has cultural artefacts, providing a rich environment for incorporating cultural games.
3	The teacher is able to integrate cultural games into the mathematics lesson	✔	Not being integrated
4	The teacher uses play-based pedagogy in her class	✔	The teacher effectively employs play-based pedagogy by incorporating songs and rhymes

			in between the lesson for example 10 green paw paws on the tree top
5	The teacher uses a variety of cultural games to accommodate all learners in her class	✗	No observed instances of using a variety of cultural games during lesson delivery
6	Cultural games are planned for in each lesson in the class	✗	While cultural games are mentioned in the syllabus and scheme of work, they are not being incorporated during lesson planning
7	The teacher shows confidence in using cultural games in the class	✔	Not planned for but indicated under activities column
8	Learners are excited to learn using play activities (cultural games)	✔	Learners display enthusiasm while engaging in play activities
9	Cultural games are adequately used in the class	✗	Not used
10	There are adequate resources to implement cultural games activities in the class	✔	There are plenty
11	The curriculum in Zimbabwe allows teachers to use cultural games in class	✔	The mathematics and science syllabus for Early Childhood Development (ECD) explicitly permits teachers to integrate cultural games into their lessons, aligning seamlessly with curriculum guidelines (Mathematics and Science syllabus page (sections 3.1 & 3.6. Pages 13, 16, 23; 31 and 48.).

Appendix Four: School 1 Completed IDI Guide

School 1: Teacher 1

1. **Explain briefly what you understand by the term cultural games**
   Culture games are activities children engage in where they use their native language as well as native/traditional activities. When children engage in activities of this nature these are culture games.

2. **What are your views about using cultural games for teaching and learning?**
   The use of cultural games is good as learners acquire knowledge from their own traditional experiences using language they understand better. Cultural games are fun and children play the games at home, with friends and thus will enjoy the lesson more as it relates to their home and outside school experiences.

3. **Name some of the cultural games that you are familiar with.**
   Cultural games I'm familiar with include nhodo, pada, chihwande hwande, zambiringa munyemba

4. **Does the curriculum in Zimbabwe allow you to use cultural games in class?**
   Yes the curriculum encourages us the use of cultural games

5. **What kinds of cultural games are recommended in the maths policy document in Zimbabwe**
   I am not sure about the document being referred to but games that relate to concepts like counting, adding, subtracting, division and multiplication all help in the acquisition of skills and knowledge. Children use the play-way method and learn through play

6. **How often do you use cultural games for teaching and learning?**
   The culture games are used normally for the introduction and conclusion of a lesson to check on how much knowledge has been acquired.

7. Name some of the cultural games that you use in your class for teaching and learning.

Tsoro, zambiringa munyemba, pada, nhodo, muimbi- makonye 10 aripamutsetse, madhadha 8 aripamutsetse.

8. What are your learners' views and attitudes towards using games for teaching and learning?

Learners enjoy using games. They have a positive attitude as they add variations to the games to make them more interesting. They share ideas with colleagues and use the games in the teaching and learning process.

9. What kind of training have you received in using cultural games in your class?

I have not received any training but I use my childhood experiences to teach the learners new songs, games, rhymes

10. Does your school have adequate resources to implement cultural games?

We do not really require resources as most of the material is locally found in the school environment or children can bring at home

11. What support have you been given to implement cultural games?

No support given to implement the games but there is adequate space for the cultural games

12. What support do you require so that you can implement cultural games in your class?

support needed is just getting a wider array of the cultural games. when you look at the modern games they are recorded, edited and well-articulated in books, on the u-tube and other platforms thus we get to learn more. if we had same coverage with the cultural games it would be easier and we would also learn from different tribes in the shona culture.

13. In your opinion, are cultural games adequately used in teaching early grade mathematics

I do not think they are being used adequately as generations differ in terms of what they know, what they do and what they plan to do. Cultural games need to be imparted and shared

School 1: Teacher 2

1. **Explain briefly what you understand by the term cultural games**
   Cultural games are traditional games used for entertainment by our forefathers and at the same time they were educative in nature. They are indigenous

2. **What are your views about using cultural games for teaching and learning?**
   They are vital in that they are socializing, educative, have moral values, keep children focused on a concept, help in mastering concepts on topics being covered and are entertaining

3. **Name some of the cultural games that you are familiar with.**
   Nhodo, tsoro, pada, dudu-muduri, dunhu, arawuru, chisveru, mahumbwe and zai rakaora

4. **Does the curriculum in Zimbabwe allow you to use cultural games in class?**
   Yes, it is written in the syllabus not sure where but it is there

5. **What kinds of cultural games are recommended in the maths policy document in Zimbabwe**
   Tsoro, nhodo, pada arawuru

6. **How often do you use cultural games for teaching and learning?**
   Very oten when introducing and concluding lessons, they keep children focused

7. **Name some of the cultural games that you use in your class for teaching and learning.**
   Nhodo I use to teach addition and subtraction in Mathematics

8. **What are your learners' views and attitudes towards using games for teaching and learning?**
They love games and are very interesting because of their nature both educative and entertaining

9. **What kind of training have you received in using cultural games in your class?**
During workshop but not in detail but in passing

10. **Does your school have adequate resources to implement cultural games?**

11. Most culture games don't need resources but just favourable grounds that are not harmful. The school has got favourable and adequate space and natural objects like stones /sticks

12. **What support have you been given to implement cultural games?**
The school managed to clear play ground by cutting grass

13. **In your opinion, are cultural games adequately used in teaching early grade mathematics**
Not adequately used because there is time limitations due to pressure of work and the timetable is congested that it is difficult to implement them. In some cases, technological advancement and the use of Information Communication Technology has killed the use of cultural games.

14. **What support do you require so that you can implement cultural games in your class?**
More classrooms are needed so that there won't be any sharing. This creates adequate space that even in class learners will have enough space to move around

School 1: Teacher 3

1. **Explain briefly what you understand by the term cultural games**
Games that are from the past – that were used in the past

2. **What are your views about using cultural games for teaching and learning?**
   They are very effective, motivate children to learn

3. **Name some of the cultural games that you are familiar with.**
   pada, nhodo, fish, fish, tsoro,mahumbwe, chisveru.

4. **Does the curriculum in Zimbabwe allow you to use cultural games in class?**
   Yes especially in Family and Heritage Studies(FHS).

5. **What kinds of cultural games are recommended in the maths policy document in Zimbabwe?**
   I didn't see them- Are they stated Hapana chandakaona but when we teach children we can play tsoro the children counting

6. **How often do you use cultural games for teaching and learning?**
   Ini hangu handinyanyo mashandise because ndinenge ndisina time.

7. **Name some of the cultural games that you use in your class for teaching and learning.**
   Nhodo, pada, tsoro,

8. **What are your learners' views and attitudes towards using games for teaching and learning?**
   Children like games but teachers ndovasina time unongovaudza nemuromo asi hatizoiti practical vana vanoatamba

9. **What kind of training have you received in using cultural games in your class**
   No training at all I just use my own previous childhood experiences

10. **Does your school have adequate resources to implement cultural games?**
    Aaah pane a… not clear- Zvimwe zvacho zvinongoda kushandisa zvinhu zvatinongowana naturally in the local environment. Kungodrawer pada even nhodo- unongotsvaga Matombo

11. **What support have you been given to implement cultural games?**
    -Aaah – nothing- vana vanotenga vega – you ask them to bring balls and skipping.

12. **What support do you require so that you can implement cultural games in your class?**
    Staff development in how we can plan for cultural games

13. **In your opinion, are cultural games adequately used in teaching early grade mathematics?**
    Aaah, ummm, - they are not

School 1: Teacher 4

1. **Explain briefly what you understand by the term cultural games**
   They are used by learners to learn games that were used long ago to play

2. **What are your views about using cultural games for teaching and learning?**
   They are good and learners enjoy ,and are easily accessible and cheap unlike computers

3. **Name some of the cultural games that you are familiar with.**
   Chisveru, zvamutsana mutsana ,dudu muduri ,dunhu ,chuti

4. **Does the curriculum in Zimbabwe allow you to use cultural games in class?**
   Yes -scheme books and plans **Probing What about syllabus-** Yes there are there

5. **What kinds of cultural games are recommended in the maths policy document in Zimbabwe?**
   In grade 1 they can say you can introduce by dudumuduri

6. **How often do you use cultural games for teaching and learning?**
   Hatina (We never used)

7. **Name some of the cultural games that you use in your class for teaching and learning.**
   Not used but children engage on their own and at their own spare time

8. **What are your learners' views and attitudes towards using games for teaching and learning?**
   They do enjoy even these that are reserved

9. **What kind of training have you received in using cultural games in your class?**
   Received from college

10. **Does your school have adequate resources to implement cultural games?**
    It does not have

11. **What support have you been given to implement cultural games?**
    We do not get support

12. **What support do you require so that you can implement cultural games in your class?**
    Materials and resource persons

13. **In your opinion, are cultural games adequately used in teaching early grade mathematics?**
    They are not because of time and time table is loaded

Appendix Five: School 2 Completed IDI Guide

School 2: Teacher 1

1. **Explain briefly what you understand by the term cultural games**
   Ndiwo aitambwa kudhara - maindigenous games (were played long ago these are indigenous games)

2. **What are your views about using cultural games for teaching and learning?**
   anodabatsira vanoda maslow learners kunzwisisa (They help children to understand especially slow learners) - they cater for individual differences

3. **Name some of the cultural games that you are familiar with.**
   zai rakaora,tsoro, nhodo, maflawa, arawuru, Pada, ,dunhu, bhangi ngiriya ngiriya.

4. **Does the curriculum in Zimbabwe allow you to use cultural games in class?**
   They are written in syllabus

5. **What kinds of cultural games are recommended in the maths policy document in Zimbabwe?**
   I havent seen where they are indicated anywhere they are recommended
   Probe..Your answer is not clear…. Answer: They are recommended

6. **How often do you use cultural games for teaching and learning?**
   Weekly when you introduce a lesson and new concepts

7. **Name some of the cultural games that you use in your class for teaching and learning.**
   Nhodo,

8. **What are your learners' views and attitudes towards using games for teaching and learning?**

   Children become so happy

9. **What kind of training have you received in using cultural games in your class?**

   No – **after a probe** …. in college – yes

10. **Does your school have adequate resources to implement cultural games?**

    No aah but we have the open space.

11. **What support have you been given to implement cultural games?**

    No nothing

12. **What support do you require so that you can implement cultural games in your class**

    We need material.

13. **In your opinion, are cultural games adequately used in teaching early grade mathematics?**

    Not adequately used-dai aishandiswa tisina vana vanotadza (If they were adequately used, children might not fail)

School 2: Teacher 2

1. **Explain briefly what you understand by the term cultural games**

   Indigenous games that are used by an identified group of people

2. **What are your views about using cultural games for teaching and learning?**

   I think they help -they are tangible things than writing on the board

3. **Name some of the cultural games that you are familiar with.**

   pada and nhodo

4. **Does the curriculum in Zimbabwe allow you to use cultural games in class?**

   Yes….

   Probing where? Answer: Nowhere you can see the copy but as teacher you improvise so your pupils understand

5. **What kinds of cultural games are recommended in the maths policy document in Zimbabwe?**

   No there is nowhere it is written but oh yes in Visual and Performing and in Family and Heritage Studies

6. **How often do you use cultural games for teaching and learning?**

   when we start in the first term when we are counting first six weeks, not everyday- maybe once a week.

7. **Name some of the cultural games that you use in your class for teaching and learning.**

   Nhodo, pada, tsoro

8. **What are your learners' views and attitudes towards using games for teaching and learning**

   They really enjoy especially country game

9. **What kind of training have you received in using cultural games in your class?**

   No training but we were once told at the training college that one can use cultural games

10. **Does your school have adequate resources to implement cultural games?**

    Yes we do have

11. **What support have you been given to implement cultural games?**

    Nothing

12. **What support do you require so that you can implement cultural games in your class?**
    I don't need

13. **In your opinion, are cultural games adequately used in teaching early grade mathematics?**
    Very rare most of the time we will be busy with the scheme it is new up to the teacher to use them

School 2: Teacher 3

1. **Explain briefly what you understand by the term cultural games**
   magames anoshandiswa echinyakare like nhodo and pada (Games that were played long ago)

2. **What are your views about using cultural games for teaching and learning?**
   Like infants they need hands on approach vanokasika kubata vachiita (They quickly grasp concepts) and can experience hands on approach

3. **Name some of the cultural games that you are familiar with.**
   zvamutsana muchuru, tarisai Makati, chihwande hwande,nhodo ne pada

4. **Does the curriculum in Zimbabwe allow you to use cultural games in class?**
   in the syllabus even teacher's books Best Approach, Visual and Performing Arts and Family and Heritage Studies

5. **What kinds of cultural games are recommended in the maths policy document in Zimbabwe**
   Traditional and modern games

6. **How often do you use cultural games for teaching and learning?**

We use them, not often but maybe once or twice a week

7. **Name some of the cultural games that you use in your class for teaching and learning.**
   Pada, nhodo

8. **What are your learners' views and attitudes towards using games for teaching and learning?**
   They like the games ,inguva hayo inozoshaika (It is time that is limited) but they do like it.

9. **What kind of training have you received in using cultural games in your class?**
   ummm- but we normally do some staff dupt not exactly on cultural but games - the use of games

10. **Does your school have adequate resources to implement cultural games?**
    The resources are there ,because culturally we normally use the environment

11. **What support have you been given to implement cultural games?**
    The resources are there ,because culturally we normally use the environment

12. **What support do you require so that you can implement cultural games in your class?**
    Nothing but we are encouraged to be resourceful

13. **In your opinion, are cultural games adequately used in teaching early-grade mathematics?**
    Aah -they are used but not always

School 2: Teacher 4

1. **Explain briefly what you understand by the term cultural games**

   Indigenous games -games which were done long ago

2. **What are your views about using cultural games for teaching and learning?**

   Children understand more and havakanganwe (They don't forget) and they learn through playing saka havakanganwe (So they don't forget)

3. **Name some of the cultural games that you are familiar with.**

   Nhodo, zai rakaora, fish fish ,pada, tsoro.

4. **Does the curriculum in Zimbabwe allow you to use cultural games in class?**

   Tongoti ehe but handisati ndazviona (We can say yes but I did not see where it is indicated)

5. **What kinds of cultural games are recommended in the maths policy document in Zimbabwe?**

   Some of the topics yes but mamwe anongoda kuti iwewe teacher uzvifungire kutu pano panoda kushandiswa magames (However some need you the teacher to decide what to do especially those topics that may need you to use games)

6. **How often do you use cultural games for teaching and learning?**

   Ndowanzoshandisa kana kuri kuMaths (Ioften use when teaching Mathematics) and some topics

7. **Name some of the cultural games that you use in your class for teaching and learning.**

   Nhodo and tsoro

8. **What are your learners' views and attitudes towards using games for teaching and learning?**

   Vanozvifarira nekuti vanoda kutamba (They are extremely happy because they like to play)

9. **What kind of training have you received in using cultural games in your class?**

   No staff dupt workshop and training

10. **Does your school have adequate resources to implement cultural games?**

    We improvise

11. **What support have you been given to implement cultural games?**

    These should be included in the syllabus

12. **What support do you require so that you can implement cultural games in your class?**

    Materials

13. **In your opinion, are cultural games adequately used in teaching early grade mathematics?**

    Umm no – maybe for remedial purposes Haanyanyoshandiswa (They are not adequately used)

Appendix Six: School 3 Completed IDI Guide

School 3: Teacher 1

1. **Explain briefly what you understand by the term cultural games**
   indigenous games

2. **What are your views about using cultural games for teaching and learning?**
   Help learners to understand better in topics likeaddition and subtraction- using counters in nhodo.tsoro for subtracting

3. **Name some of the cultural games that you are familiar with.**
   Nhodo, tsoro

4. **Does the curriculum in Zimbabwe allow you to use cultural games in class?**
   not as such but as a teacher you need to be creative

5. **What kinds of cultural games are recommended in the maths policy document in Zimbabwe?**
   In the syllabus there are statements like games

6. **How often do you use cultural games for teaching and learning?**
   When there is need- e.g. once per term-once per week when introducing the topic
   Probe…How often in the class? Once per week.at least once per week

7. **Name some of the cultural games that you use in your class for teaching and learning.**
   Nhodo Tsoro and pada

8. **What are your learners' views and attitudes towards using games for teaching and learning?**

They really enjoy especially in the rural setup

9. **What kind of training have you received in using cultural games in your class?**

   So far no training

10. **Does your school have adequate resources to implement cultural games?**

    Yes they do have but very few hence the teacher need to improvise

11. **What support have you been given to implement cultural games?**

    we need adequate material such as tyres instruments

12. **What support do you require so that you can implement cultural games in your class?**

    We need resources

13. **In your opinion, are cultural games adequately used in teaching early grade mathematics?**

    They are not nowadays people are playing morden games such as computer games and chess

School 3: Teacher 2

1. **Explain briefly what you understand by the term cultural games**

   Ndiwo magames emaculture,echivanhu,apasichigare *(These are games played long ago)*

2. **What are your views about using cultural games for teaching and learning?**

   Zvinenge zvakanaka vana vanobva vakura vachiziva zveculture iyoyo yavanenge vachikura nayo *(It will be a noble idea children grow up knowing about their own culture)*

3. **Name some of the cultural games that you are familiar with.**

   nhodo,pada,hwishu,tsoro

4. **Does the curriculum in Zimbabwe allow you to use cultural games in class?**
   Yea they just indicated any games

5. **What kinds of cultural games are recommended in the maths policy document in Zimbabwe?**
   Any games

6. **How often do you use cultural games for teaching and learning?**
   Hatiwanzo mashqndise asi pano neapo- (We don't use them often but here and there) when you say outdoor free play.

7. **Name some of the cultural games that you use in your class for teaching and learning.**
   Nhodo, pada tsoro, hwishu, dunhu

8. **What are your learners' views and attitudes towards using games for teaching and learning?**
   Vanofara zvakanyanyisa vanobva vaabata *(They will be extremely happy and they grasp them)*

9. **What kind of training have you received in using cultural games in your class?**
   Training kubva kupi *(From where)*-Not yet

10. **Does your school have adequate resources to implement cultural games?**
    Yes but not for all the cultural games sometimes we improvise

11. **What support have you been given to implement cultural game**
    If we tell the school what we need they do give us but if you don't tell them they may not know what you need

12. **What support do you require so that you can implement cultural games in your class?**

    Aaah-chiko senhodo unongonhonga uye vana ukavaudza vanounza (Aah, for example, nhodo, (*you just pick pebbles from the local environment and children can bring some pebbles*).

13. **In your opinion, are cultural games adequately used in teaching early grade mathematics?**

    No – haashandiswe *(They are not used)*-Hapana (Nothing) teacher anoti garai apa mutambe nhodo *(Sit here and play nhodo)* -kutoti chigarai apa mutange kutamba (Will definitely say sit here and start playing)- unless vatamba vega *(Play alone freely)*

School 3: Teacher 3

1. **Explain briefly what you understand by the term cultural games**

   Are games which are played mainly by children most of them - they played them at their homes

2. **What are your views about using cultural games for teaching and learning?**

   Bridge the gap between home and school if you don't connect with what they know already, they hate the school.

3. **Name some of the cultural games that you are familiar with.**

   chutu, dunhu,nhodo pada raka-raka,hwai-hwai

4. **Does the curriculum in Zimbabwe allow you to use cultural games in class?**

   Yes -in introductions and teaching new concepts

5. **What kinds of cultural games are recommended in the maths policy document in Zimbabwe?**

   They say cultural game-they don't mention the exact games but they say the teacher use depending on the community you will be working with

6. **How often do you use cultural games for teaching and learning?**
   We use them almost everyday- to make my lesson interesting depending on the subject

7. **Name some of the cultural games that you use in your class for teaching and learning.**
   - nhodo for counting most of then depending on the topic

8. **What are your learners' views and attitudes towards using games for teaching and learning?**
   They are happy with the,they like them a lot and they do ask -and remind you

9. **What kind of training have you received in using cultural games in your class?**
   We only receive from college

10. **Does your school have adequate resources to implement cultural games?**
    Not adequately-we improvise

11. **What support have you been given to implement cultural games?**
    School admin-conduct workshops-parent make toys

12. **What support do you require so that you can implement cultural games in your class?**
    Materials

13. **In your opinion, are cultural games adequately used in teaching early grade mathematics?**
    They are used by some and not adequately used parents complain that our children are going to play what he knows

School 3: Teacher 4

1. **Explain briefly what you understand by the term cultural games**
   These are gamesthat are specifically to showcase and explore various aspects of culture including traditions, history, folklore and customs
2. **What are your views about using cultural games for teaching and learning?**
   I believe that cultural games promote cultural preservation and encourage learners to explore and value their own cultural heritage

3. **Name some of the cultural games that you are familiar with.**
   Nhodo, pada, tsoro and mahumbwe

4. **Does the curriculum in Zimbabwe allow you to use cultural games in class?**
   To a higher extent it allows the use of cultural games
   Probe: Why do you say so? It is written in the Maths and Science syllabus

5. **What kinds of cultural games are recommended in the Maths policy document in Zimbabwe?**
   The counting games like nhodo, pada, rakaraka

6. **How often do you use cultural games for teaching and learning?**
   Two to three times a week

7. **Name some of the cultural games that you use in your class for teaching and learning.**
   Chisveru, Hwishu and chamuhwande muhwande

8. **What are your learners' views and attitudes towards using games for teaching and learning?**
   Learners really enjoy using cultural games

9. **What kind of training have you received in using cultural games in your class?**

   No training but at college when I trained we were told to include cultural games in the teaching and learning of Mathematics

10. **Does your school have adequate resources to implement cultural games?**

    Yes, it does, we use locally available materials

11. **What support have you been given to implement cultural games?**

    The school deploys specialized cultural teachers

12. **What support do you require so that you can implement cultural games in your class?**

    We would appreciate an increase in the amount of cultural materials to use

13. **In your opinion, are cultural games adequately used in teaching early grade mathematics?**

    Yes they are adequately used

Appendix Seven: School 1 Completed FGI Guide

School 1 : FGI with 4 teachers

1. Explain briefly what you understand by the term cultural games

   Teacher 1 Cultural games refer to activities that I Discussionnvolve using traditional elements, such as native language, customs, and traditional activities, to engage children in play and learning.

   Teacher 2 involve the use of native language allowing children to engage in play and learning within their cultural context.

   Teacher 3. Connects children to their cultural heritage

   Teacher 4. These are home grown indigenous games of an identified group of people

2. What are your views about using cultural games for teaching and learning?

   Teacher 1: They connect children to their cultural experience, hence they are beneficial

   Teacher 2. They make children use their native language and enjoy the learning process through familiar, relevant and meaningful activities

   Teacher 3. makes learning process funny

   Teacher 4. Facilitates learning through play as they create an enjoyable learning environment

3. Name some of the cultural games that you are familiar with.

   All teachers were naming: Nhodo, pada, arawuru, chute, tsoro, chihwande hwande,dunhu, mahumbwe, tarisai mukati, zvamutsana mutsana, hwai hwai huyai

4. Does the curriculum in Zimbabwe allow you to use cultural games in class?

   Teacher 1. Yes in the syllabus

   Teacher 2. Did not see where it is written specifically

   Teacher 3. Umm not sure but they are encouraged

   Teacher 4. Have seen them in Visual and performing Arts and Family and Heritage Studies

5. What kinds of cultural games are recommended in the maths policy document in Zimbabwe?

   Teacher 1. Although I am not familiar with the specific maths policy document, cultural games that involve counting, adding, subtracting, division, and multiplication are likely recommended to support the acquisition of mathematical skills.

   Teacher 2. They are recommended to support mathematical learning but haven't read where they are written specifically

   Teacher 3. Haven't seen where they are written but, in the syllabus, there is a statement on cultural games

   Teacher 4. Yes, the curriculum in Zimbabwe encourages the incorporation of cultural games in the classroom.

6. How often do you use cultural games for teaching and learning?

   Teacher 1. I incorporate cultural games into teaching and learning at the beginning and end of lessons to assess students' understanding

   Teacher 2. Regularly, both at the beginning and end of lessons,

   Teacher 3. They serve as an effective tool for introducing and concluding lessons, allowing me to assess students' comprehension.

   Teacher 4. Not more often I don't have time to use them

7. Name some of the cultural games that you use in your class for teaching and learning.

   All teachers were shouting traditional games, nhodo, tsoro, zai rakaora, dudu-muduri, pada

   7A. Probing: how do you view the usage of these games in the class?

   Teacher 1. Time consuming and the timetable is loaded

   Teacher 2. some learners don't know the games so they will be just spectatorsso sometimes we just make them play on their own spare time

   Teacher 3. Tsoro is difficult for ECD B learners though it teaches sharing and sets

   Teacher 4. I only use musical games songs and rhymes

8. What are your learners' views and attitudes towards using games for teaching and learning?

   Teacher 1. My learners have a positive attitude towards using games for teaching and learning. They actively participate, share ideas, and enjoy the interactive nature of the activities.

   Teacher 2. They enjoy adding variations to the games and often share ideas with their peers.

   Teacher 3. *They actively participate*, and are extremely excited

   Teacher 4. They really enjoy the games, and often bring their own ideas to make them more engaging.

9. What kind of training have you received in using cultural games in your class?

   Teacher 1. Although I have not received specific training in using cultural games, I integrate my own childhood experiences and knowledge to introduce new songs, games, and rhymes to the students.

   Teacher 2. I utilize my own knowledge and experiences to introduce new songs, games, and rhymes to the learners.

   Teacher 3. I did not receive any training

   Teacher 4. From college, we were told to incorporate games in the teaching and learning process

10. Does your school have adequate resources to implement cultural games?

    Teacher 1. Our school possesses adequate resources for implementing cultural games, as most materials are readily available within the local environment or can be brought from home.

    Teacher 2. Same as first speaker

    Teacher 3. We need documented cultural games so that they are available in text and audio visual

    Teacher 4. Same as the other speakers

11. What support have you been given to implement cultural games?

    Teacher 1. No support there should be materials procured for cultural games such as ropes for fish fish.

Teacher 2. While no specific support has been provided for implementing cultural games, our school environment accommodates and encourages the incorporation of such activities.

Teacher 3. no explicit support has been provided for implementing cultural games,

Teacher 4. No support

12. What support do you require so that you can implement cultural games in your class?

Teacher 1. To enhance the implementation of cultural games, it would be beneficial to have access to a wider variety of games. Having resources and materials that document cultural games from various tribes would enrich our teaching practices.

Teacher 2. I would appreciate support in terms of having access to a wider range of cultural games. Modern games are readily available in books, online platforms like YouTube, and other resources, but having similar coverage for cultural games would greatly enhance our teaching and learning experiences.

Teacher 3. We need workshops, resource persons because some of us here we are not from the same culture children we teach come from

Teacher 4. They should give maths subject more time to accommodate games

13. In your opinion, are cultural games adequately used in teaching early-grade mathematics?

Teacher 1. In my opinion, cultural games are not adequately used in teaching early-grade mathematics. There is a need for increased emphasis on their incorporation in the curriculum and comprehensive training to ensure their effective utilization for meaningful learning experiences.

Teacher 2. Same as the previous speaker

Teacher 3. They are not adequately used children most of the time they freely engage them on their own

Teacher 4. They are not in the classrooms the time table is congested

Appendix Eight: School 2 Completed FGI Guide

School 2 : FGI with 4 teachers

1. **Explain briefly what you understand by the term cultural games**

   Teacher 1. cultural games refer to traditional games that are unique to a particular culture or community.

   Teacher 2. I understand them as games that are deeply rooted in the traditions, customs, and cultural practices of a specific group or community.

   Teacher 3. These indigenous games are intertwined with the cultural heritage and traditions of a specific group or community. **Probing What do you mean?** These games often have historical significance and are passed down from generation to generation, serving as a way to preserve and transmit cultural knowledge.

   Teacher 4. These are games that are deeply rooted in the culture and traditions of a society.

   Probing: Can you explain further? These games carry the values, customs, and historical significance of the culture they belong to.

2. **What are your views about using cultural games for teaching and learning?**

   Teacher 1: Cultural games provide a hands-on and interactive approach to education,

   Teacher 2. They make the learning experience more engaging and memorable.

   Teacher 3 They offer a tangible experience that goes beyond simply writing on the board or reading from a textbook.

   Teacher 4. There is experiential learning approach that goes beyond traditional classroom methods.

3. **Name some of the cultural games that you are familiar with.**

   All teachers were naming the games as follows: De de zangara uyu mutii? Dunhu, pada, tsoro, chute, rakaraka, hwai hwai, jongwe jongwe iwe mambo, tarisai mukati,

4. **Does the curriculum in Zimbabwe allow you to use cultural games in class?**

   Teacher 1. In Zimbabwe, the curriculum does not explicitly allow the use of cultural games in the classroom.

   Teacher 2. Umm not sure but in Visual and performing Arts as well as in Family and Heritage Studies

   Teacher 3. Yea in the syllabus

   Teacher 4. Not sure

5. **What kinds of cultural games are recommended in the maths policy document in Zimbabwe?**

   Teacher 1. Not recommended

   Teacher 2. Not sure in Maths but in VPA

   Teacher 3. It is just indicated traditional and modern games

   Teacher 4. Not sure but they are good for the learners

6. **How often do you use cultural games for teaching and learning?**

   Teacher 1. I integrate cultural games into my teaching practices not quite regularly, here and there sometimes I give reference to what I see them playing.

   Teacher 2. While I may not use them every day, I incorporate cultural games at strategic points throughout the academic year

   Teacher 3. I use cultural games for teaching and learning during the first term, particularly in the initial six weeks when we focus on counting and basic maths concepts. I don't use them every day but rather once a week to provide variety and a hands-on experience for the learners.

   Teacher 4. Umm I rarely use them during teaching and learning. **Probing.why?** I do not have time the timetable is always congested

7. **Name some of the cultural games that you use in your class for teaching and learning.**

   Teacher 1. Nhodo, pada tsoro but its not consistent that I use them,

   Teacher 2. I don’t have time to make children play these games because some games like tsoro are difficult to be understood and to be played by ECD B

   Teacher 3. Usually children play on their own to be honest

Teacher 4. Pada when I am teaching shapes

8. **What are your learners' views and attitudes towards using games for teaching and learning?**

   Teacher 1. From what I have observed, my learners have a positive attitude towards playing games

   Teacher 2. my learners have shown great enthusiasm

   Teacher 3. They find cultural games particularly enjoyable

   Teacher 4. They find cultural games engaging and enjoyable, as they provide a break from traditional classroom routines and allow for active participation.

9. **What kind of training have you received in using cultural games in your class?**

   Teacher 1. I have not received specific training in using cultural games in my class. However, during my time at the training college, we were introduced to the concept of incorporating cultural elements into our teaching practices, including the use of cultural games.

   Teacher 2. No training at all but during college yea we were told to incorporate cultural games

   Teacher 3. Same as the previous speaker no training

   Teacher 4. A workshop when I am now a qualified teacher but they were mentioned in passing

10. **Does your school have adequate resources to implement cultural games?**

    Teacher 1. We have adequate resources because they can be found in the local environment and can be made at home or at school such as improvised balls

    Teacher 2. Same as the previous speaker

    Teacher 3. Same as the previous speakers

    Teacher 4. Same as the previous speakers but we would appreciate if some materials can be bought

11. **What support have you been given to implement cultural games?**

Teacher 1. No support but if you ask for it am sure they will give us support

Teacher 2. Grounds were cleared the grass is short so learners can play freely and safely

Teacher 3. Regarding support, I have not been given any specific support to implement cultural games. However, I have taken the initiative to explore and incorporate cultural games into my lessons based on my own research and understanding

Teacher 4. No support because children sometimes play on their own

12. **What support do you require so that you can implement cultural games in your class?**

Teacher 1. Clarity on how to plan for the cultural games

Teacher 2. More resources to implement these cultural games

Teacher 3. Staff development on the use of cultural games

Teacher 4. A large block of time because they take much time to organize learners

13. **In your opinion, are cultural games adequately used in teaching early grade mathematics?**

Teacher 1. In my opinion, cultural games are not adequately used in teaching early-grade mathematics. There is a need for more explicit integration of cultural games into the curriculum, as they have the potential to enhance students' learning experiences, foster cultural appreciation, and promote a well-rounded education.

Teacher 2. As for me there is a need for greater recognition and integration of cultural games into the curriculum to promote cultural appreciation, enhance learning outcomes, and create a more inclusive and culturally responsive educational environment, in other words they are not being planned for in our classes.

Teacher 3. They are not used adequately. However, they are good to foster cultural appreciation, and promote a well-rounded education

Teacher 4. Not adequately used in mathematics teaching and learning even in other subjects, children play these games on their own and at their free spare time

Appendix Nine: School 3 Completed FGI Guide

School 3 : FGI with 4 teachers

1. **Explain briefly what you understand by the term cultural games**

   Teacher 1. These games are typically played by children in their homes and during free time and serve as a way to connect them with their cultural heritage

   Teacher 2. They are traditional games of children of an identified group of people

   Teacher 3. Connects children to their cultural heritage

   Teacher 4. These are indigenous games played by young children. These games are deeply ingrained in our community and are often played during social gatherings, festivals, or leisure time. Each game has its own set of rules and objectives, but they all reflect our cultural values and traditions.

2. **What are your views about using cultural games for teaching and learning?**

   Teacher 1: using cultural games for teaching and learning is essential. These games bridge the gap between home and school, allowing students to connect with what they already know and engage with the learning process.

   Teacher 2. By incorporating cultural games, we can make the educational experience more meaningful and enjoyable for students.

   Teacher 3. When we incorporate these games into the classroom, we create a bridge between students' home cultures and the school environment.

   Teacher 4. I believe that incorporating cultural games into teaching and learning is highly beneficial. **Probing Why do you say so**? By using games that are familiar to students, we can create a more engaging and inclusive learning environment.

3. **Name some of the cultural games that you are familiar with.**

   All teachers concurred that they know nhodo, tsoro, pada, hwai hwai huyai, mahumbwe, zai rakaora , zvamutsana mutsana tsuro nembwa, fish fish, dunhu and rakaraka

4. **Does the curriculum in Zimbabwe allow you to use cultural games in class?**

   Teacher 1. Yea but I haven't come across where cultural games are clearly stipulated in the Zimbabwean curriculum

   Teacher 2. In the syllabus it is stated playing traditional games in addition

   Teacher 3 I personally I haven't seen where they are stated

   Teacher 4. Yes, the curriculum in Zimbabwe does allow us to incorporate cultural games into the classroom. It recognizes the importance of preserving cultural heritage and encourages teachers to integrate cultural games into their teaching practices.

5. **What kinds of cultural games are recommended in the maths policy document in Zimbabwe?**

   Teacher 1. The maths policy document in Zimbabwe does not specify the exact cultural games to be used. Instead, it encourages teachers to select and adapt cultural games based on the specific community they are working with.

   Teacher 2. Nhodo, pada, dunhu raka,raka

   Probing: Where are these games written? Umm not really sure but they are encouraged

   Teacher 3. All of them as long as they are relevant:

   Probing Where is this indicated? In the syllabus

6. **How often do you use cultural games for teaching and learning?**

   Teacher 1. Umm here and there not more often

   Teacher 2. I use cultural games not quite regularly in my teaching practices but I encourage children to play them

   Teacher 3. Not quite I don't even plan for them

   Teacher 4. I integrate cultural games into my teaching almost every day. Cultural games provide an opportunity to make my lessons more interactive, fun, and memorable. Depending on the subject and topic, I incorporate relevant cultural games to enhance learner engagement and understanding.

7. **Name some of the cultural games that you use in your class for teaching and learning.**

   All teachers named bhangi-ngiriya ngiriya, country game, dunhu, pada, arawuru, tsoro, nhodo, fish fish

8. **What are your learners' views and attitudes towards using games for teaching and learning?**

   Teacher 1. express enthusiasm for these interactive experiences.

   Teacher 2. They will be so happy

   Teacher 3. Quite excited

   Teacher 4. They enjoy playing these cultural games but some children are still too young to play and master most of these games

9. **What kind of training have you received in using cultural games in your class?**

   Teacher 1. I attended one professional Development workshop where cultural games were being encouraged

   Teacher 2. Umm no I did not receive training on cultural games and how they can be used in teaching ECD B Mathematics

   Teacher 3. During college training yes, but we were not shown how to scheme and plan for them

   Teacher 4. During my college education, I received training on the effective integration of cultural games into the classroom.

   Probing: Do you want to give clarity on your response? This training provided me with a solid foundation in understanding the educational value of cultural games and equipped me with strategies to incorporate them into my teaching practices.

10. **Does your school have adequate resources to implement cultural games?**

    Teacher 1. Unfortunately, our school does not have sufficient resources to fully implement cultural games. However, as teachers, we have learned to be resourceful and creative.

    Teacher 2. We improvise most things

Teacher 3. We have plenty because most materials are found in the local play grounds:

Probing: Which materials? Pebbles, fibre for fish fish, some games needs children themselves like hwai hwai huyai and zvamutsana mutsana tsuro, zai rakaora, they take a stone to represent an egg. Balls can be made by plastics or rugged cloths

Teacher 4. We improvise

11. **What support have you been given to implement cultural games?**

Teacher 1. To support the implementation of cultural games, our school administration conducts hasn't conducted workshops for teachers. These workshops if we can attend one they provide us with guidance, ideas, and best practices for incorporating cultural games into our teaching.

Teacher 2. Additionally, parents are involved and contribute by making toys and materials that can be used for cultural game activities.

12. **What support do you require so that you can implement cultural games in your class?**

Teacher 1. Data bases for the cultural games because technology is taking them over

Teacher 2. Parents and the local community should do more by providing materials and sharing their knowledge of cultural games that are fading away.

Teacher 3. School based workshops and staff development

Teacher 4. Training and more resource persons from the local community

14. **In your opinion, are cultural games adequately used in teaching early grade mathematics?**

Teacher 1. In my opinion, cultural games are not adequately used in teaching ECD B mathematics. While some teachers recognize the value of incorporating cultural games, there is still room for improvement.

Teacher 2. Not really, we do not know how to plan for them. It is essential to raise awareness among educators, parents, and policymakers about the benefits of cultural games in promoting mathematical understanding and cultural appreciation.

Teacher 3. Not adequately used but with increased support and recognition, cultural games can be more effectively integrated into early-grade mathematics education**.**

Teacher 4. When implemented effectively, cultural games can significantly enhance the learning of ECD B mathematics and should be utilized more extensively.