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# Influence of Indigenous Games on the Mathematics Foundation Knowledge for Young Children in Afijio Local Government

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**Abstract:** This study explores the impact of indigenous games on the foundational mathematics knowledge of young children, addressing the need for culturally relevant educational practices in early childhood education. Building on Lev Vygotsky's Theory of Play-Based Learning (1934), the research aims to determine whether participation in indigenous games enhances early mathematical skills such as counting, pattern recognition, spatial awareness, and problem-solving. The study responds to a gap in the literature regarding the integration of cultural activities into formal education. A mixed-method research design was employed, involving a sample of 200 children from Afijio Local Government, selected through stratified random sampling. Data were collected using self-structured questionnaires, standardized tests to assess mathematical skills, and observations to record interactions during play. The instruments were validated by experts in early childhood education and mathematics, with a reliability test yielding a Cronbach's Alpha of 0.70. Data analysis included both descriptive statistics (frequency and percentage) and inferential statistics to compare the mathematics foundation knowledge between groups, along with thematic analysis of qualitative data. The findings demonstrate that indigenous games significantly enhance children's foundational mathematics knowledge, suggesting that those who engage in these activities perform better in mathematics than their peers. The study highlights the importance of integrating indigenous games into early childhood curricula, not only to improve mathematical learning but also to preserve and promote cultural identity. These results underscore the need for educational policies that incorporate culturally relevant practices, providing a dual benefit of academic and cultural development.

**Keywords:** Indigenous Games, Mathematics Foundation Knowledge, Early Childhood Education, Cultural Relevance, Cognitive Development, Educational Practices.

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## 1. Introduction

Indigenous games such as "Ayo," "Ludo," and "Oware" (Ayo olopon) hold significant value in the cultural heritage and cognitive development of children in various African communities. These games extend beyond mere entertainment, offering substantial educational benefits by promoting skills such as strategic thinking, counting, and problem-solving. For instance, "Ayo" enhances abilities in strategic thinking and counting, while "Oware" improves problem-solving and pattern recognition, serving as effective tools for cognitive development within culturally relevant contexts [1]. Research also shows that these games encourage social interaction and cultural transmission, reinforcing community values and traditions among younger generations [2]. Additionally, integrating indigenous games into educational curricula has been found to enhance learning outcomes by making education more relatable and engaging for children [3].

Nonetheless, challenges such as modernization and the decline of traditional practices pose risks to the continuity of these games, underscoring the need for preservation efforts [4]. Overall, indigenous games play a crucial role in fostering both cultural identity and cognitive development.

The development of mathematics has a long and complex history. It is largely known that the first formal recorded evidence of mathematics came with the Babylonian civilization, which dates as far back as 3500 B.C. During prehistoric times, children practiced and learned by playing. [5] The aborigines also played with their kids and taught them how to become skilled hunters and good gatherers. Through the use of indigenous games, mathematical thinking, reasoning, reflections, and manipulation come into play. [6] Research shows that knowledge of indigenous games and play is the solid foundation on which the mathematics that young children know must rest [7]. The ability of young children to have a mathematics foundation in school can be influenced by the type of early childhood development experienced. However, the relationship between the games played and indigenous games that can provide a good mathematics foundation for young children. Indigenous games are cultural materials used in the learning process by the community. A variety of indigenous games can be sources of knowledge, such as mathematics, which can be used for early childhood education. In Piaget's opinion, upright helping drives pupils' self-discovery and understanding. Mastering mathematics is not something foreign to human culture. Indigenous games can be used as a material that has the potential to be a mathematics foundation for young children because the materials can motivate them to learn mathematics. [8] among other benefits.

Indigenous games offer substantial educational benefits for children, extending beyond mere entertainment to support the learning of crucial mathematical concepts. Research shows that these games enhance essential skills such as counting, pattern recognition, and spatial awareness, which are vital for early cognitive development. [9] For example, the interactive nature of these games enables children to engage with mathematical concepts in a practical setting, leading to a more profound understanding. [10]. Additionally, the social interactions involved in these games foster teamwork and communication, enriching the learning experience through cultural expression and collaboration [11]. The inclusion of local traditions in these games not only supports cognitive development but also strengthens children's cultural identity. Despite these evident benefits, further research is needed to investigate the long-term effects of these games on academic performance and social skills [12]. Overall, indigenous games are a versatile educational tool that aids in both cognitive and social development in children [13].

Anon (2003), and Nordi (2014) have all reported on the educational value of indigenous games. Indigenous people and children use play to create and make sense of the world. Yousif (2013) defines 'a child's right to play' as playing at a transformative activity, affecting and being affected in equal measure. While Kabir and Linguistics (2011) argue that play involving different types of physical activities and games that are conditioned by present and future events. Play helps in achieving the balance in the living of an individual and encourages them to be mentally and physically strong. Khamis (2015) views indigenous games as tools for both mental and physical development. The researcher believes that indigenous games can have an effect on the mathematical foundation knowledge of 4-6-year-old children [14]. Claudia and Mokgalaka (2015), on the integration of indigenous games on the learners' mathematical foundation knowledge in the intermediate phase as well as the level foundation".

Mathematics foundation knowledge encompasses the essential mathematical concepts and skills that serve as the groundwork for future learning. Building a strong foundation in mathematics is crucial for children's academic success, as it supports their ability to grasp more complex mathematical ideas. Research shows that early

mathematical comprehension, including abilities like counting, number recognition, and spatial awareness, is strongly linked to enhanced problem-solving skills and logical reasoning in later years [15, 16]. Mukuka and Kalariparampil, for example, emphasize that foundational skills are vital for cultivating the higher-order thinking required for advanced mathematics [17]. Similarly, Sa'di et al. highlight that early exposure to mathematical concepts promotes cognitive development, which is essential for academic success [18]. Additionally, Zamir qizi's research indicates that children who possess a solid understanding of basic mathematical skills tend to excel in school overall, underscoring the significance of early intervention in mathematics education [19]. Collectively, these studies highlight the importance of nurturing foundational mathematical skills to support children's future learning paths [20,21].

Incorporating indigenous games into the learning process can greatly enhance young children's foundational knowledge in mathematics. Research shows that culturally relevant games, like "Oware," popularly call "Ayo olopon in Yoruba land" help introduce mathematical concepts such as counting and pattern recognition within a familiar context, making learning more engaging and meaningful for children [22]. These games not only reinforce mathematical skills but also foster cultural identity and relevance in education, which is essential for effective learning [23]. Additionally, studies indicate that interactive methods, including indigenous games, can lead to better mathematical understanding and retention among young learners. Despite the clear potential benefits, implementing such games in diverse educational settings may present challenges, such as varying levels of cultural familiarity among educators and students. Overall, harnessing the educational potential of indigenous games can help build a strong mathematical foundation that is aligned with children's cultural experiences. This study was anchored on Theory of Play-Based Learning by Lev Vygotsky (1934). Theory stated that "Play is the leading source of development in early childhood because it fosters the development of higher psychological processes." The theory emphasized that the significance of play in cognitive development. According to Vygotsky, play is a fundamental activity through which children learn and develop higher psychological processes. He posited that play allows children to experiment with social roles, solve problems, and practice skills in a context that is both enjoyable and challenging. Through play, children engage in activities that are slightly beyond their current capabilities, which Vygotsky referred to as the "zone of proximal development" (ZPD). This theory asserts that the interactive and dynamic nature of play provides opportunities for cognitive growth and learning.

The Theory of Play-Based Learning is highly relevant to the study on the influence of indigenous games on mathematics foundation knowledge. Indigenous games, as traditional play activities, embody Vygotsky's concept of play as a vehicle for cognitive development. These games are inherently designed to be interactive and engaging, promoting skills such as counting, pattern recognition, and spatial awareness—key components of mathematics foundation knowledge. By integrating indigenous games into early childhood education, the study aligns with Vygotsky's theory by leveraging play as a medium to enhance mathematical skills. The cultural context of these games enriches the learning experience, making mathematical concepts more meaningful and relevant to children. As children interact with and learn through these traditional games, they are engaging in activities that stimulate their cognitive development and support their understanding of foundational mathematical concepts. Thus, Vygotsky's theory provides a solid foundation for exploring how culturally significant play activities can contribute to early mathematics education. This study aims at investigating influence of indigenous games on the mathematics foundation knowledge for young children in Afijio local government.

### Statement of the Problem

The upbringing of children is a significant concern for parents, teachers, and guardians, who aim to ensure that children benefit from indigenous games as these activities play a crucial role in shaping the development of young children, particularly in Nigerian culture. These games are instrumental in laying a solid foundation for the formal knowledge that will later be acquired in schools and colleges across various fields of science and technology. Indigenous games not only develop physical and cognitive abilities but also nurture talents that are essential for life improvement and self-reliance.

However, a pressing issue is the underperformance of young children, especially in Mathematics, where the foundational skills appear weak. This problem can be traced to the diminishing exposure of the current generation to these meaningful indigenous games, which are essential for establishing a strong knowledge base. Parents and teachers have not adequately established environments where these games are played, depriving children of this crucial aspect of their upbringing.

Existing literature has explored the positive impact of indigenous games on children's cognitive and physical development. For instance, research has shown that these games can enhance problem-solving skills, foster teamwork, and improve mathematical reasoning among young learners. Studies also highlight the cultural significance of these games in reinforcing identity and promoting social cohesion. However, despite these benefits, there is a noticeable gap in integrating indigenous games into formal educational settings, particularly in early childhood education.

This study seeks to fill this gap by examining the specific impact of indigenous games on mathematics foundation knowledge among young children in Afijio Local Government. By investigating this relationship, the study aims to provide insights into how culturally relevant educational practices can be leveraged to improve mathematical learning outcomes and overall child development.

### Purpose of the Study

The purpose of this study is to investigate the influence of indigenous games on the mathematics foundation knowledge of young children in Afijio Local Government. Specifically this study aims to:

1. Examine how indigenous games contribute to the development of mathematical skills in young children.
2. Identify specific mathematical concepts that are enhanced through participation in indigenous games.
3. Determine if there are differences in mathematics foundation knowledge between children who engage in indigenous games and those who do not.

### Research Questions

To achieve the purpose of this study, the following research questions was formulated to guide this study

1. How do indigenous games contribute to the development of mathematical foundation knowledge in young children in Afijio Local Government?
2. What specific mathematical skills are enhanced through participation in indigenous games?
3. Are there differences in mathematics foundation knowledge between children who engage in indigenous games and those who do not?

## 2. Materials and Methods

This study adopted a mixed method research design to investigate the influence of indigenous games on the mathematics foundation knowledge of young children in Afijio Local Government. The descriptive research design is suitable for this study as it allows for the systematic collection, description, and analysis of data related to the impact of

indigenous games on mathematical learning. This design helped in understanding the current state of mathematics foundation knowledge among children who engage in these games compared to those who do not.

The target population for this study consisted of young children in Afijio Local Government who was enrolled in preschools and early childhood education centers. The population includes children aged 4 to 6 years, as this age group is crucial for the development of early mathematical skills and is actively engaged in play-based learning. A stratified random sampling technique was used to select the sample for this study. The sample was drawn from different preschools and early childhood education centers within Afijio Local Government to ensure representation of various cultural and socio-economic backgrounds.

The study involved a sample of 200 children, with 100 children who participate in indigenous games and 100 who do not. Data was collected using a combination of instruments designed to measure children's mathematics foundation knowledge and their engagement with indigenous games. A self - Structured questionnaire was administered to educators and parents to gather information on children's participation in indigenous games and their perceived impact on mathematics skills. Standardized tests were used to assess children's mathematics foundation knowledge, including skills such as counting, pattern recognition, and spatial awareness. Observational tools were used to record children's interactions with indigenous games and their engagement in mathematical activities during play.

To ensure the validity of the research instruments, the instruments was reviewed by experts in early childhood education and mathematics to ensure that they accurately measure the intended constructs. The instruments were pilot tested with a small group of children and educators to identify any issues and make necessary adjustments. The reliability of the instruments was assessed through Cronbach's Alpha to the internal consistency of the questionnaires and achievement tests was measured using Cronbach's alpha, aiming for a coefficient of 0.70.

For observational checklists, inter-rater reliability was evaluated by having multiple observers' record and compare their observations. Data analysis was conducted using both quantitative and qualitative methods: For Quantitative Analysis, Statistical techniques was used to analyze test scores and questionnaire responses. Descriptive statistics (mean, standard deviation) and inferential statistics (t-tests, ANOVA) was employed to determine differences between children who engage in indigenous games and those who do not. Thematic analysis was used to analyze qualitative data from the observations, identifying key themes related to the impact of indigenous games on mathematics foundation knowledge.

### 3. Results

#### Analysis of Questionnaire Responses

##### A. Educator Questionnaire

Table 1. Educator Questionnaire

Item	Frequency	Percentage
<b>Incorporation of Indigenous Games</b>		
Yes	15	75%
No	5	25%
<b>Frequency of Game Play</b>		
Daily	8	40%
Weekly	5	25%
Monthly	2	10%
<b>Perceived Impact on Mathematics Skills</b>		
Significant Improvement in Counting	80%	80%
Moderate Improvement in Pattern Recognition	70%	70%
Significant Improvement in Spatial Awareness	65%	65%

#### Interpretation:

A majority (75%) of educators incorporate indigenous games into their teaching practices, with a significant portion using these games daily (40%). This high frequency suggests a strong integration of cultural play activities in educational settings.

Educators perceive indigenous games to have a positive impact on mathematical skills, with 80% noting significant improvements in counting abilities, 70% in pattern recognition, and 65% in spatial awareness. This indicates that these games are seen as effective tools for enhancing various mathematical competencies.

##### B. Parent Questionnaire

Table 2. Parent Questionnaire

Item	Frequency	Percentage
<b>Child's Engagement with Indigenous Games</b>		
Regular Play	60	60%
<b>Impact on Mathematics Foundation Knowledge</b>		
Significant Improvement in Counting	75%	75%
Moderate Improvement in Pattern Recognition	65%	65%
Significant Improvement in Spatial Awareness	70%	70%

**Interpretation:**

60% of parents reported that their children regularly engage in indigenous games at home, reflecting a notable level of cultural play outside of educational settings.

Parents also observe significant benefits from these games, with 75% noticing substantial improvements in counting, 65% in pattern recognition, and 70% in spatial awareness. This confirms that the positive impact of indigenous games on mathematical foundation knowledge is also recognized by parents.

**C. Results from Mathematics Achievement Tests**

Table 3. Results from Mathematics Achievement Tests

Test Component	Indigenous Games Group	Non-Indigenous Games Group
Counting Skills	85%	70%
Pattern Recognition	80%	65%
Spatial Awareness	75%	60%
Problem-Solving	90%	75%

**Interpretation:**

Children who engage in indigenous games outperform those who do not in all areas assessed: counting skills (85% vs. 70%), pattern recognition (80% vs. 65%), spatial awareness (75% vs. 60%), and problem-solving (90% vs. 75%). These results suggest that participation in indigenous games positively influences children's mathematical abilities, providing empirical support for the effectiveness of these games in enhancing foundational math skills.

**D. Observational Checklist Results**

Table 4. Observational Checklist Results

Observation Item	Indigenous Games Group	Non-Indigenous Games Group
Active Participation	90%	70%
Following Rules	85%	60%
Accurate Counting	80%	65%
Pattern Recognition	75%	55%
Spatial Awareness	70%	50%
Cooperative Play	85%	65%
Problem-Solving Abilities	80%	60%

Table 5. General Observations Mathematical Skill Improvements

General Observations	Indigenous Games Group	Non-Indigenous Games Group
Preferred Games	"Ayo," "Oware"	Not Applicable
Mathematical Skill Improvements	Significant	Moderate

#### Interpretation:

Observational data revealed that children who engage in indigenous games are more actively involved in play (90% vs. 70%) and better at following rules (85% vs. 60%) compared to those who do not play these games.

They also demonstrate better skills in counting (80% vs. 65%), pattern recognition (75% vs. 55%), and spatial awareness (70% vs. 50%).

Furthermore, these children exhibit higher levels of cooperative play (85% vs. 65%) and problem-solving abilities (80% vs. 60%).

The preferred games, such as "Ayo" and "Oware," are associated with significant improvements in mathematical skills, indicating that these games play a crucial role in developing foundational math knowledge in young children.

#### 4. Discussion

The findings from this study highlight the positive influence of indigenous games on the mathematics foundation knowledge of young children in Afijio Local Government. This discussion interprets these results in light of recent literature and examines their implications for early childhood education.

##### Impact of Indigenous Games on Mathematics Skills

###### A. Educator and Parent Perceptions

Both educators and parents reported significant benefits from the use of indigenous games in enhancing children's mathematical skills. Educators observed notable improvements in counting skills, pattern recognition, and spatial awareness, with 80% noting significant gains in counting and 70% in pattern recognition. Similarly, parents reported significant improvements in their children's counting abilities and spatial awareness. These findings are consistent with research highlighting the role of culturally relevant activities in cognitive development. For instance, studies have shown that culturally tailored educational practices can enhance children's learning outcomes by making learning more relatable and engaging.

###### B. Mathematics Achievement Tests

The mathematics achievement tests revealed that children who engaged in indigenous games performed better in counting, pattern recognition, spatial awareness, and problem-solving compared to their peers who did not engage in these games. This supports previous research indicating that interactive and game-based learning approaches significantly enhance mathematical competencies in early childhood education. For example, research by Cayang and Ursabia (2023) found that these interventions enhance engagement and motivation, leading to improved math performance among young learners. Similarly, Ke et al. (2024) observed that game-based methods not only enhance students' problem-solving capabilities but also deepen their understanding of mathematical principles.

###### C. Observational Checklists

Observational data confirmed that children participating in indigenous games demonstrated higher levels of engagement, rule-following, and mathematical skills compared to those not involved in these games. This observation aligns with the findings of Matafwali and Mofu (2023) who noted that traditional games enhance cognitive

development, particularly in mathematical skills and spatial reasoning, as children engage with the rules and strategies of these games

### **Implications for Early Childhood Education**

The positive outcomes associated with indigenous games suggest that integrating such cultural practices into early childhood education can enhance foundational mathematics skills. The results imply that educators should consider incorporating indigenous games into their teaching strategies to provide children with diverse learning experiences that promote mathematical understanding. This approach aligns with Xu and Ball (2024) highlight that such games support experiential learning, helping children understand mathematical principles through play.

### **Challenges and Recommendations**

Despite the positive findings, some challenges were identified, including limited resources and time constraints for educators. Addressing these challenges requires providing additional training and resources for educators, as well as integrating indigenous games more systematically into the curriculum. Recommendations include developing professional development programs focused on the use of indigenous games and creating resource materials to support educators in implementing these activities effectively.

### **Summary of the Findings**

This study explored the influence of indigenous games on the mathematics foundation knowledge of young children in Afijio Local Government. The findings from various data sources—including educator and parent questionnaires, mathematics achievement tests, and observational checklists—highlighted several key insights into the impact of these culturally relevant activities on children's early mathematical development.

#### **1. Impact on Mathematical Skills**

The results indicate that indigenous games significantly enhance children's counting skills, pattern recognition, spatial awareness, and problem-solving abilities. Educators and parents reported substantial improvements in these areas, with 80% noting significant gains in counting and 70% in pattern recognition. Similarly, mathematics achievement tests showed that children engaging in indigenous games outperformed their peers in all tested components (counting skills, pattern recognition, spatial awareness, and problem-solving).

#### **2. Observational Insights**

Observational data further validated these findings, with children participating in indigenous games demonstrating better engagement, rule-following, and mathematical skills compared to those who did not engage in these games.

#### **3. Perceived Benefits**

The perceived benefits reported by educators and parents are consistent with the literature on culturally responsive pedagogy. By integrating indigenous games into educational practices, children not only engage in enjoyable and meaningful activities but also build foundational mathematical skills in a context that is familiar and culturally relevant. This approach helps bridge the gap between traditional education and culturally informed learning, enhancing both engagement and educational outcomes.

### **5. Conclusion**

The study concludes that indigenous games play a significant role in enhancing the mathematics foundation knowledge of young children. The evidence suggests that these games contribute positively to key mathematical skills such as counting, pattern recognition, and spatial awareness. The findings underscore the importance of incorporating culturally relevant activities into early childhood education to support holistic development.

### Recommendations

Based on the findings, the following recommendations were made

1. Educators should integrate indigenous games into the early childhood curriculum to leverage their benefits for mathematical learning.
2. Training programmes should be developed to help educators effectively incorporate indigenous games into their teaching practices.
3. Educational resources and materials should be created to support the use of indigenous games in early childhood settings.

### Implications for Policy and Practice

The positive findings from this study suggest that educational policies should promote the integration of culturally relevant activities into early childhood education. By recognizing the value of indigenous games, policymakers can support the development of more inclusive and effective educational practices that benefit all children.

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