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Teachers' use of indigenous play in teaching numeracy in the Sekyere East District, Ghana

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DECLARATION

Student's Declaration

I, **GLADYS ATTAA ARHIN,** declare that this thesis is a result of my original research except for references to other people's work which have been duly acknowledged and it has neither in whole nor in part been presented for another degree in this university or elsewhere.

Candidate's Signature: …….

Date: ……..

Supervisor's Declaration

I hereby declare that the preparation and supervision of this research work were done in accordance with the guidelines for the supervision of research work as laid down by the School of Graduate Studies, University of Education, Winneba.

Name of Supervisor: Dr. Salome Praise Otami

Supervisor's Signature: …….

Date: ……

DEDICATION

To my lovely Family

ACKNOWLEDGEMENTS

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ABSTRACT

The purpose of the study was to explore teachers use of indigenous play in teaching and learning of numeracy in early childhood centres in the Sekyere East District. The case study design was adopted for the study. The study used the purposive sampling technique to select thirteen (13) kindergarten teachers in the Sekyere East District. The instrument used for the collection of data was semi-structured interview guide. The data from the interview were analysed thematically. The study revealed that the use of traditional songs and rhymes, cultural arts and craft as well as traditional games activities were some of the ways through which indigenous play can be use in the teaching and learning of numeracy. Also, availability of indigenous teaching and learning resources, parental involvement, ability to enhance easy understanding as well as teacher training were some factors that influence teachers use of indigenous play. Again, lack of in-service training and professional development, classroom management as well as time constraints as some of the challenges affecting the use of indigenous play in teaching numeracy. Continuous professional development, availability of indigenous teaching and learning materials, active parental involvement were some of the strategies that can be used to improve the use of indigenous play based pedagogy in teaching numeracy in kindergarten centres in the Sekyere East District. The study therefore recommends that teacher pre-service training emphasize the importance that comes with the use of the indigenous play-based pedagogy, provision of adequate teaching and learning materials for teachers and young children, encourage open communication between educators and parents to promote a shared understanding of the value of play-based pedagogy in nurturing well-rounded learners within the Sekyere East District.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Numeracy is a crucial component of early childhood education and plays a vital role in laying the foundation for lifelong learning and academic achievement. It goes beyond the basic ability to count numbers, encompassing the capacity to understand and apply numerical concepts to everyday situations. According to Education Scotland (2019), numeracy is a fundamental aspect of mathematics and a life skill that allows individuals to navigate the demands of daily life, whether at home, in school, at work, or within the broader community. Doig, McRae, and Rowe (2003) similarly emphasize that numeracy involves the effective application of mathematical understanding to address real-life challenges. In early childhood education, numeracy includes developing abilities such as counting, recognizing numbers, understanding number sequences, identifying patterns, and solving simple problems using basic arithmetic operations.

Numeracy in early childhood is closely associated with cognitive development and language acquisition, as it requires children to reason, communicate, and make sense of the quantitative relationships in their environment. Purdie et al. (2011) assert that numeracy is a combination of mathematical knowledge, problem-solving skills, and communication abilities that enable individuals to function effectively in their communities. Similarly, Hamukonda (2021) and Aunio & Räsänen (2016) highlight that early numeracy includes the capacity to comprehend number word sequences, recognize number symbols, develop numerical relational skills, and perform basic counting operations skills that are central to mathematical-logical thinking in young learners.

Extensive research has demonstrated that early numeracy skills serve as strong predictors of later mathematics achievement and overall school performance. Nogus and Domeless (2021) found that competencies such as understanding the mental number line, recognizing numerical magnitudes, naming number symbols, and solving basic arithmetical word problems are essential in determining a child's future success in mathematics. These findings reinforce the argument made by Watts et al. (2014) that early mastery of numeracy concepts is crucial because it significantly influences a child's academic trajectory. Ginsburg, Lee, and Boyd (2008) further emphasize that education systems must prioritize the development of numeracy in young children to build a strong foundation for future learning and success in both academic and non-academic domains.

In response to these findings, many educational systems around the world have explored the integration of culturally relevant teaching strategies to enhance early numeracy learning. One such approach is the use of indigenous play activities in numeracy instruction. Indigenous play refers to traditional games, rhymes, songs, and recreational activities that are rooted in local culture and passed down through generations. These games not only serve recreational purposes but also promote essential cognitive, motor, and social skills in children. In the African context, indigenous play has historically been used as a medium for informal learning, providing children with opportunities to develop problem-solving, numeracy, and literacy skills through socially meaningful interactions.

Yekple et al. (2021) advocate for the incorporation of indigenous play in the teaching of numeracy at the early childhood level, arguing that it stimulates children's interest and makes learning enjoyable and relatable. They explain that when learners engage with familiar games in the classroom, abstract numerical concepts are transformed into

tangible, culturally relevant experiences. Nabie and Akayuure (2014) also recognize the importance of incorporating culturally responsive pedagogies such as indigenous play in the teaching of mathematics and other subjects. They assert that culturally grounded teaching practices have the potential to contextualize mathematics instruction within the social domains of the learner, thereby enhancing understanding and retention.

In Ghana, the significance of integrating indigenous knowledge systems into formal education has been emphasized in several curriculum reforms. Akayuure and Ali (2016) noted that the curriculum reviews between 1987 and 2004 encouraged the integration of indigenous knowledge and cultural practices into school curricula. This initiative aimed to transform and contextualize the teaching of mathematics by linking it with learners' everyday experiences and cultural practices. Nabie (2015) argues that this contextualization of mathematics instruction not only demystifies the subject for learners but also reinforces their cultural identity, promoting a sense of ownership and relevance in the learning process.

More recently, the 2020 Education Reform Policy in Ghana has reiterated the need to incorporate indigenous knowledge, artefacts, and cultural practices in the teaching and learning of Mathematics (Ministry of Education, 2020). This policy directive emphasizes that embedding indigenous play into classroom practice can help make mathematical concepts more meaningful and engaging for young learners. Tachie and Galawe (2021) point out that these initiatives also address broader socio-economic issues by fostering African identity, promoting cultural diversity, and improving access to quality education.

The Sekyere East District, with its rich cultural heritage and traditional play forms, presents a unique opportunity to utilize indigenous games as tools for numeracy instruction. Preliminary classroom observations and informal interactions with teachers in the district indicate that while some indigenous games are occasionally used, they are largely treated as informal recreational activities rather than structured pedagogical resources for teaching numeracy.

This situation is further complicated by the limited awareness and pedagogical skills of many early childhood teachers in Sekyere East District regarding the numeracy content embedded in these indigenous games. Nabie (2011) observed that many teachers either lack knowledge about the mathematical concepts contained in traditional play activities or are not adequately trained to integrate them into their lesson plans effectively. Consequently, opportunities to enhance early numeracy learning through culturally responsive methods are often missed.

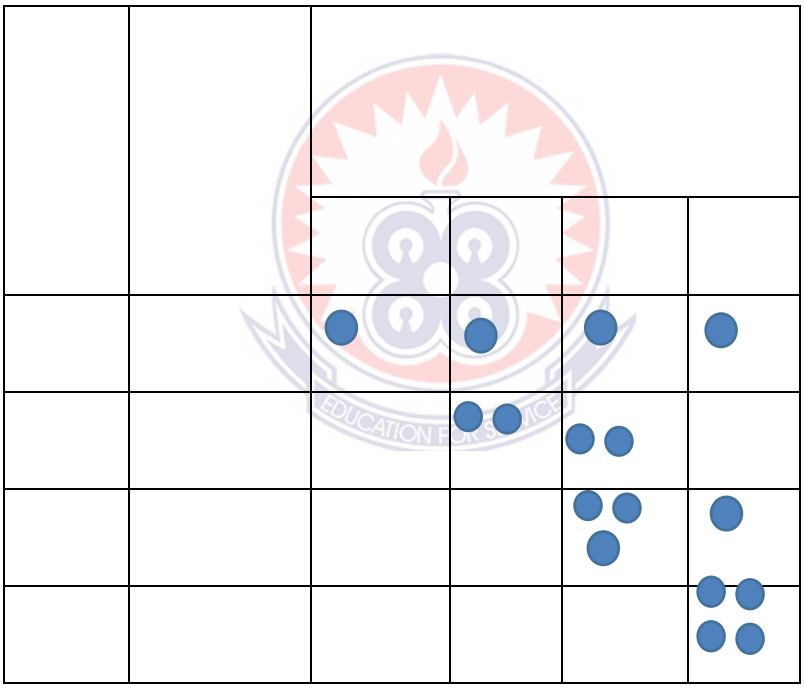
Moreover, there is a dearth of empirical research on the specific types of indigenous games used in numeracy instruction in Sekyere East District, the challenges teachers face in implementing them, and the strategies required to improve their application in early childhood classrooms. While studies such as those conducted by Yekple et al. (2021), Akayuure (2016), and Tangkur et al. (2022) have examined the potential of indigenous play in mathematics education in other parts of Ghana, little is known about how these practices are utilized within the Sekyere East context. The lack of documented evidence on the subject makes it difficult for policymakers, curriculum developers, and educators to design interventions tailored to the needs of teachers and learners in the district.

Moreover, indigenous play is a traditionally conceive art or representation of a culture (Daru et al., 2019). Again, Agbagbla (2018) explains indigenous play as a play that comes from the child's immediate socio-cultural context. Indigenous play/games are semi-structured forms of play (repeated as games) developed by indigenous and local inhabitants of a geographical area who have absorbed traditional cultural content as well as contemporary aspects of daily living and contexts. Many developing countries have indigenous play activities or resources that could be explored to teach numeracy (Ali, 2021). Some of these indigenous play activities include '*Ampe', 'Asorba and Nkro', 'Pilolo', 'Sansakroma', 'Merepe kwan ako', 'Pinpina and Panpana'* among others.

Learners in the early grades grasp numeracy concepts more easily and meaningfully when teaching is connected to their lived experiences and cultural practices, such as indigenous play and games (Yekple et al., 2021). This view is supported by Moloi et al. (2021), who highlight examples from South Africa, including *morabaraba* (a traditional board game), *kgati* (skipping rope), and *diketo* (a coordination game), as indigenous games that effectively support young learners in developing numeracy skills. According to Manzunzu (2022), the use of indigenous games in teaching numeracy enables learners to link classroom concepts with everyday activities and familiar contexts.

In Ghana, Yekple et al. (2021) similarly identify indigenous games such as *Aɖifɔfɔ* (pebble picking), *Papa kple Dada* (Father and Mother), and *Tolovi* (push and measure), which help enhance young learners' understanding of numeracy concepts such as size, shape, and patterns, verbal counting (both forward and backward), numeral recognition, quantity comparison (more or less), and one-to-one correspondence (matching sets or identifying which group has a certain number of items).

In the context of the Sekyere East District, early childhood classrooms are culturally rich environments where indigenous games and play activities are still practiced informally among children outside the classroom. However, there appears to be limited systematic integration of these culturally relevant games into formal numeracy instruction. Many teachers in the district rely heavily on conventional teaching methods, often overlooking the potential of indigenous play as a valuable pedagogical tool for numeracy learning. This disconnect between culturally familiar practices and classroom instruction may be contributing to challenges in early numeracy development in the area.



According to the authors, from the play, the learners perform various activities numerically which become part of their arithmetic building competency. The learners recite numbers in order of magnitude; sometimes match numerals and quantity correctly; count objects and beginning to count beyond 10; count an irregular arrangement of at least ten objects; categorise objects according to properties such as shape and size; and order two items by weight (Yekple et al.

2021). Owusu-Mensah and Baffour (2015) add that '*oware'* and *'dame'* are indigenous play/games that involve numbers and strategy, stimulating children's mathematical imagination and thinking (can early grade learners play these games?). Daru et al. (2019) confirm that developmental psychologists and mathematics educators have observed that indigenous play/games and other thinking activities engage children intellectually. These indigenous games do not necessitate a high level of numeracy.

Although the arithmetic foundations of indigenous games are not always immediately apparent to learners, it is the responsibility of teachers to intentionally highlight the mathematical concepts embedded within these games as learners play. Research by Bhuda (2021) and Owusu-Mensah and Baffour (2015) indicates that when indigenous games are purposefully incorporated into classroom instruction, they can support the development of essential numeracy concepts among early grade learners. These games capture learners' interest and promote multi-sensory learning, engaging children through physical, visual, and auditory experiences that enrich understanding and retention (Yekple et al., 2021).

Moloi (2015) further explains that indigenous play provides meaningful, practical contexts in which numeracy skills can be applied and reinforced. This is particularly valuable in early childhood education settings, where learning through play fosters deeper comprehension. Additionally, since children naturally enjoy play-based activities, integrating culturally familiar games into numeracy lessons has the potential to stimulate intrinsic motivation for mathematics learning.

In the Sekyere East District, indigenous play remains an active part of children's social lives outside the classroom, yet its integration into formal numeracy

instruction appears limited. Teachers in the district often depend on textbook-driven, abstract teaching methods, which may not fully engage learners or reflect the cultural realities of the communities they serve. Incorporating indigenous games such as *ampe* (a clapping and jumping game), *oware* (a traditional counting board game), and *pilolo* (a hide-and-seek counting game) into numeracy lessons could not only make learning more enjoyable and culturally relevant but also offer opportunities for scaffolded instruction, formative assessment, and responsive feedback, as suggested by Yekple et al. (2021).

Indigenous play/games have the potential to deconstruct mathematics as an abstract and difficult field of study (Nabie, 2011). This also addresses the concern about making numeracy classroom activities solely abstract, remote, and largely disconnected from the children's experiences. For effective numeracy teaching and learning, efforts should be made to reintroduce and reintegrate culturally informed mathematics. Thus, incorporating African mathematics into educational curricula and supplementing it with modern technological knowledge stems from indigenous knowledge systems (indigenous play/games) (Turugari, 2022). In online teaching and learning, this technological knowledge has been transformed into digital knowledge. This makes teaching and learning more enjoyable and fun (Akayuure, 2021).

According to Tachie and Galawe (2021), the high failure rate among many learners may be due to a large percentage of teachers in schools failing to incorporate indigenous play/games into their teaching. Indigenous play/games have an impact on a variety of socioeconomic issues in the lives of many Africans, including African identity, cultural diversity, education, and training, access to resources, international relations, and economic growth. Learners, particularly those from disadvantaged backgrounds, are

unable to apply current teaching methods in our schools because they do not relate to their daily activities.

To meet the demand for education reform, the Ghana Education Service has since promoted indigenous play/games through competitions in Sekyere East District schools. However, these reform intentions continue to be a challenge for teachers who are in charge of incorporating indigenous play/games into numeracy classrooms. Research finding reveals that although many teachers may be aware of advantages of using indigenous play/games, "few experienced them at the point where their pedagogical skills are developed" for classroom practices (Nabie, 2015).

Observations point to a lack of teacher knowledge and a lack of numeracy books, teaching guides, and resources depicting Ghanaian cultural games. Furthermore, the use of indigenous games in classrooms and teaching experiments aimed at mathematical analysis remain limited (Akayuure & Ali, 2016). Indigenous play/games that learners engage in are an aspect of their culture. According to Waller and Davis, (2014) incorporating indigenous play/games into the teaching and learning of numeracy is important because young children learn through play. Recognizing the importance of indigenous play/games in teaching learners' numeracy, it is critical to assess how teachers use them in Sekyere East District early childhood education centres.

According to a study by Akayuure, and Ali (2016) when learners' cultural treasures from home are relegated to the margins of the classrooms, numeracy learning becomes less productive for those learners. Indigenous play/games are among the cultural treasures of learners. This implies that, in order to improve numeracy learning, teachers must incorporate indigenous play/games into their teaching practices (Akayuure & Ali, 2016). Furthermore, Bender, (2017) asserts that the use of indigenous play/games to

teach numeracy is original and unique, and that if used within a specific culture and society, it would produce excellent results.

Dewah and Van-Wyk (2014) observed that, many Zimbabwean educators are unaware of the connections between numeracy and the surrounding world. Many teachers do not have time to research and implement strategies to help students of all ethnicities in their classrooms. According to Tachie and Galawe (2021), in South Africa, teachers rarely incorporate indigenous play/games into their numeracy teaching and learning.

1.2 Statement of the Problem

A solid foundation in numeracy is essential for children's cognitive development and future academic success. Research consistently highlights that young learners grasp numeracy concepts more easily when these are connected to their everyday experiences, cultural practices, and familiar activities (Owusu-Mensah & Baffour, 2015). Indigenous games and play, which have long been part of African and Ghanaian childhood culture, provide a natural, enjoyable, and contextually relevant medium through which mathematical concepts can be introduced to children in ways that are both meaningful and memorable. The use of indigenous play in teaching numeracy makes learning culturally sensitive, reduces numeracy-related anxiety, and promotes multisensory, active learning that keeps learners engaged (Moloi, 2015).

Ideally, early childhood teachers should be equipped to utilize indigenous games and play activities deliberately within the classroom to facilitate numeracy learning. Games such as *ampe*, *oware*, *pilolo*, and *abɛ dɔ* inherently involve counting, measurement, estimation, pattern recognition, and logical reasoning. When integrated into numeracy instruction, these activities can help demystify mathematical concepts, making them more accessible and enjoyable for learners. Moreover, indigenous games naturally

foster collaboration, turn-taking, and problem-solving skills essential competencies in early childhood development.

However, existing evidence suggests that many teachers, both nationally and locally, struggle to recognize and harness the pedagogical potential of indigenous games for teaching numeracy. In Sekyere East District specifically, anecdotal observations and informal interactions with early childhood educators reveal that while teachers occasionally engage learners in indigenous games, these are typically used to manage classroom boredom, serve as recreational breaks, or simply as attention-grabbing activities. The games are rarely purposefully integrated into numeracy lessons to teach or reinforce specific mathematical concepts. This missed opportunity deprives learners of the chance to experience mathematics in familiar, fun, and relatable ways, which could significantly enhance their understanding and interest in the subject.

One of the major challenges contributing to this situation is teachers' limited knowledge and awareness of the numeracy content embedded within indigenous games. Many early grade teachers in the Sekyere East District reportedly lack the pedagogical skills required to identify mathematical concepts within these games and translate them into effective teaching strategies. As observed by Nabie (2011), it remains unclear how many teachers are even aware of the educational value of indigenous play in numeracy learning, let alone how to systematically integrate these activities into their lesson plans.

Additionally, cultural knowledge transfer from learners' homes and communities into formal classroom instruction is often undervalued. Owusu-Mensah and Baffour (2015) noted that the incorporation of indigenous ways of knowing in schools is sometimes overlooked, and traditional knowledge systems are not always considered relevant to modern academic curricula. This disconnect between children's cultural experiences

and the numeracy content delivered in classrooms contributes to difficulties in making abstract mathematical ideas meaningful for young learners.

Although several studies (Owusu-Mensah & Baffour, 2015; Ali, 2016; Akayuure, Yekple et al., 2021; Tangkur et al., 2022) have explored the role of indigenous play in mathematics education in other parts of Ghana, there appears to be inadequate empirical data specifically focusing on the Sekyere East District. The types of indigenous games used, the reasons for their use, the challenges teachers face, and the strategies needed to improve their application in numeracy lessons within early childhood education centres in the district have not been adequately documented.

Given the importance of early numeracy development and the potential benefits of indigenous play in facilitating this, it is necessary to investigate the current practices within Sekyere East District. This study, therefore, sought to fill this gap by examining the types of indigenous play used in teaching numeracy, exploring teachers' reasons for using them, identifying barriers they encounter, and proposing strategies to enhance the effective use of indigenous play in early childhood numeracy classrooms.

1.3 Purpose of the Study

The purpose of the study was to examine how teachers' use of indigenous play in teaching numeracy at early childhood education centres in Sekyere East District.

1.4 Research Objectives

The following objectives guided the study.

1. Investigate the types of indigenous play activities used to teach numeracy at the early childhood education centres in Sekyere East District.

2. Examine factors that influence teachers' use indigenous play in teaching and learning numeracy at the early childhood education centres in the Sekyere East District.
3. Identify the barriers that teachers face in using indigenous play to guide pupils to learn numeracy at early childhood education centres in the Sekyere East District.
4. Identify strategies to improve teachers' use of indigenous play in teaching and learning numeracy at the early childhood education centres in the District.

1.5 Research Question

The following questions were set as a guide to the study.

1. What types of indigenous play activities do teachers use in teaching numeracy at the early childhood education centres in Sekyere East District?
2. What factors influence teachers in using indigenous play in teaching and learning numeracy at the early childhood education centres in the District?
3. What barriers do teachers face when using indigenous play in teaching and learning numeracy at early childhood education centres in the District?
4. What strategies can help improve teachers' use of indigenous play in teaching and learning numeracy at early childhood education centres in the District?

1.6 Significance of the Study

The study's findings will help in identifying the right kinds of indigenous games that are suitable for the teaching of numeracy in the Sekyere East District. It will further enlighten pre-school teachers in the district on the various forms of indigenous games and how they will be able to use them at the right time in order to enhance the learners understanding of numeracy by enlightening the teachers in the study area on how to use indigenous play/games to improve students' understanding of numeracy.

Furthermore, the study's findings will inform teachers about the benefits of using indigenous play/games to teach numeracy and the need to include it as a method of teaching and not only fall on it at certain times during instruction by modifying their teaching methods to incorporate indigenous play/games in teaching numeracy. The study will as well inform policymakers in developing an indigenous play-based academic curriculum that will assist learners in the study area in learning numeracy. Furthermore, the study's findings will provide researchers and other stakeholders with the necessary research document as reference information as well as a guide for future research.

1.7 Delimitations of the Study

The study was early childhood centres in the Sekyere East District in the Ashanti Region of Ghana. The study was also delimited to only teachers teaching in early childhood centres in Sekyere East District and hence did not include all teachers in the district. In content, the study was delimited to the type of indigenous play activities early childhood teachers use, the factors that influence teacher use of indigenous play, the barriers to the use of indigenous play as well as the strategies that facilitate teachers' use of indigenous play in numeracy instructions. The study was also delimited to the use of a descriptive case study design.

1.8 Limitations of the Study

The study was conducted at the time when schools were preparing for examinations and as a result the sample size of the teachers was affected. This also delayed the period of data collection as the day and time schedules for the interviews kept changing. Some respondents were not responsive to the questions as others were too hostile to the researcher and demanded payments to respond to the interviews and in the long run turned down the request of the researcher to answer the questions.

1.9 Operational Definition of Terms

Numeracy: Numeracy is the ability of learners in this study to understand and work effectively with numbers.

Indigenous play/indigenous games: They are used interchangeably in this study to mean the same thing which refers to activities that are done for enjoyment that stem from traditions, environment, and cultural practices.

1.10 Organisation of the Study

The study is divided into five chapters, each of which thoughtfully considers the chapter heading. The first chapter is an introduction that covers the background to the study, the statement of the problem, the purpose of the study, the objectives, and research questions of the study, the significance of the study, the study's delimitations, operational definitions of terms, and the study's organisation. The second chapter is a review of the literature. It examines relevant literature to the study. The methodology chapter covers the research philosophy, research approach, research design, study area, population of the study, sample size and sampling procedure, data collection instruments, data collection procedure, data analysis procedure, and ethical considerations. The fourth chapter dealt with the findings and their discussion. The fifth and final chapter contains a summary, conclusions, and recommendations.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0. Overview

This chapter introduces readers to the relevant literature in the study of early childhood teachers' use of indigenous play in teaching numeracy in the Sekyere East District, Ghana. The following strands guided the review;

Theoretical Framework

- Social Constructivist Theory (Lev Vygotsky, 1978)

Conceptual Framework

- Concept of Play
- Types of Indigenous Play
- Benefits of Play
- Play-Based Learning in Early Childhood Education

Empirical Review

- Types of Play-based Activities Used in Teaching Numeracy
- Factors that Influence Teachers' Use of Indigenous Play
- Barriers to the Use of Indigenous Play
- Strategies to Enhance the Use of Indigenous Play

2.1. Theoretical Framework
(Social Constructivist Theory -Lev Vygotsky, 1978)

The social constructivist theory underpins this research. The theory was first proposed by Vygotsky (1978) and later expanded by some other writers, including Isaacs (2013). This theory is based on the premise that education must engage with and broaden experience, and that educational methods must allow for exploration, thinking, and reflection. The theory's central claim is that reality is socially constructed through human activity (Owusu-Mensah & Baffour, 2015). Both learning (e.g., numeracy concepts) and social contexts (e.g., indigenous play like pilolo, ampe etc.) are central to learners' creation, discovery, and attainment of desired knowledge in social constructivism.

Thus, the theory emphasizes the importance of culture and context in comprehending what happens in society and constructing knowledge based on this comprehension. Both the context in which learning occurs and the social context that learners bring to the learning environment are important to social constructivists. Thus, from the perspective of social constructivists, it is critical to consider the learner's background and culture throughout the learning process, as this background helps to shape the knowledge and truth that the learner creates, discovers, and attains (Akayuure & Ali, 2016).

According to social constructivism, knowledge emerges from social interaction and is not an individual possession but a shared experience. In line with this stance, Owusu-Mensah and Baffour (2015) argued that, in a teaching and learning situation, the teacher should guide, support, and lead rather than ‘spoon feed’ the learner. We construct our understanding through our experiences and the character of our experience is influenced profoundly by our cognitive lenses (Owusu-Mensah & Baffour). The constructivists

reject the assumption among some people that in teaching the teacher can simply pass on knowledge or information to students and expect them to understand. Simply providing learners with information or notes may not result in effective learning.

Akayuure and Ali (2016) argues, if a student merely repeats what the teacher or the text book has said, this is of course no indication of a conceptual fit. People construct their own understanding and knowledge of the world through experiencing things and reflecting on them. The utilisation of indigenous play activities such pilolo, ample and *anhwɛ woa kyi* is supported by social constructivist theory, and facilitates the teaching of numeracy.

Relevance of the Social Constructivist Theory to the Study

To the constructivists, learning is much more than memory, hence the argument that for learners to really understand and be able to apply knowledge they must be engaged in active tasks or be guided to solve numeracy problems. It is through the engagement of learners in indigenous play tasks that they can construct knowledge and meaning in their own minds and discover numeracy concepts for themselves.

This study is guided by social constructivist theory because it inspires teachers to use indigenous play to teach numeracy in kindergarten classrooms and allows learners to construct knowledge from their indigenous perspectives, which improves their learning skills.

Moreover, the essence of using the social constructivist theory is that, it gives teachers the opportunity to engage themselves with the indigenous play activities and in the process, teachers make their own sense of the numeracy embedded in indigenous play, and engage learners in a meaningful way that will allow them to form their own conception of numeracy through indigenous (play) game. This theory is applied

throughout this study because it encourages learner- centred teaching in which the teacher sees himself as a 'guide on the side' and not the 'sage on the stage'. The teacher's role in the classroom is to guide and assist the learner to discover and construct own meaning in his social context

2.2 The Concept Play

The perspective of children`s play was initially considered in education as a yardstick for development of pedagogy (Sommer et al., 2010). There has been lots of research and findings produced over the years relating to the definition of play. Several researchers and theorists define play differently, however, many different perspective views on what play is overlapped with other views. Play can be viewed, conceptualized, and defined from many different theoretical and ideological perspectives.

Gülşeker (2019) defined play as, "an activity that is symbolic, meaningful, active, pleasurable, voluntary, rule-governed and episodic" (Nowak, et al., 2009). Play as pleasurable and an activity, is seen as a situation by which children learn and interact with the environment and the world around them. Gordon (2009) also argues that "play is the voluntary movement across boundaries, opening with total absorption into a highly flexible field, releasing tension in ways that are pleasurable, exposing players to the unexpected and making transformation possible." (p. 8). Through play children learn informally and relate their play to real life experiences. The voluntary movement of children which includes exploration, playing and learning according to their interests, offer them the opportunity to satisfy their curiosity and level of maturation.

Additionally, Wood (2009) indicated that characteristics of play include intrinsic motivation, engagement; dependence on internal rather than external rules, control and autonomy, and attention to means rather than ends". Children formulate their own rules to suit and match with the play situation. Therefore, children experience the joy and

skills development through self- motivation. According to Pramling-Samuelsson and Carlsson (2008) play is considered as a learning situation or an activity initiated by children, on the other hand, learning is regarded as a result of a practice or activity initiated by any adult to help children to learn. They further state that play activities as well as learning situations are as joyful since both play and learning are seen as an activity that is transgression. Play and learning are interrelated; the two words touched on each other in an early childhood setting and further serves as an important process for promoting children's learning and development (Kieff & Casbergue, 2000). Play provides children the opportunity to discover the world and find new answers through voluntary learning. Also, children`s play promotes and enhances socio-emotional development, cognitive and physical skills that cannot be taught through formal classroom instruction (Ministry of Education Science and Sports, 2007).

Fromberg (1992) is also of the view that play enhances language development, social competence, creativity, imagination, and thinking skills. He talked about how play can support a child's learning such as concepts and ideas, interactions, emotional well-being and physical development. Play provides children with the opportunity to discover the world and find new answers through voluntary learning. Children are likely to be engaged in play activities that are relevant to them and can play and have an active participation. Additionally, play is pleasurable and can be defined as an activity requiring no end or goal only participation and fun (Nowak, et al., 2009).

One important aspect of children`s play to be considered is the use of play in early years setting. Combining play in the teaching process in the early years setting, there is the need for greater confidence among practitioners in approaching problems without fear and taking risks needed in the search for new ideas to help the development of children. Play is often being regarded as cognitively challenging process, which requires the child

to make use ability, memory, signs and symbols, cultural tools which includes development of language, social skills such as negotiations, communication, planning and sharing and prediction (Fleer, 2010). Many skills that are needed for later life are developed through play and also are very important in a pre-school setting. Children will continue to make use of different learning situations, experiences and in remembrance for further learning. In general, play is considered as an important learning activity and developmentally appropriate which is considered valuable for all children (Bodrova & Leong, 2003; 2003b). In contrast, however, play can also be seen as an unimportant or even harmful practice or activity both in the home and the school environment (Johnson, et al, 2005; Scarlett, et al., 2005; Sutton-Smith, 2001). Although play is very important for children and its usage in the school`s context or early year settings, (Hyvonen, 2011) expresses similar sentiment that it should be restricted by hindrances. The discourse of play both in theory and practice in early childhood education is very vital as stages of human evolution.

2.2.2 Types of Indigenous Play

Defining play continues to be a complex task, largely due to its multifaceted and dynamic nature. Recent scholarship acknowledges this complexity and has made various attempts to classify the different forms of play that contribute to children's development (Yogman et al., 2018). For every area of a child's growth whether physical, cognitive, social, emotional, or creative there is a corresponding type of play that supports it. Contemporary developmental and educational literature typically categorizes play into five broad types based on the specific developmental functions they serve. These include physical play, object play, symbolic play, socio-dramatic or pretend play, and games with rules (Whitebread et al., 2017). Each of these categories plays a vital role in promoting different aspects of a child's learning and development.

Although each type is primarily associated with particular developmental outcomes, collectively, they foster holistic growth by supporting physical coordination, language development, problem-solving, social skills, and creativity (Zosh et al., 2018). Current evidence strongly suggests that providing children with varied and balanced experiences across these different forms of play contributes significantly to their overall well-being and developmental competence (Skene et al., 2022).

2.2.3 Physical Play

Physical play is regarded as one of the earliest and most fundamental forms of play to emerge in evolutionary history, observable not only among mammals but also in certain reptiles and amphibians (Whitebread & O'Sullivan, 2020). In young children, physical play encompasses active activities such as running, climbing, dancing, skipping, cycling, and playing ball games, as well as rough-and-tumble play, which involves playful wrestling, chasing, and grappling. Additionally, it includes fine motor activities like drawing, cutting, threading, and constructing objects using small items (Leggett & Newman, 2017). Generally, physical play is grouped into two primary categories: exercise play and fine motor play.

Exercise play typically emerges in the second year of life and by preschool age, can make up as much as 20% of children's daily activity (Lester & Russell, 2014). This form of play has been strongly linked to the development of gross motor skills, coordination, physical strength, and endurance, while also contributing to children's confidence and resilience (Brussoni et al., 2015). A particularly well-researched aspect of physical play is rough-and-tumble play, often misunderstood as aggression, but clearly distinguishable by the mutual enjoyment of the participants. This type of play generally appears slightly later than exercise play and remains common in early

childhood, typically occurring among friends, siblings, and sometimes adults (Kemple et al., 2016).

Recent studies emphasise that rough-and-tumble play supports the development of social competence, emotional regulation, and the ability to interpret social cues within a controlled, cooperative setting (Fletcher et al., 2016). It has also enhanced empathy and fostered strong social bonds between children and their caregivers. For instance, research by Fletcher found that playful physical interactions between fathers and their young sons significantly contributed to the children's emotional well-being and social competence.

Contemporary urban lifestyles, however, have raised concerns about children's reduced access to outdoor spaces and opportunities for 'risky' play activities involving mild physical challenges and unpredictability. Over-supervision and safety fears have limited these experiences, which are crucial for nurturing children's independence, problem-solving skills, and resilience (Brussoni et al., 2015). As a response, early childhood educators and policymakers have increasingly advocated for outdoor play environments, resulting in renewed interest in outdoor-based early years education models such as Forest Schools in the UK and Nordic countries (Leggett & Newman, 2017).

Fine motor play involves activities requiring careful hand and finger movements, often undertaken individually or in small groups. These include threading beads, cutting paper, constructing with small blocks, and using tools such as scissors. Such activities not only build fine motor coordination but also enhance concentration, patience, and perseverance important skills for later academic and everyday tasks (Whitebread & O'Sullivan, 2020).

2.2.4 Play with Objects

Children's development through exploratory engagement with their environment investigating the physical world and interacting with objects is widely recognized as crucial to holistic development (Whitebread & O'Sullivan, 2020). Play with objects begins in infancy when children can first grasp and manipulate items. Early exploratory actions include mouthing, biting, rotating, rubbing, and dropping objects. This phase, often termed 'sensory-motor play,' involves discovering the texture, weight, and behaviour of objects (Leggett & Newman, 2017). From approximately 18 to 24 months, toddlers progress to arranging, stacking, and organizing objects, gradually developing sorting and classifying abilities. By around four years of age, more complex activities such as building, assembling, and constructing typically emerge (Lester & Russell, 2014).

Like many other forms of play, object play frequently overlaps with physical, pretend, and socio-dramatic play, often featuring imaginative elements as children tell stories or role-play while constructing or handling objects (Samuelsson & Carlsson, 2019). It is one of the better-researched play types due to its clear links with cognitive development, particularly in enhancing problem-solving, reasoning, and goal-setting skills (Whitebread & O'Sullivan, 2020). While playing with objects, children frequently set personal challenges, monitor their actions, and expand their motor and cognitive repertoires. For instance, a study by Allee-Herndon et al. (2021), which involved systematic observations of three- to five-year-olds across a school year, found that children's engagement in exploratory and constructive play significantly predicted their abilities in later physical problem-solving tasks.

Object play is also closely linked to the development of 'private speech' when children verbalize their actions and thoughts while engaged in tasks. This self-directed speech aids in maintaining focus, monitoring progress, making strategic decisions, and regulating their behaviours as they engage with objects and problem-solving situations (Martinez-Alvarez, 2021). Consequently, play with objects fosters not only cognitive and motor development but also perseverance and a constructive attitude toward overcoming challenges (Leggett & Newman, 2017).

Following such findings, researchers have examined the therapeutic potential of constructive play in supporting children with self-regulation difficulties, such as those diagnosed with autism spectrum disorders (ASD) or attention-deficit/hyperactivity disorder (ADHD). For example, Lima et al. (2022) conducted a 16-week LEGO-based therapy intervention with children aged six to twelve years with ASD, revealing significant improvements in social interaction skills and reductions in maladaptive behaviours compared to a no-intervention control group.

2.2.5 Symbolic Play

Symbolic play refers to children's use of objects, actions, or ideas to represent other objects, actions, or concepts, playing a vital role in nurturing their ability to express, process, and reflect on personal experiences, emotions, and thoughts (Marjanovic-Shane, 2016). Humans possess a unique capacity for symbolic systems, including spoken and written language, numbers, images, music, and various other forms of representation. During the first five years, as children gradually acquire mastery over these symbolic forms, their play naturally incorporates and supports this developmental process (Veraksa et al., 2021).

Language-based play emerges very early, with infants experimenting with sounds before their first birthday. As they grow, this progresses into experimenting with the sounds and structures of the languages spoken around them. Such playful language experiences include inventing nonsense words, playing with rhymes, and developing a fondness for puns, jokes, and humorous wordplay in early childhood. Research has consistently confirmed the importance of these playful interactions in promoting children's language development and, more critically, enhancing phonological awareness a key predictor of later reading and writing success (Davidson et al., 2019). Similarly, engaging children in playful, real-world activities involving counting, measuring, and comparing objects meaningfully strengthens early numeracy skills, laying a foundation for confident engagement with formal mathematical learning (Zhang et al., 2023).

Contemporary studies also reaffirm Vygotsky's (1978) proposition that drawing and writing emerge from the same symbolic system in early childhood, with mark-making as a foundational symbolic activity. Interestingly, comparative research on the spontaneous drawing behaviour of primates has shown that mark-making may be one of the earliest forms of human symbolic representation (Einarsdottir et al., 2019). Observational studies on children's early drawings indicate that through this medium, they expand their 'graphic vocabularies' and gradually learn to organise lines, shapes, and symbols into structured, meaningful images, effectively developing what has been termed a 'visual grammar' (Hope, 2017). Moreover, evidence suggests that early experiences with diverse visual media, such as drawing, painting, collage, and digital imagery, considerably enhance children's visual literacy improving their ability to interpret and create representations like maps, diagrams, photographs, and models (Merewether, 2021).

2.2.6 Pretence/Socio-Dramatic Play

Pretence or socio-dramatic play is typically recognised as one of the most essential and expressive forms of free play in early childhood. In this type of play, children adopt roles and enact scenarios, requiring them to follow social rules and behavioural expectations associated with the characters they portray (Fesseha & Pyle, 2016). Emerging from around twelve months of age, socio-dramatic play becomes increasingly complex as children grow, and it is currently among the most studied forms of play due to its clear associations with cognitive, social, and emotional development (Whitebread et al., 2017).

Research has consistently shown that high-quality pretend play is strongly linked to the advancement of children's narrative abilities, problem-solving, and social competence. For example, longitudinal studies have demonstrated that engaging in complex socio-dramatic play supports children's ability to manage impulsive behaviours and promotes self-regulatory capacities (Pyle & Danniels, 2017). Furthermore, play experiences grounded in imaginative and narrative contexts have been associated with enhanced language and storytelling skills in children between five and seven years (Samuelsson & Carlsson, 2008, as cited in Lin et al., 2022). This form of play also fosters deductive reasoning and social awareness, as children must negotiate, plan, and co-operate within play episodes.

Building on Vygotsky's (1978) foundational theories about the developmental benefits of pretend play, more recent investigations reaffirm that such activities nurture both representational thinking and self-regulation (Veraksa et al., 2021). Private speech self-directed verbalisation used by children to guide their actions frequently occurs during socio-dramatic play, serving as a tool for planning, problem-solving, and behavioural control (Fernyhough & Meins, 2009; Winsler et al., 2021). Interestingly, while socio-

dramatic play allows for creative freedom, it paradoxically demands considerable self-restraint, as children must manage emotions, inhibit impulses, and adhere to negotiated rules within peer play settings.

Intervention studies further confirm these benefits. O'Connor et al. (2017) conducted a pretend play-based programme with a group of children aged five to eight in specialist educational settings and observed notable improvements in social integration and reductions in disruptive behaviours among participants, compared to a control group without such interventions.

A topic of ongoing debate within this play category involves children's engagement in weapon-themed or 'gun play'. Although traditionally discouraged by adults, recent evidence suggests that such play is typically not associated with real-life aggression but rather offers opportunities for children to practise negotiation, role-taking, and social boundary-setting in scenarios that reflect both their personal interests and broader social experiences (Robson & Rowe, 2019). As with other forms of socio-dramatic play, it contributes to the refinement of cooperative skills and emotional regulation when approached within appropriate boundaries and adult guidance.

2.2.7 Games with Rules

Young children have a natural curiosity to understand the world around them, and a key part of this developmental process involves an interest in rules. From an early age, children engage enthusiastically in games governed by rules, often creating their own variations to suit their interests (Moyles, 2015). Classic collections of children's games have long documented this preference, illustrating how children enjoy both spontaneous physical games like tag, hide-and-seek, and catch, as well as structured activities as they mature, including board games, card games, digital games, and

organized sports (Howard & McInnes, 2013). Beyond learning about the concept of rules, these games contribute significantly to children's social development. By participating in games with peers, siblings, and adults, young children acquire essential social competencies such as turn-taking, cooperation, negotiation, and understanding others' perspectives (Lester & Russell, 2014).

The increasing use of digital and computer games by contemporary children has also generated considerable debate. Concerns typically focus on the possible promotion of aggression and the addictive tendencies of certain video games. However, recent research findings have been mixed. For example, Przybylski and Weinstein (2019) conducted a large-scale study involving British children aged 12–18 and concluded that moderate engagement with video games did not negatively affect children's psychological well-being or displace other leisure activities. In fact, when appropriately designed, video games can offer benefits similar to those associated with problem-solving and constructional play, fostering cognitive flexibility, strategic thinking, and collaboration (Granic et al., 2014).

Further, studies have highlighted the educational potential of well-constructed digital games. For instance, Hamari et al. (2016) found that video games designed with open-ended tasks and problem-solving elements encouraged creativity and perseverance in school-aged children. These digital experiences parallel the developmental gains seen in traditional object-based play, particularly in enhancing problem-solving abilities and promoting social interaction when games are played collaboratively (Blumberg et al., 2019). While concerns about excessive screen time persist, current evidence suggests that balanced, mindful use of educational and recreational digital games can meaningfully contribute to children's social and cognitive growth.

2.3 Benefits Learners Derive from Teachers' Use of Indigenous Play in Teaching Numeracy

Recent studies continue to highlight the importance of integrating indigenous games into the teaching of school numeracy, revealing their potential to enhance children's mathematical reasoning and problem-solving abilities. According to Mheta, Lungu, and Govender (2022), traditional games naturally stimulate children's capacity for logical thinking, pattern recognition, and numerical imagination. Similarly, research by Animashaun et al. (2021) and Boateng (2020) confirms that embedding learning within familiar cultural contexts makes numeracy education more engaging, relatable, and meaningful for learners, thereby fostering positive attitudes toward mathematics. These scholars suggest that indigenous games offer a platform for learners to connect real-life experiences with classroom numeracy tasks, bridging the gap between abstract concepts and everyday activities. This contextualisation not only enhances understanding but also helps diminish anxieties typically associated with mathematics learning.

Furthermore, the incorporation of indigenous games in educational settings strengthens the link between culturally relevant practices and formal classroom instruction. As noted by Nyoni and Bindu (2021), contextualised teaching strategies, including the use of local games, enrich classroom learning and support inclusive education practices by validating children's cultural backgrounds. Research by Chigeza and Whitehouse (2019) also investigates how ethno-mathematics can be effectively integrated into contemporary classrooms while addressing instructional challenges. Their findings reveal that cultural games contribute to a deeper appreciation of how different cultural practices embody mathematical concepts, offering practical opportunities for children to experience mathematics in an authentic and accessible manner.

Additionally, Adu-Gyamfi and Brenya (2022) argue that the social nature of games fosters meaningful peer interaction, allowing learners to discuss, debate, and interpret one another's viewpoints. This collaborative environment encourages children to refine their ideas, promoting deeper conceptual understanding. Supporting this, Mpofu and Shumba (2019) report that through indigenous games, learners engage in reasoning, turn-taking, and cooperative problem-solving, which contributes to improved numeracy skills and nurtures a positive learning culture.

Furthermore, Mudaly (2018) has been conducted on the use of indigenous knowledge and indigenous games in mathematics classrooms. Based on the findings of these studies, learners were more enthusiastic and motivated when drawing on indigenous knowledge to learn complex mathematical concepts. (Onwu, & Mufundirwa, 2020; Seehawer, & Breidlid, 2021). has exhibited that learners are exposed to educational contexts that are relevant by integrating indigenous knowledge within the school curriculum to their lives, thereby enriching teaching and learning.

Indigenous play/games also provide a natural environment which helps children to overcome ontogenetic, didactical, and epistemological obstacles in learning numeracy (Akayuure, et al., (2016). Aside indigenous play/games being used as recreational or pastime activities, they perform didactic role in numeracy classroom. When learners engage in game play, a variety of mathematical activities is generated within which mathematical concepts, skills and vocabulary assimilated. For instance, indigenous play/games like *Tomat in Ghana, pada* and *nhodo* in Zimbabwe, *cowry* in Cote d'Ivore and *mu torero* in New Zealand, can be used to help learners form new numeracy concepts or practise and consolidate mathematical skills (Dewah &Van Wyk, 2015).

Moreover, indigenous play/games can be used to as tools to: 1) learn the vocabulary of mathematics; 2) develop mental mathematics and mathematical skills; 3) generate mathematical activity at different levels; 4) stimulate investigations and problem solving; and 5) patterns discovery, logics, etc. (Nabie & Akayuure, 2014; Rosa & Orey, 2013; Sparrow & Hurst, 2012).

Indeed, several studies (Nabie, 2012) gave evidence of the significance of cultural play/games in learning. These studies consistently present cultural games as activities that stimulate children's mathematical imagination and thinking, and are therefore important cultural instruments for engaging children in their intellectual pursuit.

According to Nyoni and Bindu (2021), indigenous knowledge systems, including traditional games, represent a comprehensive body of knowledge encompassing skills, practices, and technologies that have been and continue to be employed by indigenous and local communities for survival, adaptation, and social cohesion in diverse environmental contexts. This form of knowledge is dynamic, continuously evolving as it interacts with new ideas, external influences, and changing social realities (Chigeza & Whitehouse, 2019). Traditional games, as part of this indigenous knowledge, play a crucial role in supporting children's cognitive and social development. As Adu-Gyamfi and Brenya (2022) observe, when children engage in these culturally rooted games, they often display focused attention as they work to understand and master the mechanics and strategies involved. This concentrated engagement enhances executive functioning skills such as self-regulation, working memory, and cognitive flexibility, which are essential for academic learning and problem-solving.

According to Daru et al. (2019), indigenous play/games provide the children with opportunity to continue practicing a skill until they are proficient at it. This enables

them to gain self-confidence and self-esteem. Berger highlights that the children's games are more than just games when she observes the misconception that most researchers have about these activities. She says, "Most researchers of young children believe that play is the work of childhood". Essentially, indigenous play/game teaches youngsters to have an understanding of some aspects of their biophysical environment (Daru et al., 2019)

The *oware* and *dame* games offer an opportunity for teachers to highlight some mathematical concepts such as counting, shapes, and logical reasoning to learners. These games also encourage communication among learners. During the game, learners will make some "moves" of which they should be able to explain the reason why they do that. The explanation of the "move" gives learners the confidence to express themselves in the classroom. These games are usually played in groups with two (or more participants). The games can be played within a class or as inter class competition. The games therefore encourage group work and cooperation (Owusu-Mensah & Baffour, 2015).

When learners have developed the attitude of playing these games together, it is expected that they will be able to work or study together in a group. It therefore makes it easier for the teacher when organising group work in the classroom. These games have the value of instilling co-operation and tolerance in learners. In the situation where the views of others are respected and tolerated, learners will be encouraged to contribute to class discussion without being intimidated. The *oware* and *dame* games have sets of rules which must be known and followed by all players. The adherence to the rules of these games could be transferred to the study of mathematics. Thus, learners should be familiar with some of the rules governing the study of arithmetic and follow them at all times (Owusu-Mensah & Baffour, 2015).

Achor, et al., (2009). conducted research in Nigeria to determine the effectiveness of ethno-mathematics approaches on learners' retention and achievement on the concept of locus in geometry. Findings revealed that learners who were taught using ethno-mathematics approaches had higher retention as well as higher mean achievement scores than those who were taught using the conventional approach. Findings further revealed that ethno-mathematics approach proved to be a viable approach in promoting meaningful learning in locus. The researchers claimed that the major reason for such findings could be that learners taught with ethno-mathematics approaches were able to connect the cultural practices in their societies with the learning of locus. This implies that ethno-mathematics approaches might help in reducing the abstract nature of the teaching and learning of geometry

Akayuure and Ali, (2016) also did research in Ghana to analyse and show how the indigenous *bukre* game could be incorporated into the teaching and learning of probability concepts in junior high school mathematics. Forty-five pupils from Vea Junior High School and a 79-year-old knowledgeable man were purposively engaged in *bukre* game and data were gathered by participant observations and interviews. A comparative analysis uncovers that, similar to the classical experiment of tossing a coin, a variety of probability concepts surrounds bukre game. It is also observed that the game can promote pupils' native conception of probability, intrinsic motivation, friendly classroom dialog, and interactions.

Abisha and Matemera (2016) studies concluded that traditional play/games like *nhodo, tsoro, pada,* and *madhadha ari pamutsetse* are some of the most effective and interesting games in the teaching and learning of mathematics in the primary schools. Regarding the use of traditional games in the teaching and learning process as primitive approach, has contributed to several mathematical myths. The results of Golafshani

(2022) suggested that, utilizing Indigenous storytelling for teaching mathematical curricular expectations could benefit both Indigenous and non-Indigenous students.

The study on the use of indigenous game, *morabaraba*, in mathematics by Nkopodi and Mosimege (2009), found that the use of indigenous games promotes spontaneous interaction among learners as they communicate their activities to fellow participants. The study also found that the enjoyment of the game was not restricted to a specific cultural group. This suggests that most indigenous games can be used in a multicultural setting. Thus, the current study determined the benefit learners derived from teachers' use of indigenous play/game in teaching numeracy in the kindergarten classroom within Sekyere East District.

Impact of Play-Based Pedagogy on Learning Outcomes

When teachers observe children's engagement in playful activities that have explicit numeracy learning objectives, the nature and quality of the children's engagement reveals important information about their thinking and reasoning. High quality early childhood pedagogy is associated with gains in child learning outcomes (Niklas &Tayler 2018). Teachers' numeracy content knowledge predicts their ability to identify and assess children's demonstrations of mathematical thinking. This is important as embedding numeracy teaching and learning in integrated, informal, play-based curricula leads to children's mathematical thinking emerging in diverse ways that may be verbal, or nonverbal such as drawing and dance (Pollitt, Cohrssen, & Seah, 2020; Deans & Cohrssen, 2015). It follows, therefore, that supporting teachers' ability to integrate such teaching into a play-based curriculum is likely to influence child learning outcomes as far as numeracy is concerned.

The home learning environment is the context of first learning and thus from the start of the learning trajectory, children experience differing levels of support for early mathematical thinking (Lehrl, Kluczniok, & Rossbach 2016). Similarly, children experience variable levels of support for mathematical thinking in early childhood education and care (ECEC) settings (Cohrssen, Tayler, & Cloney 2014). Not only does this impact on transitions into school, but it raises equity concerns (Cohrssen & Page 2016) and points to the importance of supporting preschool teachers' enactment of high-quality numeracy teaching by highlighting the big ideas children need to acquire, and developmentally appropriate play-based pedagogies as the vehicle for teaching and learning (Pyle, DeLuca, Danniels, & Wickstrom, 2020).

Research has demonstrated the efficacy of a play-based approach to mathematics learning as children are intrinsically motivated to play and attitudes to mathematics learning have a significant effect on achievement (Colliver, 2018). For instance, playing number board games is positively correlated with sustained gains in young children's number knowledge, specifically comparison of magnitude, numeral identification, magnitude estimation and counting. Similarly, symbolic play prompted by a visit to a bakery has been found to lead to five- and six-year-old children incorporating increasingly complex mathematical thinking in their play, supported by social interactions (Chessar, 2012) Children think mathematically long before they start school and mathematical thinking is a strong predictor for later academic success in school, indeed, it is a better predictor than early reading and early attention skills. Whilst children are born with innate abilities, what children learn is subject to environmental influences (Butterworth, 2005).

Children acquire both mathematical language and conceptual understanding when they are provided with multiple opportunities to participate in language-rich interactions and

to rehearse mathematical thinking playfully, supported by well-paced, contingent interactions that facilitate the acquisition of both concepts and associated language (Cohrssen, & Niklas, 2019). The roots of Early Childhood Education can be traced to indigenous practices when young children were taught basic life skills, cultural norms, and customs within the confines of the family and the community. Storytelling, indigenous games, and songs were seen as universal means of education as well as essential tools for cultural transmission of knowledge.

However, the advent of formal Westernstyle education during the colonial era saw the emergence of a more structured approach. In keeping with the demands of the curriculum, the pedagogical discourse in early childhood education has recently been dominated by the concept of play-based learning. In practice, play based learning approach requires a teacher to be innovative by employing a variety of strategies including providing adequate classroom space for children to engage in various play activities such as dramatic play, block building, and sensory play (Matafwali, & Mofu, 2023; Lungu & Matafwali, 2020). Play is a vital aspect of child development that transcends cultural barriers, fostering cognitive, emotional, and social development. Evidence confirming the importance of play in child development is well documented. Friedrich Froebel emphasised play as the foundation of learning, where children naturally explore and experiment to make sense of the world around them.

According to Vygotsky (1978), play is an essential developmental activity that has a significant impact on a child's cognitive and social development during the early years. Research has repeatedly demonstrated that academic competency, such as language, cognitive, social-emotional, and psychomotor, is readily acquired through play. Children acquire high-level cognitive skills through play, including abstract thinking, exploratory skills, imagination, creativity, self-regulatory executive functions, memory,

and problem-solving skills (Johnstone et al., 2022) Play also enhances the development of social-emotional abilities, such as the capacity to form friendships, empathy, emotional control, conflict resolution, and attachment (Yogman, 2022).

For the majority of children especially in rural communities, play experiences involve outdoor activities that allow them to create their own play spaces, choose games play materials that interest them, and engage in vigorous physical activities such as climbing, jumping and running. Matafwali, and Mofu, (2023) notes that outdoor play enables children to explore their community and engage in sensory-rich experiences like playing with sand, clay and water, searching, and fleeing. Children can experience all their senses while playing outdoor games through observations, physical activity, social interaction, math, science, art exercises, and dramatic play. The right to play also aligns with the African Charter on the Rights and Welfare of the Child and the United Nations Convention on the Rights of the Child, which emphasises the importance of providing children with appropriate play opportunities and safe spaces for recreation.

Even though play-based learning is widely acknowledged, early childhood education teachers frequently concentrate on structured indoor play activities that skew toward modern games, without maximizing on positive effects of unstructured outdoor indigenous games on child development (Matafwali, et al., (2023). Marginalisation of indigenous outdoor games in the ECE setting may be attributed to several factors. Matafwali, et al., (2023). Usman and Yusuf (2021) contend that in today's technologically driven society, many educators may be less knowledgeable about outdoor indigenous games and their value in promoting early childhood development. A qualitative study found that although teachers were aware of the value of outdoor play for children's development, they lacked the necessary knowledge and motivation to promote it as a pedagogical strategy. (Kemple, Oh, Kenney, & Smith-Bonahue,

2016) observe that, children no longer spend as much time engaging in unstructured, child-directed outdoor play.

The availability of television programmes, the popularity of computer games and other technology products, the lack of adequate physical space for outdoor play, and parental concerns about their children's safety in the physical environment have all been identified as factors reducing children's participation in outdoor indigenous play activities. Other scholars have observed that the current educational system in many African countries is primarily based on the Western paradigm, and as a result, pedagogical strategies are reminiscent of Western societies' traditions relegating indigenous education practices to a subordinate position. Indigenous games have long been an essential aspect of human culture, providing entertainment, education, and fostering a sense of belongingness. For centuries, indigenous games have been treated as an institution for organised socialisation and leisure time. These games have been transmitted from generation to generation, cherished, used, and perfected (Petrovska, Sivevska, & Cackov, 2013).

Additionally, indigenous games preserve the folk tradition central to national heritage. Through engaging in indigenous games, children learn about the rules and values of their culture. These games also have spiritual value as well as social and historical relevance. In the context early grade education, indigenous games hold enormous benefits as they foster holistic development, physical fitness, and cultural awareness (Matafwali, et al., (2023). Indigenous outdoor games enhance gross and fine motor skills, balance, eye-hand coordination, increased spatial awareness and more significant social skills.

Indigenous games help children to think, intellectualise or discuss their ideas and explore the world around them. A review of literature shows that indigenous game genres are diverse and transcend cultures, thus highlighting the universal character of indigenous games across cultures. For instance, pebble games are played in many parts of Africa and other regions of the world. Although the rules of the game may vary across regions, Chiyato game has been reported to promote eye-hand coordination, numeracy skills, emotional regulation, social skills, and problem-solving skills. Another game is a board game that has several variations across cultures (Matafwali, et al., (2023). These games teach young children how to count (Moyo & Hopscotch is another popular children's game where players toss a pebble into patterned squares and hop through the squares to retrieve the pebble.

The game is called by different names across cultures: Espada or Kapendo in Zambia (Mtonga, 2012); Pada in Zimbabwe (Madondo & Tsikira, 2021); Tumatu in Ghana (Adjei-Boadi et al., 2022); and Hinke in Denmark. Some of the benefits of hopscotch include movement of large muscles, flexibility, coordination, balance, and agility. Laely and Yudi (2018) conducted an experimental study which examined the impact of hopscotch on kinesthetic intelligence. Similarly, Kim, Lee, and Lee, 2023; Polevey et al. (2023) found a statistically significant improvement in rhythm movements among 8- to 9-year-olds who played hopscotch compared to children who participated in the standard school physical culture programme.

Findings showed that children's kinesthetic intelligence increased after exposure to hopscotch. Ismaiyah, and Fadhilawati, (2022) further found improved gross motor and social skills. While the efficacy of indigenous games in child development cannot be underscored, research has indicated a decline in these games in children's playgrounds and schools due to the influence of digital technologies and games.

Teachers are expected to be trained with both traditional and non-traditional skills of imparting knowledge before they join the teaching profession. Traditional skills include content and pedagogical knowledge while non-traditional skills include being able to foster socio-emotional skills among children. Promotion of collaboration and social activities among students increase their involvement and participation in team learning. Trajkovik, Malinovski, Vasileva Stojanovska, and Vasileva (2018) suggests that when students share their own ideas and respond to others' reactions their level of thinking and understanding deepens.

Due to a strong connection between culture and learning, educators are expected in the 21st century to use culturally responsive pedagogy to facilitate learning. It also aims at encouraging community and family engagement in educating the child (Ford, Stuart & Vakil, 2014). Educational properties embedded in TEPG when effectively modified and facilitated, can turn the classroom into creative environment for academic interaction hence promoting creativity and life-long learning. By this effort, the classroom becomes an extension of the home; a play-based learning environment. Better collaboration between teacher and learner, home and school would be achieved and learning outcomes improved. However, the play seems to have taken a backseat in early grade classrooms to teacher-directed instruction.

This unproductive practice is based on the belief that play does not effectively prepare children to perform well on standard-based assessments (Yekple, et al., 2021; Kekesi, et al., 2019). Several challenges account for the non or less use of play as teaching approach by teachers. Notable among them is the lack of motivation by teachers to use Emphasizing children's play, as relevant both for its own sake and for its relation to learning, as in a socio-cultural theory, means that the challenges of integrating indigenous and non-indigenous students in a majority education system have to be

extensively problematized. In play, children take control and participate deliberately. In some cultures, observing and listening when participating in activities are part of that culture's tradition (Lillemyr, Søbstad, Marder, & Flowerday, 2011). In this sense, human development can be seen as a cultural process, with consequences for play and learning (Lillemyr, et al., (2011). The recent research literature has argued that children's play can promote learning (Karaoğlu, 2020). These perspectives are of relevance for early childhood education and care institutions when attempting to provide quality learning environments.

The same tendencies attempting to include play to ensure children's engagement can be seen in countries such as Great Britain, Australia, and Sweden. Based on research, it seems reasonable to assume that there would be a close relationship between children's interests in play and their interests in learning, and that these are closely related to self-concept and motivation (Lillemyr 2001). Each day in class, children work to maintain and establish interpersonal relationships, they strive to develop social identities and a sense of belongingness, they observe and model social skills and standards of performance displayed by others, and they are rewarded for behaving in ways that are valued by teachers and peers. The socio-cultural perspective of play and learning is important in all cultures, as children in all cultures seem to play.

There is a system of mediating knowledge and skills from one generation to the next, although cultural differences can be found.

Prior to implementing the games, each teacher attended a professional learning workshop during which the mathematical concepts underpinning each game were discussed, drop-back and extension ideas suggested to support differentiated teaching

and learning, and opportunities provided for discussion and reflection (Cohrssen, & Niklas, 2019).

2.4 Play-Based Learning

The PBL environment is a child-centered pedagogy that promotes the development of children by following their natural inquisitive and explorative disposition. "Young children are naturally predisposed to exploring that which draws their interest and engages them. For them to continue to grow this disposition, they must feel connected to their learning environment and confident in their abilities as a learner" (Aiono, et al, 2023). The power of play as a pivotal precursor to formalised instruction is well documented within educational research (Bergen, 2009; Canning, 2007; Mastrangelo, 2009; Nolan & Paatsch, 2018). The PBL environment consists of a child-directed exploration of phenomena through the method of play (Aiono, 2015, 2017; Alfieri, Brooks, Aldrich & Tenenbaum, 2011; Pyle & Danniels, 2017). The pedagogy of exploration, to make sense of the objects in the world around them, has been the focus of early childhood education for many decades (Bergen, 2009; Briggs, 2012). In recent years, the environment of the primary classroom has changed from a teacher-led curriculum to a more child-centred approach, causing great debate in regards to what is deemed to be pre-school education/learning pedagogy versus that of the mainstream primary classroom (Aiono, 2015, 2017; Alfieri et al., 2011; Pyle & Danniels, 2017). Pyle and Danniels (2017) state "the purpose of play-based learning is inherent in its name: to learn while at play" (p. 285). By connecting to their learning environment and feeling confident in their abilities, young children will naturally explore whatever interests them (Aiono, 2015). PBL therefore, within this review, is seen as a child-directed exploration of phenomena through the method of play (Aiono, 2015, 2017; Alfieri et al., 2011; Pyle & Danniels, 2017). The concept of discovery-learning

challenges the notion within education of the child being an empty vessel needing to be filled with adult knowledge, as was once believed (Bandura, 2001). In contrast to this, constructivist educational theorists such as Piaget and Reggio Emilia believed that the child unlocks their own intelligence through a process of discovery (McNally & Slutsky, 2017). Therefore, the role of the teacher within these philosophies is to support the child to reach their full potential through self-guided discovery. Vygotsky (1978) documented that the role of the teacher is to identify what the child can currently achieve independently and what they can achieve with support or within "the zone of proximal development" (Khaliliaqdam, 2014, p. 891). In the zone of proximal development (ZPD) the role of the teacher is to scaffold the child's abilities to increase their knowledge and understanding (Cullen, 2001; Wasik & Jacobi-Vessels, 2016).

2.3 Empirical Review

2.5 Types of Indigenous Play Activities Used in Numeracy

Indigenous games have long been recognized as culturally meaningful tools that support young children's numeracy development, and a growing body of empirical research especially from Ghana demonstrates their power when integrated into early childhood education.

In South Tongu District, Avornyo and Mensah (2024) conducted a classroom observation and teacher interview study in which kindergarteners used the traditional game *Achi* during math activities. Teachers guided children in patterns, sequencing, and counting as they played, with one-to-one correspondence exercises embedded seamlessly within the game. The children's engagement and emerging mathematical reasoning underscored the cultural relevance of such games and how they can strengthen foundational numeracy skills. A separate descriptive study in Bongo District

involved 410 early childhood teachers and revealed that those who provided locally sourced play materials and adopted facilitative roles during numeracy instruction created more effective learning environments through culturally situated play (Avornyo & Mensah, 2024).

In Ghana, Nabie and Akayuure (2014) similarly emphasized that integrating such games into numeracy instruction enhances children's understanding of mathematical operations by embedding learning within familiar, culturally meaningful activities. These studies validate the observations from the Sekyere East teachers, confirming the cognitive and cultural benefits of including traditional games in early numeracy education. Ntekane (2018), whose work in South African preschools demonstrated that engaging children in cultural crafts improved their understanding of measurement, symmetry, and patterns. Similarly, Nabie and Akayuure (2019) in Ghana argued that embedding numeracy within indigenous art forms provides a tactile, visual, and social learning experience that strengthens mathematical thinking while preserving cultural traditions.

Comparative research from neighboring Zambia adds weight to these findings. Mwinsa and Dagada (2024) implemented a participatory action research project across rural preschool centres, where teachers introduced indigenous games into both literacy and numeracy lessons. Classroom observations, interviews, and thematic analysis revealed enhanced student confidence and improved arithmetic and language skills. Teachers also reported that involving the community and providing culturally aligned professional development strengthened their capacity to use game-based learning.

In KwaZulu-Natal, South Africa, Hadebe-Ndlovu (2022) used semi-structured interviews with teachers in inclusive education settings to explore how indigenous

games inform mathematics teaching. Educators shared that students became more enthusiastic and socially engaged when learning through stone-placement and counting games derived from their heritage. Yet they also emphasized the need for pedagogical frameworks to help integrate such practices in a meaningful and intentional way.

Internationally, examples from Indonesia and South Africa such as *Engklek* (hopscotch) and *Morabaraba* offer further insight. These culturally familiar games promote spatial reasoning, counting, patterning, and strategizing skills central to early mathematics learning (Lidinillah et al., 2022; Mosimege, 2016). A 2024 scoping review confirmed a wide range of traditional play and culturally embedded activities as significant, yet underutilized, supports in early numeracy development globally (Xu & Ball, 2024).

The mechanisms behind these learning gains are both cognitive and social. Children develop executive function and working memory as they keep track of turns, positions, and scores in traditional games. In games like *Oware*, moving seeds around pits requires careful counting, strategic planning, and anticipation of opponents' moves reinforcing arithmetic operations and cognitive flexibility. Socially, the requirement to adhere to rules, take turns, and negotiate outcomes creates space for mathematical talk and reasoning. Teachers in Ghana and Zambia report that these interactions deepen students' conceptual understanding and peer learning.

Research by Avornyo and Mensah (2024), Akayuure and Asuo (2022), and Ntekane (2018) consistently demonstrates that when indigenous games, songs, and crafts are thoughtfully integrated into formal education, they significantly enhance young children's engagement, mathematical understanding, and retention. They also foster cultural pride and identity, bridging the often-perceived gap between home culture and classroom learning.

However, implementing indigenous game-based learning is not without its challenges. National curricula in Ghana and South Africa often reference "play" vaguely, without explicit guidance on using cultural games. Teachers report lacking confidence and structure for integrating such practices. Moreover, the diversity of students' cultural backgrounds means educators must thoughtfully select games to ensure equity and inclusion. While most traditional games require minimal resources, teachers still note a need for classroom-ready lesson plans, demonstration videos, and peer support structures.

To support sustainable integration, several strategies are emerging. Policy makers in Ghana's Ministry of Education are encouraged to explicitly embed indigenous games in early childhood mathematics standards. Professional development in this area could include workshops, demonstration classrooms, and resource toolkits. Experts also suggest sequencing game difficulty starting from simple counting tasks to strategy-based challenges like *Oware* to align with developmental readiness. Research in Ghana is recommended to adopt mixed-method designs, combining pre-post testing with in-depth classroom dialogue analysis, and to expand studies across regions for greater generalizability.

Collaborations between schools, cultural centers, NGOs, and universities would help create high-quality, culturally grounded numeracy programs that support teacher training, curriculum development, and resource sharing. By valuing and incorporating the cultural capital children bring from home, these approaches challenge traditional power dynamics in education and promote more joyful and effective learning.

In sum, evidence from Ghana and beyond consistently shows that when traditional games such as *Achi*, *Ampe*, and *Oware* are used intentionally in early classrooms,

children benefit cognitively, socially, and emotionally. Executive function skills sharpen, peer discourse flourishes, and essential numeracy concepts take root all while students engage in culturally affirming play. For education systems committed to equity, relevance, and student-centered pedagogies, thoughtfully integrating indigenous games offers a promising and timely path forward.

2.6 Factors that Influence Teachers use of Indigenous Play in Teaching and Learning Numeracy

Cultural Identity and Values

Teachers' use of indigenous play in early numeracy instruction is profoundly shaped by cultural identity and values. When educators harness games, songs, and stories rooted in local heritage, they create a powerful bridge between children's lived experiences and academic learning. This cultural resonance fosters a sense of belonging, enhances engagement, and makes abstract numerical concepts more accessible and meaningful (Akayuure & Nabie, 2007; Hadebe-Ndlovu, 2022).

Firstly, when teachers employ indigenous games such as Ghana's *Oware*, *Pilolo*, or counting rhymes they help learners see mathematics reflected in their own cultural landscape. Children naturally relate to familiar symbols, rhythms, and rituals, which enables them to grasp numeracy ideas more intuitively. For example, bead threading in Ghana operates not only as a creative craft, but also as a means of practicing patterns and addition. Teachers consistently report that using such culturally embedded activities perk students' curiosity and improve retention of numerical skills (Boateng-Nimoh & Nantwi, 2020; Bosomprah, 2024).

This alignment between culture and curriculum signals to children that their identities are valuable. Dismissed or devalued cultural practices in school often lead to disengagement, but when teachers integrate indigenous play, they affirm learners'

cultural heritage boosting self-esteem and willingness to participate (Adu-Gyamfi & Brenya, 2022; Kamau & Otieno, 2021). Indeed, research in multicultural South African classrooms shows that play anchored in local traditions fosters social cohesion and cultural pride, reducing anxiety around academic tasks (Hadebe-Ndlovu, 2022; Mpofu & Shumba, 2019).

Moreover, connecting numeracy lessons to cultural narratives engages families and communities. When children recognize in-class games they also play at home, they experience continuity between home and school, which reinforces learning outcomes and strengthens parent–teacher partnerships (Mwangi et al., 2023; Boateng-Nimoh & Nantwi, 2020). Parents are far more likely to support academic work when it reflects their own cultural frameworks, and children benefit from multifunctional learning environments that cross home and school settings (Adu-Gyamfi & Brenya, 2022; Nabie & Akayuure, 2019).

Teachers themselves report heightened pedagogical motivation when culturally responsive materials align with their own identities and values. In Ghanaian practising *Ampe* or counting songs tied to local festivals inspired teachers to design purposeful, numeracy-centered lessons that felt authentic and enjoyable (Mesesah, 2024; Ntekane, 2018). Their engagement further catalyzes school-wide initiatives, leading to collaborative curriculum innovation and resource sharing.

Cultural identity and values also guide equitable classroom practices. Drawing on a diversity of local games ensures that teachers acknowledge multiple cultural heritages, preventing marginalization. In Zimbabwe and Botswana, careful rotation among games such as *morabaraba*, *diketo*, and local counting rhymes was associated with more

inclusive classroom environments (Chigeza & Whitehouse, 2019; Nyoni & Bindu, 2021).

Beyond motivational aspects, culturally grounded play promotes deep learning. Research with Ghanaian children playing *Oware* has shown that the game fosters arithmetic operations, strategic thinking, and mental computation in a joyful, socially interactive environment (Adu-Gyamfi & Brenya, 2022; Boateng-Nimoh & Nantwi, 2020). Teachers who understand this and design purposeful game-centered lessons demonstrate stronger pedagogical impact.

In summary, cultural identity and values act as a catalytic factor in teachers' adoption of indigenous play for numeracy. They validate children's experiences, build trust between home and school, encourage teacher creativity, and enable content to be taught in a contextually rich and pedagogically powerful way. Without this cultural anchoring, indigenous play risks being seen as novelty rather than a legitimate learning tool a critical distinction for educators striving to foster both academic proficiency and cultural affirmation in early education.

Learners' Interest and Involvement

Children's interest and participation play a crucial role in influencing teachers' decisions to integrate indigenous play into numeracy instruction, particularly in early childhood education settings. Young learners are naturally drawn to activities that are familiar, engaging, and culturally meaningful, and teachers often leverage this enthusiasm to enhance both participation and academic outcomes. Studies have consistently shown that play-based strategies, especially those rooted in indigenous traditions, capture children's attention more effectively than conventional, abstract instructional methods (Pyle et al., 2017; Kim et al., 2021).

When children show excitement and active involvement in numeracy lessons that incorporate familiar games and cultural activities, it motivates teachers to use these approaches more frequently. For instance, Akayuure and Asuo (2013) observed in Ghanaian early childhood classrooms that children displayed higher levels of attentiveness and interaction during numeracy sessions that featured traditional counting games, such as *Pilolo* and *Oware*. These activities created a lively classroom atmosphere where children eagerly participated in counting, grouping, and sequencing exercises, making learning both enjoyable and effective.

Additionally, the participatory nature of indigenous games fosters peer collaboration, which has been shown to improve both cognitive and social outcomes in early numeracy learning (Sarama & Clements, 2009; Adom et al., 2019). Games such as *Antoakyire* and *Kyekye Kule* require children to take turns, observe patterns, and follow rules, naturally encouraging teamwork and communication. Teachers, recognizing this high level of engagement and its benefits for skill acquisition, are more likely to embed such games into their instructional routines (Hadebe-Ndlovu, 2022).

Moreover, children's familiarity with these indigenous activities from their homes and communities makes participation effortless, reducing anxiety often associated with learning mathematics. According to Nabie and Akayuure (2014), when children encounter numeracy concepts in contexts that mirror their lived experiences, they exhibit greater confidence and willingness to engage, which encourages teachers to prioritize these culturally grounded practices in their pedagogy. Thus, children's interest and active participation serve as key motivators for teachers, reinforcing the importance of culturally relevant, play-based numeracy instruction in early childhood education.

Teacher Beliefs and Attitudes

Teachers' beliefs and attitudes significantly influence whether and how indigenous play is integrated into early numeracy education. A teacher's conviction in the educational value of culturally-embedded games can transform them into powerful pedagogical tools or relegate them to mere playtime if viewed merely as distractions (Pyle et al., 2017; Longley et al., 2015).

When teachers hold a strong belief in the academic potential of indigenous play, they are more likely to design lessons that leverage these activities intentionally. In Ghana, educators who trust that games like *Pilolo*, *Ludu*, and counting rhymes (e.g., *Antoakyire*) can be linked with counting, addition, subtraction, and patterning are more apt to scaffold student learning posing purposeful questions, tracking progress, and highlighting math connections (Boateng-Nimoh & Nantwi, 2020; Mesesah, 2024). They embed these forms in structured lessons, sequencing activities and embedding reflection essentially turning play into meaningful, standards-aligned learning. In these classrooms, indigenous play becomes more than culture it is pedagogy.

In contrast, teachers without this conviction may still use cultural games, but in a superficial manner. Longley et al. (2015) observed that even teachers who endorse play-based learning sometimes default to traditional instruction when pressed by time, assessments, or classroom disturbances. Without deeply valuing the educational role of play, these teachers let indigenous activities serve as optional "fun add-ons" rather than integral parts of numeracy development. In such cases, the use of indigenous play is inconsistent and often dropped under pressure.

Professional training has been shown to shift these beliefs. In South Africa, Hadebe-Ndlovu (2022) reported that after workshops emphasizing the academic benefits and

cultural relevance of local games, teachers' attitudes shifted they began viewing indigenous play as essential to student engagement and understanding. Similarly, Zambian educators in Adu-Gyamfi & Brenya's (2022) study showed improved instructional fidelity and deeper classroom discourse following training that demonstrated how traditional games support cognitive skills like reasoning, counting, and strategic thinking.

Reflective practice also deepens teacher attitudes. When educators engage in peer exchange sharing successful indigenous play lessons and student outcomes their confidence grows. Boateng-Nimoh & Nantwi (2020) observed that teachers who observed colleagues successfully integrate bead-threading activities to teach addition became more willing to adapt and innovate themselves.

Teachers' cultural identity and pride also reinforce positive attitudes. For many educators, using indigenous games is an act of cultural validation that resonates personally. As they witness students responding positively, expressing pride, and engaging enthusiastically, their attitudes on the instructional value of indigenous play are strengthened (Adu-Gyamfi & Brenya, 2022; Mpofu & Shumba, 2019).

Conversely, a lack of belief in children's capacity to learn through play can hamper use. Some teachers worry that games might waste instructional time or discipline breaks especially if students are low-performing or disruptive. These beliefs often stem from limited exposure to research affirming play-based learning and lack of mentoring support (Longley et al., 2015; Peng, 2023).

Curriculum Guidelines and Policy Support

Curriculum guidelines, policy frameworks, and administrative support are pivotal in determining whether and how teachers incorporate indigenous play in early childhood

numeracy lessons. Across Ghana and the broader African continent, research underscores that institutional clarity and structured backing are essential for meaningful and sustained implementation.

In Ghana, the 2019 national curriculum reform introduced play-based, child-centered learning into kindergarten education. Yet follow-up studies show many teachers continue to prioritize traditional, didactic approaches. This is largely because the curriculum references "play" only in general terms, without explicit mention of indigenous games or detailed examples linked to numeracy (Avornyo, 2025; Children Believe/UDS, 2024). In such cases, teachers often lack the curriculum-level guidance necessary to integrate culturally rooted pedagogies into math lessons (Children Believe/UDS, 2024).

Ethnographic work in central Ghana highlights the consequences of this ambiguity. Educators report that while they appreciate the cultural relevance of traditional games, they hesitate without clear administrative direction or curricular models (Boateng-Nimoh & Nantwi, 2020). This absence of explicit curriculum guidance means reliance on individual teacher initiative or NGO support approaches that seldom endure when external partnerships end (Boateng-Nimoh & Nantwi, 2020).

In contrast, programs with strong policy and guideline support demonstrate far greater success. In Zambia, a recent action research project embedded indigenous games such as pebble distribution and bean counting within official numeracy materials made available to teachers. These materials were accompanied by district-level support and in-service workshops, helping teachers confidently integrate traditional games with numeracy objectives and achieve measurable improvements in learners' number sense

(Adu-Gyamfi & Brenya, 2022). Their findings suggest that policy coherence, formal curriculum references paired with in-class support, is essential for institutional uptake.

Similarly, in Kenya's Bungoma region, a government-led rollout of play-based kits featuring local games like hopscotch, bottle-top counters, and culturally meaningful rhymes resulted in consistent classroom use. The success was attributed to the kits' explicit link to regional curriculum outcomes and teacher support sessions that reinforced their use (Mwirigi et al., 2023). These successes underline how direct curriculum alignment, supported by administrative facilitation, can translate cultural pedagogies into classroom routines.

Evidence from South Africa further validates these insights. Hadebe-Ndlovu (2022) found that indigenous play flourished in schools where leaders recognized traditional games as valid pedagogical methods as demonstrated through observations, mentoring, and supervisory feedback. Teachers in these settings reported newfound confidence in weaving play into math lessons, while in other schools lacking such structures, the activities seldom went beyond casual use.

In Ghana, the 2023 introduction of an INSET (in-service) package for kindergarten teachers aimed at enhancing play-based instruction developed in collaboration with NGOs such as Right To Play yielded promising results. Teachers who engaged with the program demonstrated increased creativity and sustained use of indigenous games in math lessons; yet, where follow-up and resources were inconsistent, its impact waned (GES, 2023).

Crucially, one area where policy sensitivity makes a significant difference is assessment. Preliminary findings from pilot schools in Greater Accra show that when assessment rubrics include metrics aligned with play-driven learning, such as strategic

thinking, collaborative skills, and counting accuracy, teachers are more likely to integrate indigenous play consistently (GNA, 2024). This is consistent with work by Yang and Li (2024), who found that teachers match pedagogical methods to what they know will be valued in formal assessments and inspections.

Persistent challenges include curricular vagueness, where generic references to "play" fail to translate into classroom practice; policy-practice gaps, where policy change lacks systemic tools and methods; and misalignment with assessment, which pressures teachers toward conventional instruction even when play is pedagogically rich.

Pedagogical Content Knowledge

Teacher Pedagogical Content Knowledge (PCK) and the integration of subject understanding and teaching skills, is a pivotal factor influencing how educators use indigenous play to teach numeracy in early childhood. Recent studies across Ghana and southern Africa demonstrate that teachers with strong PCK are significantly more effective at embedding indigenous games into lessons in meaningful, conceptually robust ways.

Educators with deeper PCK could intentionally scaffold counting, addition, subtraction, and sequencing through play, using probing questions and linking game outcomes to specific numeracy aims (Randhawa, 2023). Other teachers, however, expressed hesitation, acknowledging that although they valued indigenous play for cultural reasons, they lacked confidence in connecting these activities to rigorous numeracy goals (Subeini, 2021).

In southern Africa, Mwinsa and Dagada (2024) implemented participatory action research with Zambian preschool teachers. Initially, educators were enthusiastic about traditional games but struggled to translate them into structured math learning. Through

collaborative training, they co-created lesson plans and math-focused tasks linked to local games such as *calabash counting* and bead threading. As their PCK strengthened, teachers reported richer classroom dialogues, more purposeful scaffolding of numeracy concepts, and higher learner engagement. Quantitative pre-post assessments reflected these shifts, with significant improvements in children's number sense (Mwinsa & Dagada, 2024).

Hadebe-Ndlovu (2022) studied inclusive education settings in KwaZulu-Natal, South Africa. Teachers who received workshops on linking indigenous counting games with curriculum standards in numeracy reported higher classroom confidence and more student-centered pedagogies. They were able to adapt games to accommodate learners with diverse needs a direct result of enhanced PCK.

International research confirms these findings. Pyle and Danniels (2017) argue that combining cultural awareness with mathematics instructional skill is essential for effective use of play in teaching. Fisher et al. (2020) note that teachers with robust subject and pedagogical knowledge are more likely to integrate manipulatives meaningfully, aligning play with cognitive objectives rather than letting it remain free-form.

A structured PCK approach enables teachers to move beyond play-for-play's sake. They can design purposeful learning sequences, frame games with mathematical questions, support reflective discussions post-play (e.g., "How many beads did you thread? How did you know? Can we add more?"), and seamlessly integrate these into broader numeracy objectives. Warusavitharana et al. (2023) highlight that such integration yields long-term retention of numeracy skills in culturally responsive teaching contexts.

Conversely, weak PCK leads to superficial integration. Teachers may include indigenous games for enjoyment or cultural expression but fail to emphasize numeracy, leaving mathematical learning incidental. In resource-limited settings, this disparity widens gaps in student learning compared to classrooms supported by teachers with strong ethnomathematical PCK (Longley et al., 2015; Ali et al., 2021).

Improving teacher PCK requires targeted professional development. Mwinsa and Dagada's methodology, combining resource kits, co-planning sessions, classroom modeling, and reflective peer debriefs, offers a replicable framework. Similarly, classroom-based mentorship, demonstration lessons, and exposure to culturally grounded mathematics practices in training significantly improve teachers' ability to use indigenous play effectively.

In Ghana, students in teacher training programs exposed to ethnomathematics projects showed greater facility in selecting and adapting cultural games for numeracy lessons. Subsequent in-service training sustained these practices when supported by coaching and peer networks (Boateng-Nimoh & Nantwi, 2020).

Availability of Resources and Instructional Materials

Access to appropriate resources and instructional materials fundamentally shapes teachers' ability to integrate indigenous play in teaching numeracy to young learners. This review examines how resource availability or the lack of it affects the use of culturally rooted games and activities, drawing on recent studies from Ghana, Zambia, South Africa, Kenya, and related international contexts.

In Ghana's Sekyere East and comparable regions, educators often rely on improvised materials such as seeds, pebbles, dice, bead strings, and Adinkra symbol patterns to implement Indigenous play-based numeracy lessons. However, they report a notable

absence of structured instructional guides, visual prompts, and ready-to-use classroom resources (Garay Abad, & Hattie, 2025). This forces teachers to individually design games and integrate math concepts without clear supports, thereby limiting frequency and consistency. As Subeini observed in Nkoranza North, teachers frequently resort to bundled sticks or bottle tops due to budget constraints, despite these manipulatives' pedagogical potential. When structured materials are lacking, teachers' confidence diminishes, leading them to prioritize standard instruction over play-based methods (Ali et al., 2024; Brantuo et al., 2023).

Evidence from indigenous play pedagogy in Southern Africa reinforces this picture. Mwinsa and Dagada (2024) implemented participatory action research in rural Zambian early childhood centres, finding that teachers equipped with guides for 33 traditional games, including clear rules, probes, and instructional links to math, rapidly adopted play-based numeracy instruction. Before this resource intervention, teachers reported hesitation due to uncertainty about mathematical connections. Once supplied with well-designed toolkits, their classroom practices transformed, reflecting improved engagement and skill development among learners. Similarly, in South Africa, Hadebe-Ndlovu (2022) found that in multiple schools, teachers who had access to culturally relevant visual guides and facilitation frameworks felt more confident incorporating games during numeracy lessons than those who did not.

Kenya's Bungoma South offers further confirmation: a mixed-methods study demonstrated a strong positive correlation ($p<0.05$) between the availability of play resources such as beanbags, sand trays, and bottle-top counters and preschoolers' numeracy outcomes (Mwirigi et al., 2023). Schools possessing dedicated numeracy play corners, stocked with manipulatives, enabled more regular and effective use by

teachers, whereas those without such infrastructure struggled to make indigenous play a viable option.

The challenges faced in these contexts align with findings on national-level disparities in Ghana. A systematic review by Ali and colleagues (2021) charted stark resource discrepancies: urban schools often have digital tools and manipulative sets, while rural schools lack even basic numeracy materials. This divide not only limits the use of indigenous play but also reduces teacher efficacy, as many feel unable to convey mathematical ideas without visual or tactile aids.

Beyond material availability, teachers emphasize the need for guidance materials step-by-step instructions, probing questions, and mathematically aligned learning objectives to use indigenous games purposefully. Mwinsa and Dagada (2024) found that when teachers understood the numeric potential of games through illustrative guides, they could intentionally scaffold key concepts like grouping, counting, and addition. Without these supports, games often remained mere entertainment.

Professional development and peer support also interact closely with resource availability. Mwinsa and Dagada (2024) show that teachers in resource-limited rural areas, when given access to both materials and training, were significantly more likely to sustain and embed indigenous play in routine instruction. Without proper tools even with training the impact of workshops was transient.

These findings are supported by research in multicultural preschools globally: Longley et al. (2015) documented how teachers who endorse play-based learning nonetheless default to direct instruction in resource-scarce environments. According to Fisher et al. (2020), without manipulatives and planning tools, free play becomes difficult to align with explicit learning outcomes particularly for cognitive domains such as numeracy.

Community and Parental Support

Community and parental support significantly shape the extent to which teachers adopt indigenous play in teaching numeracy. When traditional games and activities are woven into children's daily lives through customs, storytelling, or community gatherings, teachers are much more likely to recognize their educational value and integrate them into formal classroom instruction. Cultural alignment between home and school environments fosters smooth reinforcement of numeracy concepts and enhances both teacher confidence and learning outcomes (Akayuure & Nabie, 2007; Adu-Gyamfi & Brenya, 2022).

In Ghana, teachers report that when parents and elders actively engage in counting games like *Oware*, *Achi*, or bead threading at home, children enter school already familiar with the structure and vocabulary of these activities. This familiarity allows educators to focus on extending numeracy concepts such as grouping, addition, subtraction, and strategic counting rather than introducing the game itself (Boateng-Nimoh & Nantwi, 2020; Mesesah, 2024). The reinforcing presence of these games in both the household and classroom strengthens cognitive connections and cultural identity.

Participatory action research in Zambia also confirms this dynamic. Mwinsa and Dagada (2024) documented that when teachers collaborated with community leaders to revive traditional play, classroom implementation improved dramatically. Community buy-in resulted in shared ownership, where parents volunteered as play facilitators and brought materials like seeds, beads, or crafted boards for classroom use. Teachers credited these partnerships with enhancing sustainability and depth of learning.

In multicultural classrooms, parental support can validate indigenous play in the eyes of educators. When teachers observe children teaching peers unfamiliar games from their home regions, they see the pedagogical power of cultural exchange. Educators in South Africa reported increased confidence to use indigenous activities when community members who hold cultural authority endorsed the games as educational tools (Hadebe-Ndlovu, 2022). Such validation counters entrenched colonial narratives that have historically devalued local knowledge.

Furthermore, parental reinforcement solidifies numeracy learning across contexts. When teachers send home bead patterns to thread or *Pilolo* rhyme tasks, parents confirm their utility as tools for practical stress-free learning, not merely play. Nabie and Akayuure (2019) link positive parental engagement with deeper, more sustained numeracy gains and greater teacher motivation to maintain culturally rooted approaches.

2.7 Barriers that Teachers Encounter in using Indigenous Play to Teach Numeracy

Limited Instructional Time and Packed Curriculum

A critical barrier to integrating indigenous play into early numeracy instruction is the limited instructional time and heavily packed curriculum that many educators face. Despite recognizing the pedagogical value of culturally relevant games and activities, teachers often find themselves constrained by the demands of standard-based curricula and formal benchmarks, leaving little freedom to explore play-based approaches (Boateng-Nimoh & Nantwi, 2020; Adu-Gyamfi & Brenya, 2022).

In public school systems, accountability systems tied to syllabus coverage and standardized assessment dominate the educational landscape. Teachers under pressure to demonstrate academic progress feel compelled to adhere strictly to prescribed lesson

plans, focusing predominantly on direct instruction of mathematical concepts (Longley et al., 2015; Pyle et al., 2017). As a result, time-consuming play activities even when culturally resonant are often skipped or truncated to make room for high-stakes content delivery. These systemic constraints hinder the holistic learning that culturally grounded play can provide.

Moreover, the curricular context often lacks explicit scheduling flexibility to accommodate culturally specific play. Teachers in Zambia and South Africa noted that although play is mentioned in pedagogical guidelines, there is no structured provision such as allocated blocks or integrated lesson sequences for traditional game-based numeracy activities (Hadebe-Ndlovu, 2022; Adu-Gyamfi & Brenya, 2022). This absence of time allocation reflects policy-level oversight, signaling to educators where their instructional priorities should lie.

Furthermore, packed curricula hamper the pedagogical planning needed for effective indigenous play. Boateng-Nimoh and Nantwi (2020) argue that purposeful integration of cultural games into numeracy instruction requires careful lesson design, question scaffolding, and assessment alignment tasks that demand both time and professional support. Without dedicated planning periods, teachers resort to superficial, ad hoc use of games that fail to reinforce numeracy skills in depth.

In contrast, educational systems that afford structured time for play-based learning experience more sustained integration. Kenya's Bungoma South region, with its play-based kits and lesson frameworks, provides teachers with scheduled opportunities to use traditional games, leading to consistent implementation and improved numeracy outcomes (Mwirigi et al., 2023). This illustrates that when curriculum systems

explicitly allocate time for indigenous play, teachers feel justified in its use as a legitimate educational strategy rather than a luxury.

Inadequate Resources and Play Materials

A major obstacle to integrating indigenous play into early numeracy teaching is the widespread inadequacy of resources and culturally authentic play materials. Traditional games like *Oware*, *Pilolo*, *Achi*, and indigenous counting rhymes depend on locally sourced items such as seeds, pebbles, wooden boards, and beads yet many early childhood centres lack these materials or deem them unsafe and non-compliant with school health regulations (Nabie & Akayuure, 2019; Hadebe-Ndlovu, 2022).

In Ghana, educators report relying on improvised tools bottle tops, random sticks, or scraps of paper to replicate traditional counting activities, but note that these often fail to evoke the cultural authenticity of the original game context. Boateng-Nimoh & Nantwi (2020) found that when teachers used such substitutes, children did not connect as strongly to patterns, symbolism, or cultural meaning embedded in traditional games, reducing impact on numeracy. Teachers also noted concerns around cleanliness, choking hazards, or unsanitary conditions when school administrators discouraged the use of natural materials like seeds or small stones (Mesesah, 2024).

Similarly, Hadebe-Ndlovu (2022) observed that teachers in KwaZulu-Natal hesitated to teach *Oware* or indigenous dice games due to missing boards and seeds, leading to reliance on worksheets instead. These resource gaps directly impinge upon teachers' ability to offer vibrant, culturally meaningful play.

Furthermore, educational resource provisions often do not include culturally specific manipulatives. National early childhood resource kits tend to feature generic tools such as plastic cubes or commercial blocks lacking cultural relevance to indigenous play

(Nabie & Akayuure, 2019). Teachers report difficulty advocating for locally sourced materials in preschools, citing rigid procurement guidelines that prioritize manufactured items. This structural bias reinforces a sanitized, uniform approach to early education at the expense of culturally grounded pedagogy.

The lack of play materials also hampers teacher planning. Adu-Gyamfi & Brenya (2022) found that teachers were less likely to devote time to lessons involving indigenous play if they were uncertain about obtaining adequate materials. Packaged game instructions and lesson plans are useless without concrete tools they need to match the planning grid to actual resources.

Yet when indigenous materials are available, the impact is transformative. In Ghanaian pilot schools supported by NGO programs, educators received seed-and-board packs for *Achi* and *Oware*, as well as scripts for counting rhymes. Within weeks, teachers reported heightened student engagement, deeper cultural resonance, and improved numerical fluency (Denkyira et al., 2023). These findings underscore the importance of resource provisioning as a missing link enabling the pedagogical benefit of indigenous play.

Insufficient Pedagogical Knowledge and Training

A key barrier to the effective integration of indigenous play in numeracy instruction is teachers' insufficient pedagogical content knowledge (PCK) and lack of targeted training. Although many educators personally value traditional games, songs, and rhymes, they often lack the structured teaching strategies needed to connect these activities meaningfully to specific mathematical learning outcomes (Akayuure & Nabie, 2007; Mesesah, 2024).

However, without pedagogical guidance, these activities often fail to reinforce numeracy concepts deliberately and measurably. Teachers typically revert to conventional teaching textbooks and exercises particularly when pressed to meet academic standards (Boateng-Nimoh & Nantwi, 2020; Adu-Gyamfi & Brenya, 2022). As a result, indigenous play remains culturally meaningful but pedagogically superficial, limiting its impact on students' understanding of number operations, pattern recognition, and problem-solving.

In Zambia, a participatory action research project revealed that teachers were enthusiastic about indigenous games but lacked lesson planning skills that align play with mathematical objectives. After structured training, they incorporated clear scaffolding, guiding questions, and numeracy-focused discussions into gameplay. This resulted in more purposeful numeracy instruction, enhanced classroom dialogue around math, and improved student performance in early number skills (Mwinsa & Dagada, 2024).

South African research confirms similar findings: teachers reported low confidence in integrating local heritage games into math instruction without pedagogical frameworks (Hadebe-Ndlovu, 2022). Following targeted workshops covering lesson design, integration strategies, and classroom management of active play, these teachers demonstrated increased use of culturally grounded games and improved student numeracy outcomes.

International literature reinforces the importance of PCK in play-based education. Pyle and Danniels (2017) emphasize that educators need to understand how children learn through play and how to intentionally embed learning goals. Fisher et al. (2020) argue

that without strong pedagogical knowledge, play becomes recreational rather than instructional.

As emphasized by Boateng-Nimoh and Nantwi (2020), creating pedagogical resources such as teacher guides linking traditional games to numeracy skills and example lesson plans is crucial. When teachers feel equipped with strategies and know where each activity fits within the curriculum, they are more willing to use indigenous play systematically and with purpose.

Effective strategies include in-service and pre-service training infused with ethnomathematical methods, classroom modeling by mentor teachers, and peer reflection groups. Specifically, collaborative lesson planning analyzed through reflective learning inquiries can empower teachers to transform cultural games into instructional tools aligned with national numeracy standards.

Negative Attitudes and Perceptions

Despite growing recognition of the benefits of indigenous play in early numeracy instruction, persistent negative attitudes and perceptions among some educators and school leaders continue to hinder its integration. Rooted in colonial-era schooling models that prioritized Eurocentric academic standards, these biases contribute to viewing indigenous games as recreational distractions rather than legitimate instructional tools (Hadebe-Ndlovu, 2022; Kamau & Otieno, 2021).

Research in Ghana demonstrates that even well-meaning teachers may hesitate to incorporate culturally grounded play, fearing that it will not be valued by educational authorities (Boateng-Nimoh & Nantwi, 2020). They worry their lessons will be criticized for not appearing "serious enough" particularly during numeracy sessions that are traditionally focused on textbook drills and calculations (Adu-Gyamfi & Brenya,

2022). This sentiment is mirrored in qualitative work from South Africa, where teachers who initially attempted to incorporate local games were discouraged by administrators who viewed play as wasteful, out of step with academic rigor (Hadebe-Ndlovu, 2022).

Such skepticism is reinforced by teacher training programs that emphasize direct instruction and standardized assessments, while offering limited exposure to culturally responsive teaching (Longley et al., 2015; Pyle et al., 2017). Educators accustomed to traditional models often struggle to reconcile playful methods with what they are taught defines effective teaching.

Moreover, cultural biases can become internalized. In studies from Kenya, some teachers expressed embarrassment when using local games in academic settings, fearing ridicule from peers or loss of professional credibility (Kamau & Otieno, 2021; Mwangi & Wanjiru, 2023). This leads to tokenistic or inconsistent use of indigenous play, confined to occasional cultural days or extracurricular time rather than integrated into daily numeracy lessons.

Even when teachers appreciate the value of indigenous play, they may lack the confidence to defend its use. Hadebe-Ndlovu (2022) found that teachers in schools with strong academic performance cultures often avoid game-based strategies, fearing negative judgments from parents or inspectors. These perceptions, combined with performance pressures, diminish the likelihood of sustained implementation.

To address these negative attitudes, teacher education and leadership development must emphasize the academic credibility of play-based approaches. Research shows that when educators receive evidence of improved learning outcomes through traditional games and when school leaders explicitly support these methods, perceptions begin to shift, resulting in more creative and culturally rooted numeracy instruction (Adu-

Gyamfi & Brenya, 2022; Boateng-Nimoh & Nantwi, 2020). Without confronting these lingering prejudices, indigenous play will remain marginalized, limiting its potential to enrich early numeracy education through culturally responsive pedagogy.

Lack of Curriculum and Policy Support

Many educational contexts, especially across Ghana and other part of the world continue to treat "play" as a broad, optional pedagogical method, without offering explicit curriculum guidelines or structured lesson frameworks for indigenous games (Children Believe/UDS, 2024; Adu-Gyamfi & Brenya, 2022). As a result, teachers often feel unsure how to align traditional games with learning objectives, pacing schedules, and standardized assessments. Without official curriculum or policy backing, indigenous play risks being perceived as extracurricular, lacking legitimacy in serious numeracy instruction (Boateng-Nimoh & Nantwi, 2020; Hadebe-Ndlovu, 2022).

This uncertainty is especially acute in settings with stringent demands for curriculum coverage and test-based evaluation. Educators frequently choose to omit indigenous play to avoid detectability by inspectors and parents who expect visible, textbook-based content (Longley et al., 2015; Pyle et al., 2017). The dearth of training, structured lesson guides, and administrative endorsement contributes to ad hoc, unsustainable use of indigenous activities even amongst teachers who recognise their cultural and educational value (Adu-Gyamfi & Brenya, 2022; Mesesah, 2024).

A clear signal from policy that indigenous play is not only welcome but recommended and accounted for through assessment rubrics, teacher performance reviews, and preservice training is key. Programs that integrate play-based numeracy into core curriculum and evaluation structures, such as pilot interventions in Kenya and Ghana's

INSET programs, demonstrate greater teacher buy-in and effective practice (Mwirigi et al., 2023; GES, 2023). However, these initiatives remain localized or donor-dependent without broader educational policy integration.

Limited Parental and Community Involvement

The educational value of indigenous play is closely tied to its presence in home and community life. Traditional activities like counting songs, bead-threading, and folklore games are typically passed down through family and communal interactions, fostering cultural identity and familiarity (Adu-Gyamfi & Brenya, 2022; Mwirigi et al., 2023). However, factors such as urbanization, shifting lifestyles, and modern schooling pressures have weakened these intergenerational traditions, especially in urban areas (Denkyira et al., 2023). As a result, teachers face challenges when learners arrive with limited exposure to indigenous games, requiring extra time for explanations before numeracy lessons can begin (Mwinsa & Dagada, 2024). Additionally, when parents view these games as outdated or irrelevant to academic success, they fail to reinforce them at home, limiting children's practice opportunities (Fisher et al., 2020; Hadebe-Ndlovu, 2022). This weakens community-school collaboration, leaving teachers solely responsible for instruction, materials, and cultural transmission within already constrained classrooms.

Large Class Sizes

Large class sizes present a considerable barrier to teachers' ability to effectively integrate indigenous play into numeracy instruction. Overcrowded classrooms dilute the individual attention essential for facilitating game-based learning, which relies on close observation, guided interaction, and safety supervision crucial factors when

employing physical or manipulative activities based on local cultural practices (Boateng-Nimoh & Nantwi, 2020).

Teacher-student ratios frequently exceed recommended standards in many public early childhood centres, especially in urban and peri-urban settings. For instance, Kenyan classrooms often contain 50-60 pupils per teacher, far surpassing the ideal 25:1 ratio for active, hands-on learning (Ministry of Education, Kenya, 2020; Chagema, 2025). Such numbers make it nearly impossible to maintain order, give individual feedback, or support group play without risking injury or confusion (Chagema, 2025; Women Educational Researchers of Kenya, 2024).

Teachers report that when they attempt to introduce indigenous games like *Pilolo* or number-based board games, only a fraction of students can participate at a time. This necessitates prolonged transitions and fragmented rotations, reducing the overall efficacy of play-based math learning. Instead of having one game session, educators end up navigating delays, quieting restless children, and defending their approach as valuable ultimately diminishing instructional time (Right To Play, 2025).

Furthermore, the stress of managing large groups discourages teachers from sustaining culturally grounded play. As one study noted, in crowded settings there is a tendency to revert to traditional lecture-style numeracy instruction, which is more manageable but less engaging or culturally responsive (Longley et al., 2015; Pyle et al., 2017). Teachers express that play-based methods feel untenable under such conditions, reinforcing a cycle of reliance on didactic teaching approaches (Ministry of Education Kenya, 2020).

Conversely, when class sizes are smaller, educators are able to monitor children's interactions, facilitate peer discussion, and provide language-rich scaffolding necessary

for numeracy through play. Pilot projects in Uganda and Ethiopia show that even in refugee camps, reducing group sizes and using grouping strategies enables successful use of local songs and games for counting, sequencing, and mathematical discourse (PlayMatters, 2023).

Research consistently confirms that smaller class sizes support individualized and hands-on learning, resulting in better academic outcomes, including math performance (OECD, 2014; Project Prime Time, 1987). Teachers in Ghana involved in the Partners in Play project reported that when class sizes at their centres were reduced, they could more confidently host indigenous game-based sessions with minimal behavioral issues (Right To Play, 2025).

Addressing class size barriers necessitates systemic interventions: hiring more teachers, expanding physical classroom spaces, and redesigning timetables to accommodate play-based learning. Without these supports, teachers remain constrained forced to prioritize coverage of numeracy content in ways that preclude the rich, culturally resonant benefits of indigenous play.

2.8 Strategies to Enhance the Use of Indigenous Play in Early Childhood Centres

Creating Enriched Learning Environments

Early childhood centers prioritize the creation of rich, stimulating environments conducive to play-based learning. They design classrooms with cultural-resource materials, flexible spaces, and inviting play areas to inspire children's exploration and creativity (Boyd & Uysal, 2020). Incorporating natural elements, such as plants and sensory Creating enriched learning environments significantly enhances the effectiveness of play-based pedagogy in early childhood education. By intentionally designing classrooms with open-ended materials, flexible spaces, and inviting play

areas, educators inspire children's exploration, creativity, and engagement (Boyd & Uysal, 2020). Enriched environments incorporate natural elements, sensory materials, and interactive learning centers, providing diverse opportunities for hands-on exploration and discovery. These environments stimulate children's imaginations, promote social interaction, and support the development of essential cognitive and motor skills. Moreover, enriched learning environments foster a sense of wonder and curiosity, encouraging children to take ownership of their learning experiences and pursue their interests independently. By prioritizing the creation of enriched learning environments, early childhood educators cultivate dynamic spaces where play flourishes as a central vehicle for learning and development, ultimately fostering optimal outcomes for young children. materials further enrich the sensory experiences and support children's holistic development.

Professional Development and Training

Investing in ongoing professional development is essential for empowering educators to effectively implement play-based pedagogy. Early childhood centers provide training sessions, workshops, and coaching opportunities to enhance teachers' knowledge and skills in designing and facilitating play-based activities (Baker et al., 2018). By cultivating a culture of continuous learning, centers ensure that educators remain abreast of current research and best practices in play-based education.

Professional development and training play a crucial role in enhancing the use of play-based pedagogy in early childhood education. By investing in ongoing training sessions, workshops, and coaching opportunities, educators gain the knowledge and skills needed to design and implement effective play-based activities (Baker et al., 2018). Professional development empowers educators to understand the theoretical

underpinnings of play-based learning, cultivate supportive learning environments, and scaffold children's play experiences appropriately. Through continuous learning and reflection, educators stay abreast of current research and best practices, ensuring that play remains at the forefront of their instructional approach. Ultimately, professional development and training foster a cadre of skilled educators equipped to harness the transformative power of play in promoting children's holistic development and academic success.

Collaborative Planning and Reflection

Collaborative planning and reflection significantly enhance the implementation of play-based pedagogy in early childhood education. Educators engage in regular team meetings and reflective practices to evaluate the effectiveness of their pedagogical strategies and adjust them based on children's interests and developmental needs (Gonzalez-Mena & Eyer, 2019). By sharing ideas, resources, and insights, educators collaborate to co-create curriculum plans that prioritize play-based approaches. This collaborative process fosters a culture of innovation and continuous improvement within early childhood settings, ensuring that play remains central to children's learning experiences.

Engaging Families as Partners

Early childhood centers recognize the importance of engaging families as partners in children's learning journey. They involve parents in curriculum planning, encourage participation in classroom activities, and provide resources for extending play-based learning experiences at home (Epstein, 2018). Open communication channels, such as newsletters, parent-teacher conferences, and family workshops, foster meaningful

connections between educators and families, ensuring alignment between home and school environments.

Parental involvement is pivotal in facilitating the implementation of play-based pedagogy in early childhood education. Engaging parents through open communication channels, such as newsletters, parent-teacher conferences, and family workshops, fosters meaningful partnerships between educators and families (Epstein, 2018). When parents understand the value of play in promoting children's learning and development, they are more likely to support play-based approaches both at home and in school. By involving parents in curriculum planning, encouraging participation in classroom activities, and providing resources for extending play-based learning experiences, educators create cohesive learning environments that promote children's holistic growth and well-being.

2.9 Conceptual Framework

Indigenous play activities such *pilolo, oware, dame,* and *ampe* are used to teach numeracy in the kindergarten classrooms. These activities could improve and arouse the interest of learners in studying numeracy concepts. However, the views of teachers on the use of indigenous play in teaching numeracy could influence how they implement indigenous play in teaching numeracy in the kindergarten classroom. Moreover, when teachers use indigenous play/games in teaching numeracy, learners could benefit. Learners will learn and develop their numeral skills unconsciously in the classroom. Thus, assessing teachers use of indigenous play in teaching numeracy could help improve teacher and learner performance in the kindergarten classroom.

Figure 2.6 depicts the conceptual framework of the study.

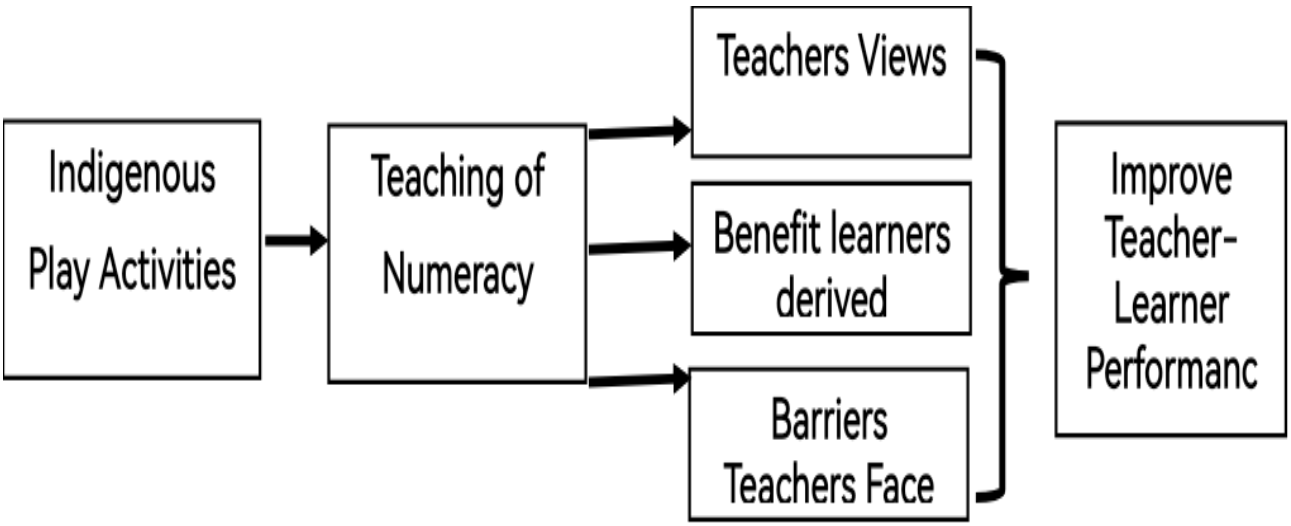


Figure 2.6: Conceptual Framework of the Study Source: Researcher Construct (2022)

2.4Summary of Literature Review

The literature reviewed established that indigenous play activities such as traditional songs, games like *Pilolo* and *Oware*, and cultural crafts are valuable tools for teaching numeracy, fostering cultural identity, and promoting active learning. Several factors influencing their use were identified, including teacher beliefs, pedagogical knowledge, curriculum demands, resource availability, and community support. Barriers such as large class sizes, limited instructional time, and negative perceptions were also noted. However, few empirical studies, particularly in Ghana's Sekyere East District, had systematically explored teachers' actual use, experiences, and contextual challenges regarding indigenous play in numeracy instruction. This study addressed that gap by providing qualitative, context-specific insights directly from early childhood teachers in the district, revealing both practices and challenges unique to their setting.

CHAPTER THREE

METHODOLOGY

3.0. Overview

This chapter covers the research philosophy research approach, research design, study area, population of the study, sample size and sampling procedure, data collection instruments, validation of data collection instruments (pilot-testing and trustworthiness), data collection procedure, data analysis procedure and ethical consideration.

3.1. Research Philosophy

This study's philosophical perspective or assumption was interpretative paradigm. A research paradigm describes the assumptions and beliefs about how the world is perceived and serves as the philosophical framework that guides the researcher's actions. The interpretive paradigm was chosen for this study because it allowed the researcher to access the experiences and perspectives of the kindergarten teachers in order to understand how they use indigenous play to teach numeracy in their classrooms, and interact more with the kindergarten teachers, making the researcher active in the research.

The interpretive paradigm, according to Assifuah-Nunoo, (2023) contends that social reality is created collaboratively through meaningful interaction between the researcher and the researched-on agreement. Interpretivism's ontological position is relativism. The relativist viewpoint holds that reality is subjective and varies from person to person. Our senses mediate our perceptions of reality. Thus, reality is created through the interaction of language and aspects of a self-contained world. Subjectivism's interpretive epistemology is based on real-world phenomena. The world does not exist

apart from our understanding of it. Meaning is created through the interaction of consciousness and the world, not discovered. (Kotchoubey, 2018).

The interpretative paradigm was chosen for this study because it provides a suitable framework for exploring the lived experiences and perspectives of kindergarten teachers on their use of Indigenous play in teaching numeracy in the Sekyere East District. This paradigm views reality as subjective and constructed through social interaction, making it ideal for uncovering the culturally embedded practices of teachers. It allows the researcher to actively engage with participants, facilitating meaningful dialogue and capturing the nuanced interpretations behind their teaching strategies. The interpretative paradigm also acknowledges multiple realities shaped by individual experiences, enabling the study to document diverse approaches to Indigenous play. This philosophical perspective ensures that teachers' voices and contextual practices are central to the study's findings.

3.2. Research Approach

The study used a qualitative research approach. The primary goal of qualitative research is to discover and interpret how people construct meaning and make sense of their lives and worlds (Merriam & Tisdell, 2015). That is consistent with the study's goal, which is to assess teachers' use of indigenous play in teaching numeracy at the early childhood education centres in Sekyere East District. Furthermore, the use of a qualitative research approach in this study allowed the researcher to focus on an interview and observation process that complemented the study's purpose. The qualitative approach was chosen for this study because it provided a platform for kindergarten teachers to tell their stories. (Lynch, 2015).

As a result, the teachers reflect on their practices and recognize their own strengths and weaknesses in the role of using indigenous play to teach numeracy in their classrooms. Qualitative researchers, according to Ravitch and Carl, (2019) are interested in how people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences.

The qualitative research approach was chosen for this study because it aligns with the objective of exploring teachers' use of Indigenous play in teaching numeracy in Sekyere East District. Merriam and Tisdell (2015) emphasize that qualitative research seeks to understand how individuals make sense of their experiences, which is central to this study. This approach enabled the researcher to use interviews and observations, providing a platform for teachers to share their personal stories and classroom experiences (Lynch, 2015). It also encouraged teachers to reflect on their practices, as qualitative research values participants' interpretations and the meanings they assign to their experiences (Ravitch & Carl, 2019).

3.3. Research Design

As a research design, a descriptive case study was used in this study. A research design is a plan or guide for data collection and interpretation that includes a set of rules that allow the researcher to conceptualize and observe the problem under study (Mayer, 2015). The use of a descriptive case study as a research design was deemed appropriate because it allowed the researcher to describe and interpret the participants' thoughts and feelings, as well as find meaning in their shared stories about using indigenous play to teach numeracy in their classrooms. Furthermore, the use of this design allowed the researcher to understand kindergarten teachers' interpretations on the use of indigenous play to teach numeracy; how teachers use indigenous play to teach numeracy in their classrooms; benefits learners derived from teachers' use of indigenous play in teaching

numeracy; and barriers teachers face when using indigenous play to teach numeracy in their classroom. A descriptive case study, according to Nhlapo, (2020 it is designed to describe natural phenomena that occur within the data in question.

The descriptive case study design was chosen for this study because it offers a practical framework for exploring and interpreting how kindergarten teachers in the Sekyere East District use Indigenous play to teach numeracy. Mayer (2015) describes a research design as a plan for data collection and interpretation, and the case study design allowed the researcher to gain in-depth insights into participants' thoughts, feelings, and classroom practices. This design was suitable as it provided an opportunity to explore teachers' interpretations, the benefits learners gain, and the challenges faced in using Indigenous play. As Nhlapo (2020) notes, a descriptive case study captures naturally occurring phenomena within a specific context, making it ideal for this study's objectives.

3.4. Study Area

The study was carried out at public early childhood centres run by the Sekyere East District. This area was chosen for the study because the main education goal of district to improve teachers and learners' performance. Thus, assessing teachers' use of indigenous play to teach numeracy could add up to the teachers and learners' performance in the district. The Sekyere East District, created in 1988 has Effiduase as its capital. It is one of the 30 districts in the Ashanti Region of Ghana. The district is located in the North-Eastern part of Ashanti Region, approximately between Latitude 6º45'- 6º55' North and Longitude 1º15'-1º25' West.

However, the district shares boundaries with Sekyere Kumawu District to the North-East, Asante-Akim Central Municipal to the SouthEast, Ejisu-Juaben Municipal to the

South-West, Sekyere South District to the west and Asante Akim North District to the East. It covers an estimated land area of about 239.1square kilometres and has about forty-two (42) major settlements of varying sizes. The district is endowed with tourist sites such as the *Efiefi Grove* at Effiduase from which the district capital derived its name and River Gyamire fish pond at Asokore. *Odwira* is the festival celebrated by the people of Effiduase during which they purify all ancestral stools and for a period of one month, there is prohibition of drumming and noise-making within the traditional chiefdom. The District has 62 pre-schools, 62 Primary Schools and 34 Junior High Schools, four (4) Senior High Schools, namely, Effiduasi Senior High/Commercial, Asokore T.I.Ahmadiyya Girls Senior High, Hamdaniyya Senior High and Krobea Asante Technical/Vocational (Agbenu & Nabare, 2014).

The Sekyere East District, created in 1988 has Effiduase as its capital. It is one of the 30 districts in the Ashanti Region of Ghana. The district shares boundaries with Sekyere Kumawu District to the North-East, Asante-Akim Central Municipal to the South- East, Ejisu-Juaben Municipal to the South-West, Sekyere South District to the west and Asante Akim North District to the East. The district has 38 pre-schools, 38 Primary Schools, 31 Junior High Schools and three (3) Senior High Schools, Effiduasi Senior High/Commercial, Asokore T.I. Ahmadiyya Senior High and Krobea Asante Technical/Vocational. There is no tertiary institution in the district. The major economic activities in the district are farming, small-scale processing of agricultural produce and trades like hair dressing, tailoring, carpentry, services, etc (Composite Budget for Sekyere East District Assembly, 2015).

3.5. Population of the Study

A population is a group of individuals or people who share similar characteristics and are of interest to the researcher (Fenny, et al., 2016). The study's target population included all kindergarten teachers in Sekyere East District public basic schools. According to the Sekyere East District Education Directorate, there were 218 early childhood teachers in public basic schools. The study's accessible population consisted of all kindergarten teachers from Sekyere East District public early childhood centres. In the sixty-two (62) public early childhood centres, there are eighty (80) kindergarten teachers.

3.6. Sample and Sampling Procedure

This study's sample size was thirteen (13) kindergarten teachers. A sample is defined as a small subset of a larger population whose selection is based on knowledge of population elements and the research purpose (Babbie, 2012). The sample size was chosen based on Tahadoost's (2016) explanation that a study aimed at exploring a phenomenon is best accomplished with a sample size of 5-20 participants. Furthermore, Rallis and Rossman (2014) believe that in qualitative research, a sample as small as 5 and as large as 30 can be used.

According to Rahi (2017), a sampling procedure is a research plan that explains how the study's respondents were chosen from the population. The study employed a purposive sampling technique. Purposive sampling was used to select the (13) kindergarten teachers who have more than ten 10) years of working experience and are experts in the field of teaching through play and have the information and experience that the researcher was looking for. As a result, the researcher chose the kindergarten teachers from the various schools in the study area by hand. Purposive sampling, according to Merrian and Tisdell (2015), is the deliberate selection of individuals and

sites by researchers to learn or understand phenomena. According to Creswell and Creswell (2018), the primary consideration in purposive sampling is the researcher's judgment as to who can provide the best information to achieve the study's objectives.

3.7. Data Collection Instruments

The research instrument that was used to collect data for this study was a semi-structured interview guide. The interview guide was used as a means of talking to the teachers such that the right questions will be asked and the needed follow up questions as well. The observation checklist was only meant to find out whether the materials for teaching the indigenous games are available at the early childhood centres. An interview is defined as a conversation between a researcher and a participant in which information is gathered through communication. The researcher was able to gain access to the participants' perspectives on the phenomena in question by using interviews in this study. The researcher first developed an interview schedule or guide to allow participants to provide a detailed account of their experience by facilitating comfortable interaction with participants. According to Merriam and Tisdell (2015), the guide assists both researchers and participants in remaining focused on the research area and anticipating potential difficulties.

The researcher used the study's research questions as a framework for developing the interview questions. A four-interview guide was created to help the researchers build relationships with the participants and to make the participants feel at ease when sharing ideas. The first section examined the demographics of the participants. The second section examined participants' views on the use of indigenous play in teaching numeracy. The third section examined the barriers teachers face in the use of indigenous play to teach numeracy in their classrooms. And the fourth section highlighted the

strategies that facilitate teachers' use of indigenous play-based pedagogy in numeracy lessons.

The first interview lasted 5 to 10 minutes and aimed to describe the study to the participants and obtain informed consent from them. The researcher asked the participants some background and demographic questions. Then it was followed by information on participants' views on the use of indigenous play to teach numeracy in their classrooms. The researcher also asked questions aimed at obtaining information on the benefits learners derive from teachers' use of indigenous play to teach numeracy and the barriers teachers face in the use of indigenous play to teach numeracy in their classrooms. Finally, the researcher asked follow-up questions and reviewed transcripts with the participants (see Appendix A for the interview guide). The total time for the interview was between 10 and 30 minutes.

3.8 Trustworthiness Criteria

In qualitative studies, the trustworthiness of the study is both paramount and sacred. This was ensured by keeping high levels of integrity, transparency, and objectivity in the collection, transcription, and interpretation of data. In his literature, Shenton (2004) indicated four elements of validity and reliability to include credibility, transferability, dependability, and confirmability. As with credibility, the researcher followed technical and ethical standards in the collection and analysis of data. Processes and tools were checked, reviewed, and verified by the study participants and supervisor to judge the content and cross-check the items for honesty and clarity.

Again, transferability was upheld through clear-cut research objectives, contextualized themes, and well-defined respondents. Moreover, the researcher never allowed her personal biases and prejudices to influence the outcome of this study. Similarly, to

ensure dependability, member checking was done on the data before and after analysis and interpretation. Participants were able to validate their narratives as to completeness and accuracy. Further, participants were adequately oriented on the purpose and rigor of the study, especially on data gathering.

Lastly, confirmability was secured in this study using audit trails. This device allows the reader to trace and confirm the information from its raw source. Cohen et al., (2011) stressed that the findings, interpretations, and conclusions must be supported appropriately. Besides, all materials and instruments used in this study were kept intact for verification and corroboration purposes.

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3.8. Data Collection Procedure

The gathering of information to serve or prove facts is referred to as data collection. It entails gathering opinions on people's attitudes toward the state of affairs of the phenomenon. Data collection is critical in research because it enables the dissemination

of accurate information and the development of meaningful programs (Gray, 2021). Before data collection could begin, the researcher obtained an introductory letter from the University of Education's Department of Early Childhood Education, which was used to obtain permission from the appropriate authorities of the selected early childhood centres to conduct the study. After being granted access to the various public early childhood centres, the researcher met with the kindergarten teachers at the school to explain the purpose of the study.

The interview and observation guides were used to collect all necessary data. The researcher developed a friendly relationship with the school's kindergarten teachers. This enabled the researcher to gain access to all necessary information. The themes of all data collected through interviews and observations were explained to the respondents, and the necessary responses were provided. The data was then played and transcribed in preparation for analysis.

3.10. Data Analysis Procedure

According to Cohen et al., (2011), the analysis of data allows the researcher to manipulate information collected during the study in order to assess and evaluate the findings and arrive at some valid, meaningful, and relevant conclusions. The instruments used in the data collection produced mainly qualitative data. Data was analysed thematically (Chen et al., 2021). The researchers explain that thematic analysis involves the search for and identification of common trends that extend throughout an entire process.

The findings of the observation guide and the interview guide were presented and analysed manually. This strategy was chosen because the volume of data collected was manageable, making it less difficult to identify relevant text passages and also the

researcher's desires was to interact and have a hands-on feel for the data. The problem associated with analysing data manually is that it is laborious (Creswell & Creswell, 2018). Because both instruments generated primarily qualitative data, the presentation followed the same steps. Following transcription, the data was coded, analysed, interpreted, and verified.

The process of transcribing the instruments enabled the researcher to gain a better understanding of the subject by listening to and reading the transcribed interviews repeatedly. Once all of the data had been transcribed, the coding process began. The codes used are keywords that are used to categorize or organize text and are an important part of qualitative research (Cohen et al., 2011). The data was then analysed, classified, and organized into themes and sub-themes that emerged during the coding process. The themes that emerged were each assigned a unique code. The next step was to interpret the data by identifying any recurring themes and emphasizing any similarities and differences in the data. The final stage involved data verification, which entails checking the validity of understanding by rechecking the transcripts and codes, allowing the researcher to confirm or modify words already determined previously (Cohen et al., 2011). The responses on participants' bio-data, on the other hand, were analysed using percentages and simple counts.

3.11. Ethical Considerations

This study adhered to key ethical principles to safeguard the rights and well-being of participants. The ethical concerns addressed included informed consent, anonymity, and confidentiality.

Informed Consent

Informed consent ensures that participants voluntarily agree to partake in a study with full knowledge of its aims, objectives, and any potential risks involved (Seidman,

2016). In this study, the researcher explained the purpose, objectives, and procedures of the research to the participants before their involvement. Consent was sought from participants, who were given the choice to either participate or decline without any form of coercion.

Anonymity

The anonymity of participants was highly prioritized throughout the study. Gujarati (2013) highlights the importance of anonymity in research ethics as it safeguards participants' identities. To uphold this, fictitious names and identification codes were used, ensuring that no personal information could be linked to any participant. Prior visits were made to the schools to explain the study's purpose and reassure participants that their privacy would be protected. No names or identifiable details were recorded, thus preventing any potential victimization.

Confidentiality

Confidentiality was strictly maintained in the handling of participants' responses. Participants were assured that their responses would remain confidential, with access limited to the researcher alone. None of the participants' names appeared in the final report. Additionally, all secondary information cited to support this study was properly acknowledged through in-text citations and a reference list to avoid academic dishonesty, specifically plagiarism.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Overview

This chapter presents the results of the analysis of data based on the purpose of the study. The purpose of the study is to explore how kindergarten teachers use indigenous play in teaching and learning numeracy in the Sekyere East District. The analysis and interpretation of data were carried out based on the results of the four (4) research questions. The analysis was done based on the responses from the respondents during the interviews used in this study. The data were analysed using thematic analysis and were analysed from research question 1- 4.

Research Question 1: What types of Indigenous play activities do teachers use in teaching numeracy at early childhood education centres in the Sekyere East District?

This research question seeks to highlight the types of Indigenous play that teachers use in their classrooms during numeracy instruction. The following themes were generated from the interview that was conducted on the types of indigenous play that are used in numeracy lessons in early childhood classrooms.

Theme 1: Traditional Songs and rhymes

> *T1: Well for me, I use it when the children have to do numeracy and I feel that a particular game is likely to help in the understanding. For instance, the rhyme "Antoakyire" involve counting backward, and helps children understand the concept of subtraction in a natural and intuitive manner. Including these elements in the curriculum not only enhances numeracy skills but also instills a sense of cultural pride and identity.*

Another teacher also said that,

> *I often use indigenous songs like 'bolambo ekor sip on do 'Kyekye Kule' when teaching numeracy. These songs help children count, follow patterns, and develop rhythm. They enjoy clapping and moving while counting, making it easier for them to remember numbers and sequences naturally. T7*

The quote suggests that the strategic use of indigenous games and rhymes, such as kyekyekule" and "Antoakyire," in numeracy lessons can significantly aid in children's understanding of counting and arithmetic concepts like addition and subtraction. Although these methods are not employed regularly, they are used when deemed beneficial. Integrating these traditional elements not only enhances numeracy skills but also instills cultural pride and identity, highlighting the dual educational and cultural value of these teaching tools.

Theme 2: Cultural Arts and Craft

> *T2: I use various cultural arts and crafts to make numeracy lessons more engaging. For instance, we often create traditional bead necklaces where children count and pattern the beads. This helps them understand concepts like sequencing, addition, and subtraction. Additionally, crafting Adinkra symbols involves shapes and symmetry, which are fundamental in geometry. These activities not only make learning fun but also connect the children with their cultural heritage.*

Another teacher also opined that;

> *I engage children with cultural arts like bead threading and basket weaving to teach numeracy concepts. As they count beads or weave patterns, they practice number recognition, addition, and sequencing. It's exciting how these indigenous activities naturally link creativity with counting, enhancing both mathematical skills and cultural appreciation in learners.* T4

The quotes emphasize how incorporating cultural arts and crafts into numeracy lessons enhances both learning and cultural identity among young learners. Through activities like bead threading, basket weaving, and crafting Adinkra symbols, children actively engage with numeracy concepts such as counting, sequencing, addition, subtraction, shapes, and symmetry in meaningful, hands-on ways. These indigenous play activities make abstract mathematical ideas more concrete and relatable, fostering deeper understanding and retention. Additionally, they help preserve cultural heritage, allowing children to appreciate and take pride in their traditions while learning essential academic skills. The implication is that integrating indigenous cultural practices into classroom activities promotes holistic child development, enhances numeracy skills,

and nurtures creativity, cultural awareness, and interactive learning in early childhood education.

Theme 3: Traditional games

One of the respondents said that;

> *I use traditional games like pilolo during numeracy lessons. Counting scores, turns, and steps in these games teaches children number recognition and simple addition. The excitement of playing while learning makes numeracy concepts easier to understand and helps children actively participate while preserving our cultural games.* T8

Another teacher also said;

> *T4. I use 'Ludu' to teach numeracy and this is how I do it, the dice has six different dots from one to six so first I make every learner identify the numbers. After that everyone will throw the dice and a number appears you write it on a sheet of paper. Then we go another round each number that will appear you write it and make the dots as well. When all the learners have ended the second round everyone puts equal to sign in front and counts the dots that has been made under the numbers then the total written. Later each learner will clap the two numbers and the total.*

The quotes reveal how traditional games like *Pilolo* and *Ludu* effectively support numeracy learning in early childhood classrooms. These games naturally introduce counting, number recognition, addition, and basic arithmetic in playful, interactive ways. They encourage active participation, peer collaboration, and hands-on practice, making abstract numeracy concepts easier to grasp. Additionally, incorporating such indigenous games preserves cultural heritage while creating enjoyable, meaningful learning experiences for young learners. The implication is that traditional games offer a culturally responsive, child-centered strategy for developing early numeracy skills while promoting engagement, social interaction, and cultural pride in the classroom.

Theme 4: Storytelling and Oral Tradition

> *T5: Oh yes, "Tomato" (hopscotch) I hope you know that one, it can be used to teach numeracy t the kindergarten, when the learner throws the pebble in the first box he counts one the second you count to two in that order am I not teaching numeracy? So, where the learner will miss then I tell them to subtract one for all the counts that they have. Also, when they drop the pebbles and are jumping, I tell them to count continuously as they jump to the end and back.*

> *T6: I use the "Oware" to teach numeracy. We count all the pebbles that we have to put in the holes then we count the total number of holes as well, since*

> *we will put four pebbles in each hole, we put them into groups of four and the total number of groupings is same as the holes. In this case we have learnt counting as well division.*

The quotes imply that incorporating traditional games like "Tomato" (hopscotch) and "Oware" into numeracy lessons offers an engaging and effective way to teach mathematical concepts. These indigenous games help children learn counting, addition, subtraction, and division through practical, hands-on activities. By using familiar cultural games, educators can make numeracy lessons more relatable and enjoyable, enhancing students' understanding and retention of mathematical concepts. Additionally, this approach promotes cultural heritage and identity, demonstrating that traditional play can be a valuable educational tool in early childhood education.

Research Question 2: What factors influence teachers in using Indigenous play in teaching and learning numeracy at the early childhood education centres in Sekyere East District?

This research question seeks to explore the factors that influence teachers in the use of Indigenous play in teaching numeracy lessons in early childhood centres in the Sekyere East District. Here are some of the excerpts from the interview.

Theme 1: Available Teaching and Learning Resources

> *When traditional resources like beads, stones, and local drums are available, it motivates me to include indigenous games and songs in my lessons. These materials make learning activities lively and help children understand numeracy and literacy better. Without them, I'm limited to only verbal explanations, which isn't as effective.* T8

One teacher also highlighted that;

> *Availability of indigenous resources makes teaching through play easier and more meaningful. If I have enough ampe spaces, beads, or oware boards, I can involve every child. But when these materials are missing, it's hard to organize*

traditional play activities for all learners, which affects participation and learning outcomes. T2

Similarly, another teacher said that;

Indigenous play depends on resources that reflect our culture. When these items are accessible, it helps children learn numbers, shapes, and language through their own cultural experiences. If resources are unavailable, it discourages teachers from using indigenous play because improvising is often time-consuming and not always effective. T5

The quotes show that the availability of teaching and learning resources is crucial for effectively using indigenous play in early childhood classrooms. When resources like beads, oware boards, and local drums are accessible, teachers can plan engaging, culturally relevant activities that make numeracy and literacy lessons more practical and enjoyable. These materials encourage active participation and support learning through familiar cultural experiences. However, when such resources are lacking, teachers are limited to verbal instruction, reducing learner engagement and lesson quality. The implication is that resource availability directly influences the frequency, quality, and effectiveness of indigenous play-based teaching strategies.

Theme 2: Teachers' Knowledge and Skills in Indigenous Play

I believe that knowing how to play traditional games like ampe, oware, and pilolo, and understanding how to link them to counting and number recognition, makes it easier for me to use them in lessons. If a teacher doesn't know these games well, it's difficult to use them effectively. T1

Another teacher said;

My ability to creatively adapt cultural songs and games for teaching numeracy depends on the knowledge and skills I've acquired. When teachers lack training in indigenous play methods, they tend to avoid them because they feel unsure about how to connect them with academic concepts like addition or subtraction. T3

The quotes suggest that teachers' knowledge and skills play a vital role in the use of indigenous play in teaching numeracy. Teachers who are familiar with traditional games and know how to relate them to numeracy concepts confidently integrate them into lessons. However, those lacking such skills often avoid using these culturally relevant methods, fearing they may not effectively connect them to academic content. This implies that professional development and training in indigenous play-based teaching strategies are essential to enhance teachers' competence and promote culturally meaningful numeracy instruction in early childhood settings.

Theme 3: Support from School Leadership

> *When school leaders support the use of indigenous play by providing resources and allowing time for such activities, it encourages us to use them more often. Without their backing, it's difficult to prioritize traditional games in lessons because we feel pressured to stick to only formal teaching methods. T9*

Another teacher said;

> *I'm motivated to use indigenous games and songs in teaching numeracy because my headteacher values cultural activities and even invites community members to demonstrate traditional games. That kind of leadership support boosts our confidence and reminds us that preserving culture through education is important. T6*

The quotes highlight that support from school leadership significantly influences teachers' use of indigenous play in numeracy lessons. When leaders provide resources, allocate time, and openly endorse cultural activities, teachers feel encouraged and confident to integrate traditional games and songs into their teaching. Such backing creates an environment where play-based, culturally relevant learning is valued alongside formal academic instruction. Conversely, the absence of leadership support can discourage teachers, forcing them to abandon indigenous methods due to pressure from rigid academic expectations. This implies that leadership commitment is essential for sustaining indigenous play-based approaches in early childhood education.

Theme 4: Children's Interest and Participation

One teacher said;

> *I love using indigenous games in my numeracy lessons because the children are always excited to participate. Their interest makes teaching easier, and when they're eager to play and learn, it motivates me to plan more of such activities to keep them actively involved.*

Another said;

> *Sometimes, the children themselves request games like ampe or oware during math time. When I see how much they enjoy these traditional games, it encourages me to use them regularly. Their participation makes numeracy lessons fun and meaningful. T5*

Moreover, another teacher opined that;

> *If the children are not interested or don't participate well in an activity, it's hard to continue using it. But indigenous games naturally attract their attention. Their active involvement helps reinforce counting, addition, and sequencing skills in a playful way, so I often choose these methods. T2*

The quotes emphasize that children's interest and participation are crucial factors in the effective use of indigenous play for teaching numeracy. When children are excited and actively engage in traditional games like ampe and oware, teachers are motivated to incorporate these activities more often. The enthusiasm of the children not only makes numeracy lessons enjoyable but also enhances learning through active involvement. Conversely, when children show disinterest or lack participation, teachers are less likely to continue using those activities. This implies that teachers are more likely to use indigenous play-based methods when they see that children enjoy and benefit from them, making learning both fun and meaningful.

Theme 5: Cultural Relevance of Indigenous Play

This theme highlight that early childhood educators believe that integrating culturally relevant games into the classroom not only supports academic development but also strengthens children's connection to their heritage. Here are some verbatim quotations from the interviews;

Teacher 1 said that;

When I use our local games like 'Antoakyire' or counting songs like 'Kyekye Kule,' the children get excited because it's something they know from home. It's not just about numbers anymore; it's about our culture, our language, and our pride. It makes the math lesson feel like their own.

Another also opined that;

When we play 'Pilolo' or 'Oware,' we're not only counting stones or numbers. We're teaching the children patience, honesty, and fairness. It reminds them of what their grandparents tell them at home. These values matter, and bringing them into school through play helps the children see that school is not separate from life. T9

Teacher 5 also added that;

Sometimes, you'll find that some children feel shy or left out during regular lessons. But when we bring in our traditional games, you see them come alive. They start teaching others the songs or the rules of the game. It builds confidence and makes everyone feel part of one big family, not just a class.

These teacher testimonies imply that integrating indigenous games into numeracy lessons strengthens cultural identity, fosters inclusivity, and enhances learner engagement. Such practices make mathematical concepts more relatable and meaningful by linking them to familiar cultural experiences. Additionally, these activities promote social values like cooperation, fairness, and confidence among children. The findings suggest that incorporating culturally grounded play transforms the classroom into a communal, culturally rich learning space, where every child feels valued, connected, and actively involved in both academic and social development.

Research Questions 3: What challenges do teachers face when using indigenous play in teaching and learning numeracy at early childhood education centres in Sekyere East District?

Theme 1: Time Constraints

> *Sometimes, I avoid using indigenous games during numeracy lessons because they take more time to organize and play compared to regular board work or drills. With the limited time we have for each subject, it's difficult to fit them in without rushing through the rest of the syllabus. T13*

Another teacher, T8, explained:

> *The school timetable is already packed, and we're expected to finish so many topics within a short period. Indigenous play activities are effective, but they*

require time to set up, explain, and manage, which makes it hard to use them often.

These quotes highlight how time constraints within the early childhood education (ECE) timetable limit teachers' ability to incorporate indigenous play into numeracy lessons. Although teachers recognize the value of traditional games for reinforcing number skills, the pressure to complete a packed syllabus forces them to prioritize faster, conventional methods over interactive play-based activities. This situation affects the frequency and quality of indigenous play use in classrooms, reducing opportunities for culturally responsive, child-centered numeracy teaching. Addressing timetable flexibility could promote better integration of indigenous play methods.

Theme 2: Inadequate Teaching and Learning Resources on Indigenous Play

When we don't have access to materials like beads, oware boards, or even enough space for traditional games like ampe, it becomes difficult to incorporate them into numeracy lessons. Without these resources, I'm forced to rely on theoretical methods, which don't engage the children as effectively. T3

Another teacher suggested that;

In my classroom, we often miss out on using indigenous play for numeracy because the resources are limited. For instance, when there aren't enough local drums or beads for each child, it's hard to create an interactive learning experience. The lack of resources reduces the impact of play. T8

The quotes emphasize that inadequate teaching and learning resources significantly hinder the effective use of indigenous play in numeracy lessons. When essential materials like beads, *oware* boards, and traditional game tools are unavailable, teachers are unable to engage children actively in hands-on learning. This lack of resources forces teachers to rely on more theoretical, less interactive methods, which fail to

capture children's attention or foster deeper understanding. The scarcity of resources reduces the impact of indigenous play, limiting its potential to enhance numeracy skills in a culturally relevant and engaging way.

Theme 3: High Teacher-Learner Ratio

This theme emphasise on how many teachers reported that large class sizes made it difficult to effectively implement indigenous play activities during numeracy instruction. They explained that managing a high number of young children during interactive, movement-based games was challenging, limiting opportunities for individual support, participation, and ensuring safety ultimately hindering the successful use of play-based numeracy approaches. Here are some excerpts;

One teacher remarked:

My class has about 60 children with only me to handle them. Even if I want to use games like Pilolo or Tomato, it's difficult because I can't watch all of them at once. Some will fight, others will leave the group, and it becomes chaotic. So, most times, I just stick to talking on the board." (T2)

Another teacher expressed:

The problem is the number of children in our classrooms. When there are too many, you can't organise games that need space and close supervision. It's hard to control and ensure that everyone participates safely, so we avoid using those activities even though we know they help." (T5)

These quotes highlight how large class sizes significantly constrain the effective use of indigenous play in numeracy instruction. When teachers are responsible for managing sixty or more young learners alone, ensuring order, safety, and full participation during physically engaging games becomes unmanageable. As a result, teachers often resort to conventional, teacher-centred methods like boardwork, limiting opportunities for

active, play-based numeracy learning. This deprives learners of meaningful, culturally relevant, and hands-on experiences that support deeper numeracy understanding and social development.

Theme 4: Inadequate Professional Training on the Use of Indigenous Play

> *I sometimes feel unsure about how to effectively link indigenous play to numeracy concepts like addition or subtraction. Without proper training on integrating traditional games, I rely on trial and error, which can be frustrating for both me and the children. T1*

Another teacher said that;

> *I wish I had more training on how to use indigenous games for numeracy. Although I know the games, I'm not always confident in how to connect them to specific numeracy skills like counting or sequencing. Proper professional development would make this much easier T5*

Teacher 4 also said;

> *Lack of training on how to use indigenous play in teaching numeracy leaves me feeling unprepared. I'm aware of the value these activities can bring, but without proper guidance on effective strategies, it's difficult to maximize their educational potential.*

The implications of these quotes reveal that the lack of adequate professional training hinders teachers' ability to confidently and effectively integrate indigenous play into numeracy lessons. Teachers express feelings of uncertainty and frustration, often resorting to trial and error due to the absence of structured guidance on linking traditional games to specific numeracy skills. This lack of training not only affects teachers' confidence but also limits the educational potential of these cultural activities. Providing proper professional development would equip teachers with the knowledge

and strategies needed to maximize the impact of indigenous play in numeracy instruction.

Theme 5: Limited Parental and Community Involvement

The theme outlines how most children are unfamiliar with these cultural play activities before encountering them in school, it difficult for teachers to integrate them effectively into lessons, weakening their educational impact and cultural relevance within the classroom. Here are some excerpts that support it.

One teacher said that;

Sometimes when I try to use games like 'Pilolo' or counting rhymes from our culture, the children look at me like it's something new because nobody plays these with them at home anymore. It makes it harder because you have to teach the game first before even starting the maths lesson. T3

Another teacher suggested that;

The truth is, if parents and elders still played these traditional games with the children, it would be easier for us to use them in school. But these days, many parents are too busy or think these games are old-fashioned. So, when we use them, there's little encouragement from the home, and the children don't always relate to it. T10

These quotes imply that limited parental and community involvement significantly undermines the effective use of indigenous play in numeracy instruction. When children lack exposure to traditional games and counting rhymes at home, teachers are burdened with not only delivering numeracy content but also first having to introduce and explain the cultural play activities themselves. This reduces instructional time for the actual numeracy concepts and weakens the cultural familiarity and relevance that indigenous play is meant to provide. Additionally, without support and reinforcement

from parents and elders, children's connection to these games diminishes, affecting both their engagement and cultural identity within the classroom setting.

Research Questions 4: What Strategies would Improve teachers' use of Indigenous play in Teaching and Learning Numeracy at the Early Childhood Education Centres in Sekyere East District?

Theme 1: Integration of Indigenous Play into the Curriculum

> *I believe if indigenous play activities like 'boloambo ekor si pon do, oware, and other traditional songs were formally included in the curriculum, it would give us clear guidance and permission to use them regularly. Right now, it feels like an extra activity, so some teachers hesitate to integrate them into numeracy lessons. T2*

T1 also said that;

> *When the curriculum highlights the use of local games and songs for teaching numeracy, it makes planning easier and motivates us to be creative. Without it being part of the official teaching guide, many teachers overlook these valuable indigenous*
>
> *activities in their lessons.*

The implication of these quotes is that integrating indigenous play into the official early childhood curriculum would legitimize its use and encourage teachers to adopt it more confidently in numeracy lessons. When such activities are formally recognized, teachers feel supported and guided to plan and implement them effectively. Without clear curriculum provisions, many teachers view indigenous play as optional or supplementary, leading to its neglect despite its benefits. Formal inclusion would promote cultural preservation, enrich learning experiences, and enhance children's numeracy skills through meaningful, engaging, and culturally relevant activities.

Theme 2: Adequate Professional Development for Teachers

> *I think regular workshops and training sessions on how to effectively use indigenous games for teaching numbers would really help. Many of us know the games but lack the skills to connect them to numeracy concepts like addition or patterns in a structured way. T6*

T4 also said that;

> *Professional development is important because it equips teachers with new ideas on how to adapt traditional games for classroom use. Without proper training, we're left to guess, and sometimes we miss the educational value these activities can offer.*

These quotes highlight that many early childhood teachers recognize the value of indigenous play but lack the necessary training to effectively integrate it into numeracy lessons. Without adequate professional development, teachers may struggle to connect traditional games to mathematical concepts like counting, addition, or pattern recognition. Regular workshops, in-service training, and peer-sharing sessions would not only build teachers' skills but also boost their confidence in using culturally relevant play activities. This could enhance learner engagement and improve numeracy outcomes while preserving valuable indigenous knowledge in classroom teaching.

Theme 3: Provision of Teaching and Learning Resources

> *Having enough resources like beads, oware boards, number stones, and space for games makes it easy to include indigenous play in numeracy lessons. When these materials are available, I can plan activities where every child participates fully, which improves their interest and number skills. T4*

T11 said:

> *Sometimes, I avoid using traditional games for math because we don't have the right materials. If the school provided more local resources like counting sticks and traditional drums, it would make numeracy lessons fun, engaging, and culturally meaningful.*

T12 explained:

> *Access to teaching materials influences how often I use indigenous play. Without simple resources like counters or game boards, it becomes difficult to organize numeracy games effectively. The availability of these resources encourages us to be creative and use more interactive teaching methods.*

These quotes highlight the critical role of adequate teaching and learning resources in promoting the use of indigenous play for numeracy lessons in early childhood centres. When resources like beads, oware boards, counting sticks, and open play spaces are available, teachers can confidently plan and implement engaging, hands-on numeracy activities that enhance learner participation and cultural connection. Conversely, limited resources discourage teachers from integrating indigenous play, often forcing them to rely on less interactive, theoretical methods. Ensuring consistent provision of culturally relevant materials will therefore improve the frequency, creativity, and educational impact of indigenous play in classrooms.

Theme 4: Parental and Community Advocacy

T5 ***said:***

When parents and community elders are involved and show interest in traditional games, it encourages us to use them more in class. Their support helps the children

value these activities, and sometimes parents even donate materials or come around to demonstrate the games, which makes learning numeracy through play more exciting."

Another teacher, T9, explained:

I believe if community members and parents actively advocate for the use of indigenous games in schools, it would raise awareness and get school leaders to support us with resources and time. Their involvement can make indigenous play a respected and regular part of our teaching."

The implication of these quotes is that parental and community involvement plays a vital role in sustaining and promoting the use of indigenous play in numeracy lessons. When parents and community elders actively participate and express interest, it not only boosts teachers' motivation but also helps preserve cultural heritage through education. Their contributions whether through donating resources, demonstrating games, or advocating for their inclusion create a supportive environment that encourages both teachers and learners. This involvement also influences school leadership decisions, making it easier for teachers to integrate indigenous play activities confidently and frequently in their classrooms.

Theme 5: Peer Learning and Professional Learning Communities (PLCs)

Sometimes I struggle with ideas on how to use indigenous games for teaching numbers, but when we have peer discussions or workshops, I learn new ways from other teachers. Sharing ideas through learning communities makes it easier and encourages me to try out more traditional games in my numeracy lessons. T3

T7 suggested that

Professional learning groups have helped me a lot because I get to see how other teachers use games like oware or pilolo for counting and addition. These meetings give

us a platform to exchange ideas, improve our skills, and support each other in promoting indigenous play activities.

These quotes highlight the importance of peer learning and professional learning communities (PLCs) in strengthening teachers' capacity to use indigenous play for numeracy instruction. When teachers collaborate, share practical ideas, and observe how colleagues integrate traditional games into lessons, it builds their confidence and encourages innovation in their teaching practices. Regular peer engagements create a supportive environment where teachers learn new techniques, overcome challenges, and promote culturally relevant pedagogy. This ultimately enhances the effective use of indigenous play, making numeracy lessons more interactive, inclusive, and meaningful for young learners.

4.1 Discussions of Research Questions

Research Question 1: What types of indigenous play do teachers use in teaching numeracy at early childhood education centres in the Sekyere East District?

The findings from the analysis revealed that teachers thoughtfully incorporate a variety of culturally rooted play activities to introduce and reinforce numeracy concepts. These include traditional songs and rhymes, arts and crafts, indigenous games, and storytelling-based activities. Beyond supporting numeracy learning, these practices also promote cultural identity, social interaction, and creativity in the classroom.

Teachers reported that traditional songs and rhymes like *Antoakyire* and *Kyekye Kule* are popular tools for teaching basic numeracy skills such as counting, sequencing, and subtraction. For instance, *Antoakyire*, which involves counting backwards, is used to introduce subtraction in an enjoyable and memorable way. Similarly, *Kyekye Kule* engages children in rhythmic clapping, movement, and counting, helping them follow number patterns while participating in lively group activities. These findings align with

those of Avornyo and Mensah (2024), who showed that incorporating indigenous songs into numeracy lessons increases young children's engagement and mathematical reasoning. Nabie and Akayuure (2014) also observed that such culturally familiar songs strengthen children's understanding of numeracy concepts while fostering a sense of cultural pride.

In addition to songs and rhymes, cultural arts and crafts activities were found to be frequently used for numeracy instruction. Teachers explained that bead threading exercises help children practice counting, recognizing numbers, and sequencing patterns while making traditional bead necklaces. Similarly, introducing children to *Adinkra* symbols exposes them to ideas of shape, symmetry, and patterning in a hands-on, culturally meaningful context. One teacher remarked that these activities make abstract mathematical ideas more tangible and relatable for young learners. These observations are in line with Ntekane's (2018) study, which showed that indigenous crafts improve children's understanding of measurement, spatial awareness, and patterns. Nabie and Akayuure (2019) similarly argued that integrating numeracy within indigenous art forms creates holistic learning experiences that blend academic skills with cultural knowledge.

Traditional games such as *Pilolo*, *Ludu*, *Tomato* (hopscotch), and *Oware* were also regularly used by teachers during numeracy lessons. Through *Pilolo*, children count steps and scores, practicing number recognition and simple addition as part of the game. *Ludu*, which uses numbered dice, allows children to identify numbers, add up totals, and engage in arithmetic through play. These results reflect the findings of Avornyo and Mensah (2024), who confirmed that games like *Achi* support counting and sequencing activities in early numeracy lessons. Internationally, studies by Mosimege (2016) and Lidinillah et al. (2022) similarly reported that familiar cultural games like

Morabaraba and *Engklek* enhanced children's counting, patterning, and spatial reasoning abilities. The use of *Tomato* and *Oware* in this study echoed the conclusions of Hadebe-Ndlovu (2022), who found that indigenous games improve enthusiasm, mathematical reasoning, and cooperative learning in early childhood classrooms.

Storytelling and oral traditions also emerged as important strategies for teaching numeracy. Teachers shared how narrative-based games like *Tomato* involve counting steps, jumps, and turns, reinforcing number recognition, addition, and subtraction through movement and action. *Oware*, a widely known traditional game, helps children learn to group objects, divide numbers, and perform simple arithmetic by counting pebbles and distributing them into pits. Teachers explained that these activities give children practical, hands-on opportunities to develop mathematical concepts in a familiar and enjoyable way. These findings are supported by Avornyo and Mensah (2024), who emphasized that embedding numeracy in culturally relevant play and stories enhances children's reasoning skills and encourages peer collaboration.

Overall, the study's findings are consistent with a growing body of literature advocating for culturally responsive pedagogy in early numeracy education. Scholars such as Xu and Ball (2024) and Ntekane (2018) have highlighted the cognitive, social, and emotional benefits of integrating indigenous games, songs, crafts, and stories into early learning settings. These practices not only help children learn mathematics in meaningful and familiar ways but also strengthen their cultural identity and executive function skills.

However, as noted in studies by Avornyo (2025), Hadebe-Ndlovu (2022), and Boateng-Nimoh and Nantwi (2020), this research also identified challenges in consistently integrating indigenous play activities into early childhood classrooms. Teachers mentioned that although national curriculum guidelines broadly recommend "play,"

they often lack specific reference to indigenous games. Moreover, teachers expressed a need for structured support in the form of sample lesson plans, demonstration materials, and professional development to help them confidently and consistently apply these culturally rooted practices.

In conclusion, this study affirms that indigenous play activities including songs, rhymes, crafts, games, and storytelling hold valuable potential for improving numeracy teaching and learning in early childhood classrooms within Sekyere East District. These practices make abstract mathematical concepts more concrete, engaging, and culturally meaningful for young learners, while also preserving local cultural heritage and promoting important social skills.

Research Question 2: What factors influence teachers in using indigenous play in teaching and learning numeracy at the early childhood education centres in Sekyere East District?

The findings from this study reveal that the availability of teaching and learning resources plays a decisive role in determining how effectively teachers integrate indigenous play into numeracy instruction within early childhood education centres in the Sekyere East District. Teachers consistently emphasized that access to culturally relevant materials such as beads, stones, *Oware* boards, and local drums motivates them to incorporate traditional games and songs into their lessons. The presence of these resources transforms numeracy activities into lively, participatory, and culturally meaningful experiences that help young learners grasp mathematical concepts through familiar, engaging practices. In contrast, in the absence of these materials, teachers are often compelled to rely on verbal explanations alone, a method they acknowledged is less engaging and less effective for young children.

This finding resonates with Subeini's (2021) observations in Ghana's Nkoranza North District, where limited access to structured instructional materials similarly restricted the integration of indigenous play. Teachers in that context, much like those in this study, resorted to improvised alternatives like bundled sticks and bottle tops, a practice that, while resourceful, often compromises the cultural authenticity and consistency of play-based numeracy instruction. The evidence aligns with international experiences as well. Mwinsa and Dagada (2024) demonstrated in rural Zambia that providing teachers with culturally appropriate toolkits and visual instructional guides significantly increased the frequency and effectiveness of play-based numeracy teaching. Without such support, teachers remained hesitant, uncertain about how to connect games to numeracy outcomes. Hadebe-Ndlovu (2022) similarly reported that culturally tailored teaching guides improved teacher confidence and instructional quality, while Mwirigi et al. (2023) confirmed a strong positive relationship between resource availability and children's numeracy achievement in Kenyan preschools.

Alongside resources, the findings emphasize the importance of teacher knowledge and pedagogical skills in using indigenous play effectively. Teachers who were well-versed in traditional games like *Ampe, Pilolo,* and *Oware*, and who understood how to link these games to mathematical concepts, demonstrated greater confidence and creativity in integrating them into lessons. This aligns with Subeini's (2021) and Mwinsa and Dagada's (2024) studies, both of which highlighted how participatory, skills-based training empowered teachers to scaffold numeracy learning through culturally rooted play activities. Additionally, leadership support emerged as a crucial enabler. Teachers reported feeling more confident and motivated to use indigenous play when school leaders actively endorsed its value and allocated time and resources for its

implementation a finding consistent with Fisher et al. (2020) and Hadebe-Ndlovu (2022).

Another key insight concerns the influence of children's enthusiasm and participation on teachers' instructional choices. Teachers in this study observed that when learners eagerly engaged in games like *Pilolo, Ampe,* and counting rhymes, numeracy lessons became more effective and enjoyable. This mirrors Adu-Gyamfi and Brenya's (2022) conclusion that children's excitement during play-based activities enhances their grasp of mathematical concepts such as counting, sequencing, and problem-solving. Similarly, Avornyo (2025) found higher learner attentiveness and improved numeracy outcomes in classrooms where indigenous games were regularly used. These games foster collaborative learning, allowing children to practice turn-taking, observe rules, and solve counting problems together promoting not only cognitive but also social skills (Hadebe-Ndlovu, 2022). Nabie and Akayuure (2014) further argued that aligning school activities with children's home and community experiences reduces classroom anxiety, making learning feel more approachable and culturally meaningful. The spontaneous requests by children to play these games reinforced teachers' motivation to include them in lessons, echoing Mwirigi et al.'s (2023) findings that child-led interest sustains culturally responsive numeracy practices.

Crucially, this study highlights the importance of cultural relevance in shaping numeracy instruction. Teachers reported that traditional games such as *Antoakyire, Pilolo,* and *Oware* made mathematics lessons more meaningful by connecting academic content with children's lived cultural experiences. This finding supports earlier assertions by Akayuure and Nabie (2007) and Hadebe-Ndlovu (2022) that embedding numeracy instruction within culturally rooted activities not only improves comprehension but also affirms learners' identities. Beyond academic gains, these

games were valued for promoting important social values like patience, fairness, teamwork, and cooperation, as noted by Adu-Gyamfi and Brenya (2022). The study further revealed that culturally grounded play increased participation, particularly among children who might otherwise feel excluded in more formal, textbook-driven lessons. This reflects Mpofu and Shumba's (2019) findings that culturally relevant play builds children's confidence, enhances inclusivity, and fosters stronger school-home connections themes also echoed by Boateng-Nimoh and Nantwi (2020) and Mwangi et al. (2023).

Overall, these findings reaffirm the importance of creating resource-rich, culturally responsive, and pedagogically supportive environments to facilitate meaningful, play-based numeracy instruction in early childhood education. The interconnected roles of material resources, teacher skills, leadership advocacy, learner enthusiasm, and cultural alignment provide a clear roadmap for policymakers, school leaders, and teacher educators seeking to sustain and expand the use of indigenous play in numeracy teaching within Ghanaian and broader African contexts. By addressing these factors holistically, early childhood education can better harness the dual potential of indigenous play preserving valuable cultural heritage while enhancing foundational numeracy skills among young learners.

Research Questions 3: What challenges do teachers face when using indigenous play in teaching and learning numeracy at early childhood education centres in Sekyere East District?

The findings of this study confirm that time constraints significantly hinder teachers' ability to integrate indigenous play into numeracy instruction. This outcome aligns with the concerns of Boateng-Nimoh and Nantwi (2020) and Adu-Gyamfi and Brenya (2022), who similarly reported that teachers struggle to balance playful learning

activities with the demands of rigid syllabus timelines. Participants in this study explained that although games like *Pilolo* and *Oware* effectively engage children and support numeracy skills, organizing and managing these activities requires substantial time — often conflicting with the packed school timetable. This challenge mirrors Mesesah's (2024) findings, where teachers found it difficult to fit play-based approaches into already crowded lesson schedules. Additionally, the absence of explicit directives within the curriculum for including indigenous games signals to teachers that content coverage should take priority (Hadebe Ndlovu, 2022). As a result, despite the known benefits of culturally grounded play for promoting engagement and numeracy skills, systemic time limitations restrict its classroom use, reducing opportunities for child-centered, culturally relevant instruction.

Another key finding is that inadequate teaching and learning resources serve as a major obstacle to incorporating indigenous play into early numeracy lessons. Consistent with Nabie and Akayuure (2019) and Hadebe-Ndlovu (2022), teachers reported shortages of essential materials such as beads, counting stones, and *Oware* boards. In their absence, teachers often resort to improvised or theoretical alternatives that dilute the cultural authenticity and hands-on value of these activities. As Boateng-Nimoh and Nantwi (2020) observed, such makeshift substitutes weaken children's connection to the cultural meaning embedded in traditional games. This lack of resources reduces the interactive, practical nature of numeracy instruction and limits both the academic and cultural benefits these activities could provide in early childhood classrooms.

The study also highlights how large class sizes critically impede the effective use of indigenous play in numeracy teaching, echoing conclusions by Mwansa et al. (2023) and Hadebe-Ndlovu (2022). Teachers shared that supervising interactive games like *Pilolo* with class sizes exceeding 60 children posed safety risks and made it difficult to

monitor participation and provide individual support. As a result, educators frequently abandon play-based approaches in favour of safer, whole-class boardwork. This shift deprives children of valuable opportunities for active, collaborative, and culturally meaningful learning experiences, limiting both their numeracy development and acquisition of important social skills.

Moreover, the findings confirm that insufficient professional training is a significant barrier to the meaningful integration of indigenous play into numeracy lessons. Although many teachers are culturally familiar with traditional games, they lack the pedagogical skills to link these activities to mathematical concepts such as addition, subtraction, sequencing, and pattern recognition (Akayuure & Nabie, 2007; Mesesah, 2024). Consequently, indigenous play is often introduced informally, without clear learning objectives. This observation supports Boateng-Nimoh and Nantwi's (2020) conclusion that teachers, under pressure to meet academic targets, tend to revert to conventional textbook-based methods. Participants in this study expressed frustration and uncertainty due to the lack of structured training. The findings suggest that targeted professional development in integrating traditional games with numeracy content would strengthen teachers' confidence, improve instructional quality, and maximize the educational benefits of culturally relevant play-based learning in early childhood classrooms.

Finally, the study emphasizes the negative impact of limited parental and community involvement on the successful integration of indigenous play in numeracy instruction. Many teachers reported that children come to school unfamiliar with traditional games like *Pilolo* or local counting rhymes because such practices are no longer common in their homes and communities (Denkyira et al., 2023; Nabie & Akayuure, 2019). As a result, teachers are compelled to spend valuable instructional time introducing and

explaining these games before using them for numeracy activities reducing both lesson time and cultural immediacy (Mwangi et al., 2023). Without reinforcement from home, children struggle to meaningfully engage with culturally grounded play in the classroom, diminishing both their numeracy learning and their connection to indigenous heritage (Hadebe Ndlovu, 2022; Adu-Gyamfi & Brenya, 2022).

In sum, the study's findings reflect a network of interrelated challenges including time constraints, resource limitations, large class sizes, insufficient teacher training, and weak home-school partnerships that collectively limit the use of indigenous play in early numeracy instruction. Addressing these issues holistically could enhance not only children's numeracy learning but also the preservation of valuable cultural practices in formal education settings.

Research Questions 4: What Strategies can help Improve teachers' use of Indigenous play in Teaching and Learning Numeracy at the Early Childhood Education Centres in Sekyere East District?

The findings from the analysed data offer a rich and nuanced understanding of the factors influencing the effective use of indigenous play in teaching numeracy within early childhood education centres. The voices of the teachers reveal both their awareness of the pedagogical value of indigenous games and songs, and the systemic and contextual limitations that hinder their consistent use.

A central theme emerging from the data is the issue of curriculum integration. Many teachers acknowledged the benefits of using traditional games in numeracy lessons but noted that the absence of indigenous play in the official curriculum often relegates it to a supplementary or informal activity. Several participants explained that if activities such as local games and songs were formally recognised in the early childhood curriculum, it would provide clear guidelines and official permission to employ them

regularly. This would legitimise their use and foster a sense of pedagogical security, motivating teachers to plan and implement culturally meaningful numeracy activities with greater confidence. This finding echoes Boyd and Uysal's (2020) argument that curriculum frameworks act as powerful tools in shaping instructional choices and promoting culturally responsive pedagogy.

Closely linked to this is the emphasis on professional development. While many teachers are familiar with indigenous games from their own cultural experiences, they admitted lacking the pedagogical strategies to effectively connect these activities with structured mathematical concepts like counting, addition, and pattern recognition. Teachers consistently expressed the need for regular workshops, in-service training, and peer-sharing sessions focused on integrating indigenous play into numeracy instruction. This supports Baker et al.'s (2018) assertion that ongoing professional learning is crucial in equipping teachers to design purposeful, play-based activities that align with curriculum outcomes. The data suggest that with targeted training, teachers would not only enhance their instructional skills but also build the confidence to innovate and adapt local games for numeracy learning.

The availability of teaching and learning resources also emerged as a pivotal factor. Several teachers cited the lack of essential materials such as beads, number stones, counting sticks, and game boards as a major limitation to implementing indigenous play activities. Conversely, when these resources are available, teachers are able to design interactive, engaging numeracy activities that promote both active participation and cultural identity. This observation is consistent with Boyd and Uysal's (2020) position that well-resourced learning environments, furnished with culturally appropriate, open-ended materials, encourage hands-on, interactive learning and nurture children's creativity.

Another valuable insight from the data is the role of parental and community advocacy. Teachers shared that when parents and community elders express interest in indigenous play and actively participate in related activities, it enhances children's enthusiasm and reinforces the cultural relevance of these practices within the classroom. Some participants recounted experiences of parents donating materials or demonstrating traditional games, which created a lively and engaging numeracy learning environment. This finding corroborates Epstein's (2018) work on family-school partnerships, which highlights that meaningful parental involvement enriches children's learning experiences and strengthens the cultural significance of education. Additionally, community engagement, as the data suggest, can influence school leadership decisions, encouraging the provision of time, resources, and support for indigenous play activities.

Finally, the importance of peer learning and professional learning communities (PLCs) was underscored throughout the data. Teachers reported that much of what they know about integrating indigenous games into numeracy lessons was acquired through informal discussions with colleagues, peer observations, workshops, and collaborative meetings. These platforms provide essential opportunities for teachers to share ideas, reflect on challenges, and learn practical demonstrations from one another. The findings indicate that such collaborative engagements not only strengthen teachers' instructional skills but also help to build a supportive professional culture where culturally relevant, play-based pedagogy can flourish. This aligns with Gonzalez-Mena and Eyer's (2019) advocacy for peer mentorship and collaborative reflection as key strategies for improving early childhood teaching practice.

Taken together, the findings suggest that the effective use of indigenous play in numeracy instruction is shaped by a complex, interconnected network of factors including curriculum policy, teacher training, resource availability, parental

involvement, and peer collaboration. These elements, affirmed by both the voices of practitioners and existing literature, point to a clear and actionable pathway for promoting culturally meaningful, play-based pedagogy in early childhood education. Addressing these issues holistically will not only enhance numeracy learning outcomes but also preserve valuable cultural traditions within Ghana's formal educational framework.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.0 Overview

This chapter discusses the summary of the findings of the study, conclusion drawn for the main findings and the recommendations that the researcher made from the findings of the study. In addition to these very important issues are suggestions for further research since this research work has opened up various avenues for other researchers to venture into.

5.1 Summary of the Study

The purpose of this study was to examine how teachers' use of indigenous play in teaching numeracy at early childhood education centres in the Sekyere East District. These objectives guided the study;

1. Investigate the types of indigenous play activities used to teach numeracy at the early childhood education centres in Sekyere East District.
2. Examine factors that influence teachers' use indigenous play in teaching and learning numeracy at the early childhood education centres in the Sekyere East District.
3. Identify the barriers that teachers face in using indigenous play to guide pupils to learn numeracy at early childhood education centres in the Sekyere East District.
4. Identify strategies to improve teachers' use of indigenous play in teaching and learning numeracy at the early childhood education centres in the District.

5.2 Main Findings

The findings from the study revealed the use of traditional songs and rhymes, cultural arts and craft are some of the ways through which indigenous play can be used in the teaching and learning of numeracy in kindergarten classrooms. Also, traditional games and activities informs how indigenous play can be used in teaching numeracy at the early childhood centres in the Sekyere East District.

The findings from the study revealed that factors such as available teaching and learning resources in indigenous play, teachers knowledge and skills in indigenous play are factors that influence their use of indigenous play in numeracy instructions in the Sekyere East District. Moreover, early childhood teachers support from school leadership regarding the use of indigenous play as well as children's interst in indigenous play ability of indigenous play also influence teachers use of indigenous play in teaching numeracy.

The findings from the study also revealed that inadequate teaching and learning resources in indigenous play, inadequate professional development opportunities for teachers affect the use of indigenous play in the teaching and learning of numeracy in the Sekyere East Municipality. Also, time constraints when it comes to the use of play-based pedagogy in numeracy lessons as well as classroom management required to control learners in play activities affects its implementation in early childhood classrooms.

The findings from the study further revealed that integration of indigenous play into curriculum, adequate professional training on the use of indigenous play, availability of indigenous teaching and learning resources, active parental and community engagement as well as peer learning and PLC enhances the use of indigenous play in teaching of numeracy.

5.3 Conclusion

The following conclusions were drawn from the study;

The study concludes that the use of traditional songs and rhymes, cultural arts and craft are some of the ways through which indigenous play can be used in the teaching and learning of numeracy in kindergarten classrooms. Also, traditional games and activities informs how indigenous play can be used in teaching numeracy at the early childhood centres in the Sekyere East District.

The study concludes that parental inclusion and acceptance, access to indigenous teaching and learning resources as well as cultural awareness of the teachers regarding indigenous play, early childhood teachers' knowledge regarding the use of indigenous play as well as ability of indigenous play to facilitate understanding of learners also influence teachers use of indigenous play in teaching numeracy in the Sekyere East District.

The study further identifies key challenges hindering the implementation of indigenous play-based pedagogy in teaching numeracy including time limitations, and a lack of teachers' understanding of play-based approaches, class control and management by teachers, poor parental involvement presents a significant obstacle to the use of indigenous play in teaching numeracy.

Finally, the study conclude that provision of adequate professional training for kindergarten teachers on the use of indigenous play, availability of indigenous teaching and learning resources, active parental and community engagement enhances the use of indigenous play in teaching and learning of numeracy.

5.4 Recommendations

Based on the findings of the study, the researcher recommends that:

1. It is recommended that early childhood educators in the Sekyere East District intentionally integrate traditional songs, rhymes, cultural arts, and games into numeracy lessons to enhance learner engagement and cultural relevance. Educational authorities should support this by providing resources, training, and curriculum guidelines that promote the use of indigenous play-based strategies, ensuring numeracy instruction remains interactive, meaningful, and reflective of the children's cultural environment.

2. It is recommended that the Sekyere East Education Directorate school provide regular training, adequate teaching resources, and create supportive environments for teachers. Additionally, school leaders should encourage indigenous play activities and engage parents to sustain children's interest. These efforts will improve teachers' capacity and confidence to effectively use indigenous play in numeracy instruction within the Sekyere East District.

3. It is recommended that Ghana Education Service and school leaders provide adequate indigenous play resources, regular professional development, and review timetables to accommodate play-based numeracy lessons. Additionally, teachers should be supported with effective classroom management strategies to successfully integrate indigenous play in early childhood classrooms within the Sekyere East Municipality.

4. It is recommended that the Ghana Education Service, curriculum developers, and school heads formally integrate indigenous play into the early childhood curriculum as well as community involvement, and peer learning communities to enhance the effective use of indigenous play in teaching numeracy.

5.5 Suggestions for Future Research

Future studies could explore the perceptions of parents and learners regarding the use of indigenous play in numeracy lessons to gain a more holistic understanding of its

impact. Researchers may also conduct comparative studies between public and private early childhood centres to identify variations in the use and effectiveness of indigenous play-based pedagogy. Additionally, longitudinal studies could investigate the long-term effects of incorporating indigenous play on children's numeracy development and overall academic performance. Further research might examine the integration of indigenous play in other subject areas such as literacy and environmental studies. Lastly, exploring policy implementation and curriculum support for indigenous play in early childhood education could provide insights for educational policymakers and curriculum developers in Ghana.

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APPENDECES

APPENDIX A

INTERVIEW GUIDE

A

1. Please how long have you taught the early childhood class?
2. Can you tell me your experiences as an early grade teacher?
3. What are the various strategies that are available for teaching numeracy at the early childhood level?
4. Can you tell us more about indigenous play activities?
5. Please tell us some of the indigenous play activities that can be used to teach numeracy at the early grade level.
6. Can you describe briefly how you use indigenous play to teach numeracy?
7. Do you think a lot of teachers who teach at the early childhood centers use indigenous play to teach numeracy at the early childhood centers?

B

1. Can you tell us why you use indigenous play activities to teach numeracy at the early childhood center?
2. Do you think it is the best way to teach numeracy at early grade?
3. Do your learners understand most of the concepts in numeracy when you use indigrnous play to teach numeracy?

C

1. What are some of the challenges you face when you use indigenous play activities to teach numeracy?
2. What kind of difficulty do you encounter when using indigenous play activities to teach numeracy at the early grade level?
3. Can you mention some of the things stakeholders must do so that these challenges will be dealt with?

D

1. What do you think stakeholders must do to improve on the use of indigenous play in teaching numeracy at early grade level?
2. Is there anything you think can be done to improve the use of indigenous play in teaching numeracy at the early grade centers?

APPENDIX B

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FES/DECE/I.1

5th August, 2022

The Director
Ghana Education Services
Sekyere East District
P. O. Box 2
Effiduasi – Ashanti

Dear Sir/Madam

INTRODUCTORY LETTER

We write to introduce to you **Ms. Gladys Ataa Arhin** with index number **202121303** who is an M. Phil student in the above department. She was admitted in 2020/2021 academic year and has successfully completed her course work and is to embark on her thesis on the topic: ***"Assessing teachers use of indigenous play activities in teaching numeracy in early Childhood Centres in Sekyere East District".***

Ms. Arhin is to collect data for her thesis, and we would be most grateful if she could be given the needed assistance.

Thank you.

Yours faithfully,

Samuel Oppong Frimpong, Ph. D
Ag. Head of Department

APPENDIX C

CONSENT FORM

APPENDIX D

DATA COLLECTION INSTRUMENTS