Supporting Learners with Dyscalculia Through Indigenous Games in Early Childhood Classes

***Hlatshwayo Isaac[1], Mokgosana Olorato Fortune[2], Legadiko Moreri[3], Tsvetai Francis[4]**

[1,2,3]BA ISAGO University

[4]Reformed Church University

DOI: https://doi.org/10.47772/IJRISS.2026.100600218

Received: 27 May 2026; Accepted: 01 June 2026; Published: 20 June 2026

ABSTRACT

This study investigates the potential of indigenous games as an inclusive pedagogical strategy to address dyscalculia among early childhood learners in primary schools. The research recognizes that mathematical learning difficulties often stem from multiple factors including genetic predispositions, cognitive variations in brain function and working memory, and environmental conditions particularly prevalent in resource-limited settings across sub-Saharan Africa. Young learners with dyscalculia demonstrate weak number concepts, rely heavily on finger counting, and experience mathophobia that can persist throughout their academic journey if not addressed during the critical early years when children's minds are most receptive to intervention. This qualitative case study, grounded in an interpretivist paradigm, was conducted at three primary schools and employed multiple research instruments including semi-structured interviews, observation checklists, document analysis, and focus group discussions. The study involved 3 (three) early childhood teachers, nine (9) lower primary learners with dyscalculia, and nine (9) parents to gain comprehensive insights into the phenomenon from three selected schools. The study findings aim to provide practical strategies for teachers facing challenges in supporting learners with dyscalculia while fostering positive attitudes toward mathematics. This research contributes to the broader discourse on inclusivity in early childhood settings by demonstrating how culturally embedded pedagogical approaches can transform mathematical learning experiences for vulnerable learners particularly learners with dyscalculia. The study findings noted some challenges that early childhood teachers face when dealing with learners with dyscalculia. Furthermore, the study findings noted that indigenous games play a pivotal role in supporting learners with dyscalculia. The study, therefore, recommends the use of indigenous games at early childhood level as a means to mitigate the challenge of dyscalculia. The study also recommends for the incorporation of indigenous games as a module in teacher training colleges.

Keywords: **dyscalculia, indigenous games, early childhood education, inclusive education, mathematical learning disabilities.**

INTRODUCTION AND RATIONALE

The use of indigenous games is one way that can decrease the learning disability of dyscalculia and bring about inclusivity at early childhood level. Indigenous games are those recreational activities that originate from specific cultural groups and that are being played by people of varied age groups including young children. These indigenous games are passed down from one generation to the other across various cultures worldwide (Pramanik, 2018). It is a global outcry that young children can develop dyscalculia, a learning disability that requires such learners to be supported so that they can access the Mathematics curriculum just like any other learners. The support that teachers can render especially at early childhood level can be in the form of learner centered play way strategies (Diamond, Grob and Reitzes, 2015; Cade, 2023). This study explores the use of indigenous games as one of the strategies that early childhood facilitators can use to address dyscalculia learning disability among early childhood learners.

Research questions

i. How does dyscalculia affect early childhood learners' academic performance?

ii. How can indigenous games be used as a strategy to support learners with dyscalculia?
iii. What games can be used to address challenges caused by dyscalculia?

LITERATURE REVIEW

In the views of Salisa and Meilasari (2023) children with dyscalculia experience challenges in grasping numerical ideas as well as performing Mathematical operations. These difficulties can influence their grades in Mathematics, their confidence and attitude towards learning Mathematics and can also be an obstacle in applying Mathematical concept in real life situation like the use of money when shopping. In the essence of early childhood education, addressing challenges earlier is crucial for fostering positive learning experience and for ensuring that children's needs are met (Pakombwele, Hlatshwayo, Sikhangele et al, 2024). This is so because the learning difficulties would not yet have developed to be learning disabilities.

Causes and factors contributing to the resultant of dyscalculia

Developmental Dyscalculia (DD) is a learning disorder affecting the ability to acquire school-level arithmetic skills, affecting approximately 3-6% of individuals (Price & Ansari, 2013). Despite having such statistics, it remains unknown as to the causes. However, efforts can be made to support such learners with dyscalculia.

Genetic factors

Among the various factors contributing to dyscalculia, genetics play a very notable role in shaping an individual's mathematical abilities. Genetic influences affect how specific brain regions develop and function, particularly those areas responsible for number sense, calculation, and mathematical reasoning factors (Kanzafarova, Kazantseva, & Khusnutdinova, 2015; Carvalho, & Haase., 2019). Genetics runs within the family. Research consistently shows that mathematical learning difficulties cluster in families, with children of parents who struggled with mathematics being significantly more likely to experience similar challenges (Ocampo, Ocampo & Cruz, 2018; Muñez, Bull, Lee, & Ruiz, 2023). This familial aggregation provides strong evidence that genetic factors contribute substantially to the development of dyscalculia. This is also supported by studies in Europe which indicate that there is 39% for dyscalculia to occur in non-identical twins children whereas for twins the percentage is much higher at 58% for if one of the twin children has dyscalculia the other one can also have it (Prior, 2022). In the case of early childhood, young learners as from reception classes to Standard 3 will be at the sensitive periods whereby their minds are like a sponge which can absorb information very quickly. As such, it is at this period whereby interventions will need to be put in place to address the condition before it becomes a learning disability.

Cognitive factors

Mathematical learning is profoundly influenced by cognitive differences. The variations in brain function, limitations in working memory, and deficits in number sense are key factors that hinder learner's ability to grasp and apply mathematical concepts (Nelwan, Friso-van den Bos, Vissers & Kroesbergen, 2022). These difficulties, frequently associated with conditions like dyscalculia more especially in early childhood education, underscore the need for teaching approaches such as use of indigenous games that accommodate diverse learning profiles and ensure all students can access mathematics effectively. Study by Haase, et al (2014) indicate that some students may need more time to do speeded tasks as the students under experiments did well when they were given more time and resources to execute their tasks. This entails that the use of indigenous games can go a long way in supporting learners with dyscalculia to process mathematical functions and concepts

Environmental factors

There are several environmental factors that can lead to dyscalculia in children. In Africa, particularly the sub-Saharan Africa resources are insufficient to support learners with dyscalculia (Roberts, Tshuma, Mpalami & Saka, 2019). For example, if a child is not exposed to basic math skills like counting, shapes, or number recognition early on, it can be hard for them to catch up later. Also, being in a school where teaching is inconsistent or where the classes are too large for individual support can make it even more difficult. Sometimes, children pick up negative attitudes about math from adults around them if a parent or teacher says things like

"math is hard" or "I am not good at math," the child may start to believe the same about themselves. A lack of learning materials at home, like books or simple math games, can also limit their practice.

Effects of dyscalculia on early childhood learners' academic performance

Some of the challenges emanate from home for example, if a child is dealing with stress at home or in school, it can affect their ability to concentrate and learn. This is so as learners with this condition are known to be having a weak number concept which give rise to excessive guessing of correct answers or coming up with incorrect strategy to come up or reach to the answer (Mokotjo, 2024). In order to deal with numbers, the study notes that the most strategy used by learners with dyscalculia is through counting using fingers.

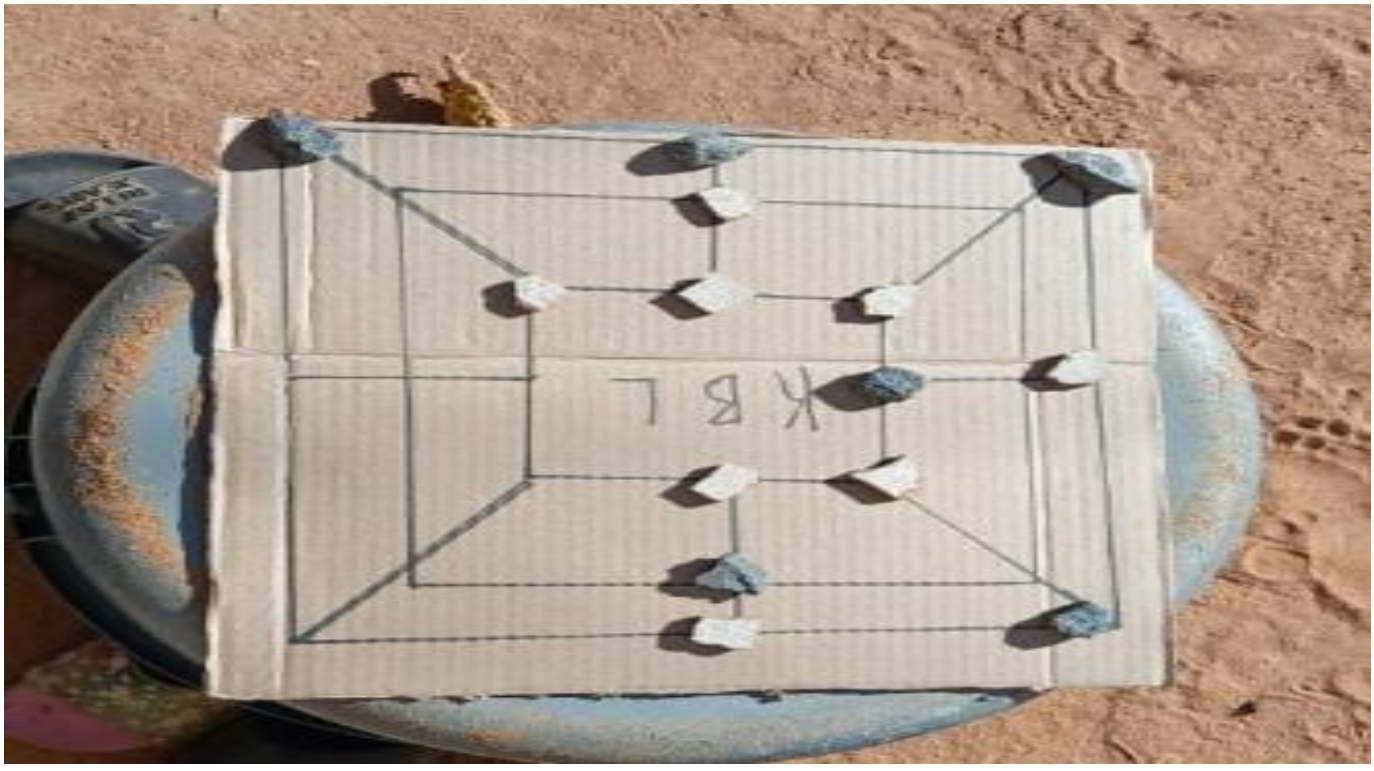
Early childhood learners affected by dyscalculia face significant challenges with basic mathematical ideas that serve as building blocks for future learning (Anjum, Ansari & Ullah, 2023; Mokotjo, 2024). It also affects the number sense, the natural ability to comprehend quantities and how they relate to one another proves particularly difficult for these children. For example, simple activities such as counting items, identifying numerical symbols, or grasping that the symbol "5" corresponds to a group of five objects present substantial obstacles. These foundational difficulties create barriers to learning arithmetic operations like addition and subtraction, skills that other children typically develop with relative ease. Dyscalculia significantly affects early childhood learners' academic performance, creating challenges that extend far beyond mathematics into emotional wellbeing, social development, and overall educational engagement (Ncube, Mcelelwa & Hlatshwayo, 2025). The cumulative nature of mathematical learning means that early difficulties can have long-lasting consequences without appropriate intervention.

Traditional games that can be used to address challenges caused by dyscalculia.

There are so many traditional games that can be used to support and address learning gaps caused by various learning disabilities in young children. Learners with early childhood learners with dyscalculia can be assisted to overcome the learning disability through such games like Morabaraba, Mhele, Koi, Diketo among others.

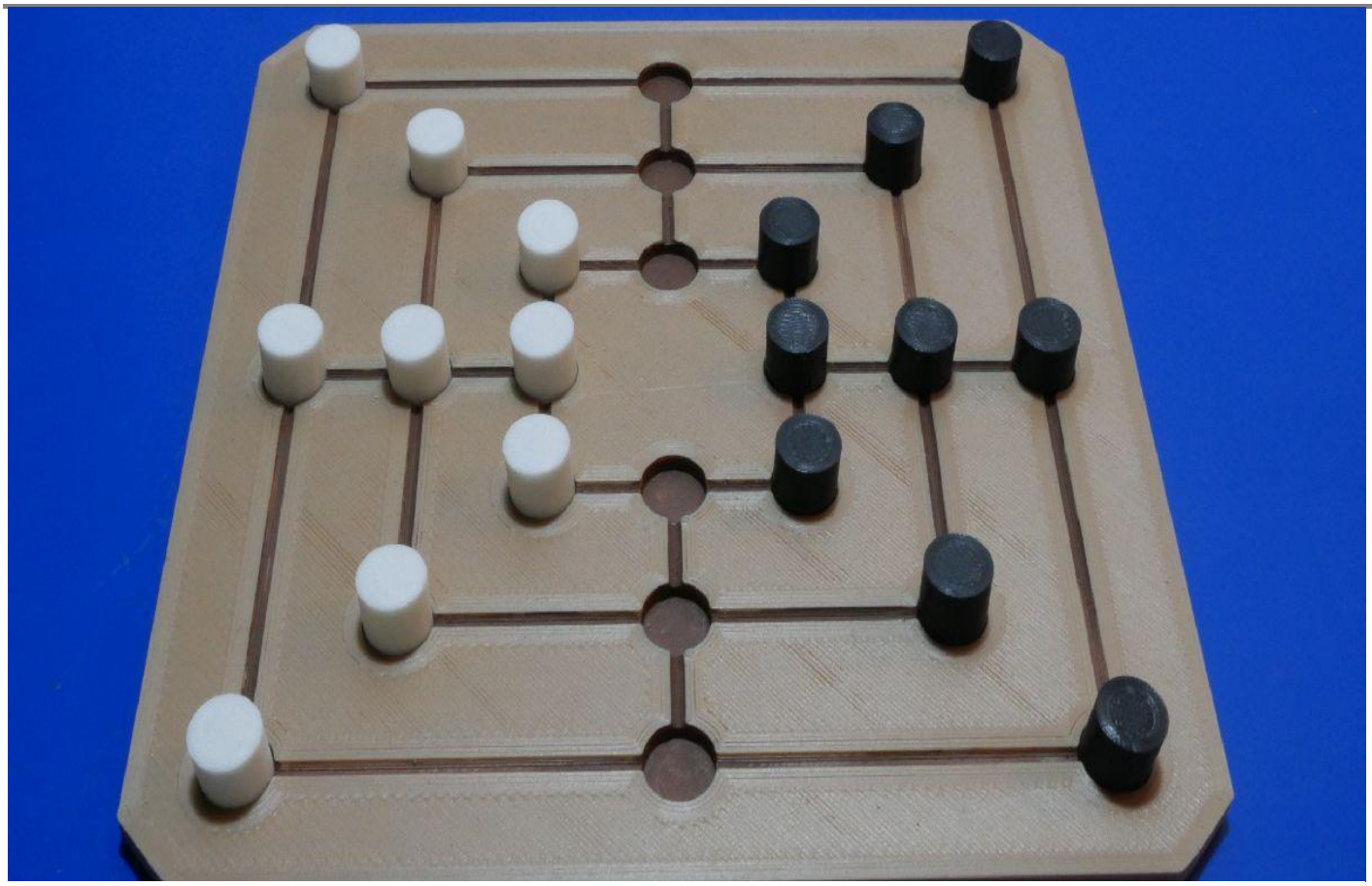
Mhele

Figure 1: Nine Men's Morris/Mhele game drawn on board



Source: Author generated

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue VI June 2026



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Mhele/Nine Men's Morris is a traditional indigenous board game commonly played in Botswana and Southern Africa. Similar to Morabaraba in terms of number of players, Nine Men's Morris is played by two players using a marked board and playing tokens such as pebbles, dried seeds, or bottle tops.

The game is played on a board drawn on the ground or board, consisting of interconnected lines and points awareness (Mweli, 2018; Hadebe-Ndlovu & Manditereza, 2025). Each player is given an equal number of tokens. Players take turns placing one token at a time on any empty point on the board while counting their tokens as they play. The aim is to form a straight line of three tokens (called a "Mhele") (Bele, 2026). When a player forms a Mhele, they are allowed to remove one of the opponent's tokens. After all tokens have been placed, players move their tokens along the lines to adjacent points, still trying to form Mhele and reduce the opponent's tokens (Mphasha, 2026). The game continues until one player is left with less than three (3) tokens to continue or cannot make a legal move (Mcelelwa & Musarandega, 2023). Mhele supports learners with dyscalculia by providing a concrete and playful way to develop numeracy skills. As learners place and move tokens, they practice counting, one to one correspondence, and number comparison in a natural and stress-free manner. The use of physical objects such as pebbles or seeds helps learners visualize quantities, which is especially important for children who struggle with abstract numbers. The game also encourages number sequencing, spatial awareness, and pattern recognition as learners aim to form lines of three. Additionally, playing Mhele reduces anxiety associated with mathematics because learning occurs through play, collaboration, and cultural familiarity. Through repeated play, learners gradually build confidence and understanding of basic mathematical concepts. A game like Mhele, involves critical thinking, spatial awareness and problem solving through counter acting on the opponent's moves. Therefore. as early childhood learners with dyscalculia will be playing such games, they will find themselves well committed in a more strategic activity than solving equations This makes Mhele an effective indigenous game for supporting learners with dyscalculia in early childhood classrooms.

Morabaraba

Figure 2: Children playing Morabaraba/Tsoro



Source: Author generated

This is a traditional strategy game played with stones or dried seeds distributed across rows of pits carved into a wooden board or dug into the ground. Players alternate turns by selecting a pit from their side, collecting all its stones, and distributing them counter-clockwise by dropping one stone into each consecutive pit, like planting seeds (Mcelelwa & Musarandega, 2023; Mphasha, 2026). The game ends when one side of the board is empty or no more moves are possible, with the final stone landing in a designated storage pit. The objective is to capture more stones than your opponent through strategic placement and movement, with the player who has captured all stones in their storage pit declared the winner. Success requires forward planning and mathematical thinking, as players must strategically decide which pits to empty to ensure a quicker and more decisive finish. Morabaraba helps learners with dyscalculia by providing concrete, hands-on mathematical practice through tactile manipulation of stones (Moloi & Tshele, 2014; Tachie & Galawe, 2021). As learners are engaged they are able to make abstract number concepts tangible and easier to grasp. Players engage in mental arithmetic adding stones to pits and subtracting through captures without the anxiety that is often associated with formal math instruction, and this strategic elements develop estimation, pattern recognition, and sequential thinking skills.

Diketo

Figure 3: Children playing Diketo



Source: Author generated

Diketo is a hand-eye coordination game where players manipulate stones or small objects while tossing a single stone in the air. The name varies by region and language; it may also be called other local names depending on the specific variant and cultural context for example *Nhodo* in Shona communities and *Amagende* in Zulu communities. The game tests player's hand-eye coordination and manual dexterity as they attempt to complete increasingly difficult rounds of stone manipulation. This game also helps learners with dyscalculia to easily grasp and understand counting, division, subtraction and addition as well as spatial awareness (Mweli, 2018; Hadebe-Ndlovu & Mandidereza, 2025). Players learn to recognize and create patterns as they play, which can help with understanding numerical relationships and operations. Bele (2026) posits that as the learners are playing *Diketo/Nhodo/Amagende* game the learners will be in a position to do the counting in play way through which learners will not be having pressure that comes with Mathematics. As young learners repeatedly accumulate the pebbles, the game encourages learners to do mental addition and also reinforces division as learners split stones into equal piles to continue the game. This will see grasping the concept of division and counting being done in a manner that is stress-free to learners especially those with dyscalculia learning difficulties.

Koi

Figure 4: Picture of children playing Koi



Source: Online pictures

Koi is an indigenous game, two people swing a rope, and one jumps over it, just like any other traditional games, it is entertaining and engaging to young children therefore, the game can be used to address the challenge of dyscalculia in ECD learners. Mokotjo (2024) asserts that effective learning requires active participation and engagement, for which the use of indigenous games such as Diketo and Koi can play a pivotal role in engaging dyscalculia learners in mathematics learning of concepts like counting, addition and subtraction. All this can be happening in a more exciting and flexible manner, since such types of games are played in children's society on regular basis.

Integration of Indigenous games that can address dyscalculia

In order to integrate these indigenous games to address dyscalculia, there are strategies that can be used by early childhood teachers. These include taking learners step by step from simple to complex versions of games, making mathematical connections to the game and having regular short sessions of the games among others.

Implementation strategies of indigenous games in Mathematics

One of the strategies is considering the gradual complexity of the game. Early Childhood teachers should begin by introducing the simplest version of the games, taking it step by step and slowly adding complexity to the

game. This is done in order to build the learner's self-confidence which is already affected by the dyscalculia condition.

Another strategy is whereby teachers can make explicit mathematical connections to the game. This can be done through having mathematical concepts incorporated in the game. For example, counting numbers in different sequences might be difficult for learners with dyscalculia but if the counting is embedded in a game like koi, learners can count these numbers or sing the song of days of the week whilst skipping a rope (koi) in a relaxed manner.

Regular short sessions are also a crucial strategy which early childhood teachers can use to implement indigenous games in Mathematics lessons (Mcelelwa & Musarandega, 2023). These short sessions may range from 15-20 minutes game sessions numerous times weekly. For example, when one wants to teach counting numbers up to one hundred (100) continuously, the early childhood teacher may break the counting content of 100 into sessions of 10s or 20s. This counting will be in a shorter space of time whereby learners will still be having energy and interest in playing Koi enhancing their counting ability. The strategy can be more effective than longer, infrequent sessions.

METHODOLOGY

This research study was grounded in an Interpretivist paradigm, through which teachers' living experiences were shared as the participants provided data through various qualitative data collection instruments.

Research Approach

This research study adopted a qualitative approach. Denzin and Lincoln (2018) view qualitative approach as a multi-method in focus, involving an interpretive naturalistic approach to its subject matter. Qualitative approach explores and helps to understand the meaning individuals or groups ascribe to social or human problems (Creswell, 2018). Therefore, a qualitative approach can be viewed as gathering information that cannot be measured easily by numbers. It is about exploring the complex human experiences, feelings and thoughts behind a certain topic. The reason for choosing qualitative is to gain a deeper understanding. For the sake of this study qualitative method allows for a richer understanding of how early childhood teachers can make use of traditional games to support learners with dyscalculia learning disabilities, and it allows the researchers to explore which indigenous games and how the mentioned games can be used for the benefit of learners with dyscalculia

Research design

A case study design was used in this study. Case study is a methodology to theory and practice suited for understanding complex and contribute significantly to theory and practice across various disciplines (Farquhar, 2019), A case study is a way to understand the unique complexities of a single case (Stake, 2020). Therefore, this study allows the researchers to gain a deep, rich understanding of how the use of indigenous games were of great use in addressing dyscalculia in early childhood learners at three selected primary schools. Case studies take place in real world settings (Creswell, 2018). This allows the study to gain relevance as learners were involved in games they usually play in their daily lives and mathematical concepts drawn out therefrom.

Data generation process

Through employing a combination of semi-structured interviews, observation checklists, focus group discussion and document analysis data was generated from participants. These instruments provided comprehensive data study to deeply understand how indigenous games can be leveraged to address dyscalculia in early childhood classrooms. This comprehensive approach yielded valuable insights into the effectiveness and practicality of integrating cultural games into math education for young learners

This study will employ four main research instruments to generate data. Firstly, a semi structured interview guide was used to gather in depth information from participants through open ended questions while allowing flexibility to probe for more detail. Secondly, a focus group discussion by parents, guided and facilitated group

interaction as well as the sharing of views among participants to capture collective perceptions and experiences. Thirdly, an observation checklist was used to systematically record behaviours, activities and conditions in the classroom environment, providing direct evidence of what occurs in practice. Lastly, a document review guide will be applied to analyze relevant school policies, records and other written materials in a structured and consistent manner. Using these instruments in combination it enabled the researcher to obtain comprehensive and credible data for the study

DISCUSSION AND FINDINGS

The key findings of the study were that there are some learners who are struggling in mathematical concepts at early childhood level. This is being caused by dyscalculia learning disability. Evidence from the document analysis showed some learners continuously scoring very low marks even on the simplest tasks they were given during assessment. The struggling of learners in mathematical concepts was also shared by parents in a focus group discussion who had this to say:

The struggles of children in mathematics are hereditary as some siblings are known to be facing some challenges when it comes to dealing with numbers. As parents we witness this as we engage these children in daily routines that involve numbers like when they go shopping counting money and or calculating change. You could easily see that the child is struggling. More so, we also notice this as we assist these children with mathematics related homework that involves numbers. FGD

Some standard 1 teachers shared the same sentiments as they had this to say:

Dyscalculia is common among early childhood learners especially at Standard 1 level as they struggle to comprehend and solve simple mathematical concepts even of addition or subtraction of numbers up to 10. Teacher A

Some learners at standard 2 will find themselves relying on finger counting even of smaller numbers. Teacher B

Another key finding was that some teachers agree that traditional games can be of great use. The participant had this to say:

Traditional games support early childhood learners with dyscalculia especially at reception level. However, teachers themselves do not have the idea of the traditional games that can be used. To some teachers they only know the names of the games but do not have any idea of how the game is played. Teacher C

The participants concurred that the most challenges faced by teachers in supporting learners with dyscalculia through traditional games include time constraints, class size in the form of teacher-pupil ratio, adaptive materials and resources as well as the assessment pressure on the teacher. Time constraints are in the sense that traditional games need more time to plan and play according to the rules of the game. Furthermore, the teachers will need to incorporate mathematical concepts thereby, causing the activity to prolong the time.

From the observations made, the size of the class also affects the support that can be rendered to learners with dyscalculia. Mostly, if the class is too big, attending to individual academic needs becomes a challenge. Meanwhile, assessment may give the teacher pressure since the teacher would want to cover and meet the demands of the syllabus at the expense of learners with dyscalculia who might need more time to grasp the concept.

CONCLUSION AND RECOMMENDATION

The study concludes that dyscalculia is a learning disability condition that affects learners including those at ECD level. However, there are some strategies that can be implemented to address such challenges and traditional games were noted to be one of the strategies that can be applied at ECD level to support learners with dyscalculia learning disability. Furthermore, the study concluded that despite traditional games being useful due

to the advent of technology, these traditional games seem to be ignored and only much being played mostly in rural areas where people are still cherishing and appreciating their cultural values and practices.

It is however noted with great concern that traditional games can support learners with dyscalculia therefore the study recommends early identification of learning disabilities in learners especially at early childhood level so as to come up with suitable intervention strategies to support such learners. In the same vein the study recommends the inclusion of learning of cultural practices which include traditional games as they assist learners with dyscalculia in comprehending concepts and skills as they will be engaged in activities they are immersed in daily basis the communities. This thereby, makes learning very authentic. Additionally, the study recommends incorporating studying of cultural games in teacher training institutions as well as workshops and seminars for teachers who are already in service but lacking the flare of cultural games.

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