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Using Indigenous Games as a Resource for Teaching Mathematics

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Abstract

This study contended that Grade 1 learners can use the indigenous *Amagende* game as part of their learning, especially in mathematics. In line with this assertion, this paper's authors explored the impact of Amagende in learning numeracy skills. This qualitative case study, underpinned by Mbigi's Collective Fingers Theory, conducted semi-structured interviews and classroom observations by engaging five Grade 1 teachers. The findings revealed that indulging in indigenous games like *Amagende* as a teaching strategy encourages literacy, numeracy, and personal development in early learning. It was recommended that teachers should consider indigenous games as tools to enhance mathematics performance in Grade 1 classrooms. This means there can be a cross-pollination of African and Western Indigenous games. This study contributes to new knowledge by highlighting that incorporating a native game like Amagende into the curriculum can increase gamification tactics and social and cognitive development.

Introduction

Generally using games in the foundation phase classes can result in positive effects in learning Mathematics, be it digital or traditional games. Having learners engage in any form of play pedagogy or play-based learning can increase engagement and motivation Nabie (2015). This study explored the use of Amagende as a traditional or cultural game in mathematics education. In this study adopting games, makes learning more relatable and meaningful. These games often embody mathematical concepts linked to ethnomathematics, allowing students to view mathematics within a real-world context, Moyo and Chinamasa (2022), Zimbabwe, and fostering a deeper understanding of the subject matter. Not only, do the learners relate to games numerically but the language practice which occurs spontaneously will assist in understanding the learning of Mathematics. Creating a play-based context within Mathematics classes. Since play-based pedagogy is child-centered and participatory, it activates all the child's senses (Danniels and Pyle,2017). Incorporating indigenous games into mathematics education supports SDG 4 (UNESCO, 2015) by making learning more inclusive, engaging, and culturally relevant. By recognizing and valuing indigenous knowledge systems, educators can create a more equitable educational landscape that fosters lifelong learning opportunities for all students.

Indigenous games are incorporated into mathematics education to promote inclusive and equitable quality

education, aligning with Sustainable Development Goal 4's aim to enhance learning experiences and make mathematics more culturally relevant.

Our study focused on a traditional game referred to as Amagende a game that is highly interactive and connects the learners to their culture as well as develops their mathematical literacy. Information on Amagende is scanty; if available, it may be over a decade. This study consulted literature that was easily accessible at the time of research. Using indigenous games in Early Childhood Education resonates with the vision of UNESCO (2022), highlighting the importance of incorporating indigenous games, toys, and cultural practices into Early Childhood Care and Education (ECCE) programs in Africa. The United Nations Convention on the Rights of the Child (UNCRC, 2020) supports this type of learning endorsed by the Ministry of Education (RSA, 1995). The South African Constitution (RSA, 1996) and the National Curriculum Framework (2023) confirmed the right to a fair and equal education for all children. Hence, Grade 1 teachers should be aware and create an awareness of such rights to engage in indigenous games to understand mathematical concepts better. There is a need for teacher training, which makes teachers aware of the significance of integrating Indigenous games in the learning context and practice to promote their active use in mathematics education; teachers can enhance students' mathematical understanding and critical thinking skills. Integrating Indigenous games into the curriculum provides a rich context for deep learning while covering essential foundational content areas for Grade 1 and beyond.

Amagende for Mathematics promotes learners' deep learning, especially critical thinking skills, and covers all five foundational content areas like addition, subtraction, numeracy, and number sense for Grade 1 learners. The idea that Amagende as an indigenous language is culturally dependent and hence is rooted in the view of Archaya et.al (2021) who view cultural games in Maths learning as enabling learners to engage in deep learning. This is by making sense of the Maths skills through the following: their experience of language, symbols, values, norms, social practices, and use of material artifacts related to their context.

Picture 1. Amagende (https://tarirohope.wordpress.com/0)

Matsekoleng (2021) states that the contextual factors will promote holistic child development through mother-tongue use and local culturally sourced materials (Awopegba et al., (2013). Zulu (2006), cited in Awopegba et al.

(2013), describes Indigenous education as a culturally evolving curriculum passed on from generation to generation while fostering social responsibilities and moral values. Indigenous education involves ceremonies, imitations, songs, games, dances, and drama. Hence, this study encourages traditional games because they provide engaging, culturally relevant, and enjoyable activities to foster young children's learning of number concepts while promoting crucial values like ubuntu. These aspects should be integrated into the Foundation Phase (FP) curriculum. Since Indigenous games can be powerful tools for promoting holistic early mathematics learning, this study recommends *Amagende*, a Zulu game *(Isipuca* in IsiXhosa), to be used in Grade 1 mathematics classrooms. Below is a picture of playing Amagende.

The Explanation of Playing Amagende

This indigenous game is played in pairs, primarily by girls; sometimes, boys chip in to have fun. Depending on how many players are available, you need several small stones (called Amagende) to play this Indigenous game. The players, in pairs, play the game by pulling and pushing the stones. The players must dig a palm-sized shallow circle or draw a small circle called isibaya (kraal) on the ground. Amagende (small stones) are placed inside the isibaya. Each player will have a particular stone called Ingede, which she holds to use during the game by throwing it up and down while pushing and pulling the stones into the circle. Only one player plays it at a time. You place ten stones in the small hole (Isibaya or kraal) and play the game according to a number sequence. A player will throw the inside into the air and quickly remove one stone, then two, then three, then four … up to ten. If a player can take out all ten, she returns nine into the kraal; the one outside will be a point for her until she collects all. When the ten stones are outside the kraal, the player skilfully puts them back. Once you miss an inside, then you forfeit your turn. So, the game may be counted in ones till you reach ten. The same pattern will continue until the player collects all the Amagende. However, there are rules to the game. It would be best to have the perfect hand-eye coordination to throw the inside up, take out stones, and skilfully return the expected number. Failure to catch the stone will incur a penalty; failure to put the required number back also incurs a penalty. Failure to follow the playing stage incurs a penalty as well. If the engine falls onto the ground, the player stops and gives a chance to the next player. The game is played by elimination.

Problem Statement

South Africa severely lacks educational resources, Aina. & Bipath (2022), especially in early childhood settings, using Amagende as a supplementary resource tool may help promote Maths skills in early childhood. In addition to offering a culturally appropriate method of interaction, indigenous games like Amagende help young students develop critical abilities, including cooperation and problem-solving (Delos Reyes, 2020).

Amagende is widely known for transcending geographic and linguistic borders. *Amagende* is known as *Nhodo* in Zimbabwe (Madondo & Tsikira, 2021), and in Zambia, the game is called Chiyato (Banda, 2018). Banda (2018) discusses the Zambian Game, Chiyato, which involves throwing and scooping stones, potentially improving children's subitising and numeracy skills through visual or perceptual subitising. The researchers of this study observed that the Tonga people of Zambia use the term Chiyato, called Chiyenga in Bemba. While both terms

refer to similar gameplay, Ichiyenga might be more commonly used in specific regions or among certain groups within Zambia, just like in South Africa where Amagende The term Amagende is prevalent in various provinces of South Africa but has local variations or synonyms that reflect regional dialects and cultural practices. The same game, Amagende, is termed *Gittey* in Pakistan, *Ondota* in Namibia (Utete et al., 2017), and *Mdako* in Tanzania (Smørdal, 2012). Despite different names, the games are the same.

In this paper, the authors envisioned creating awareness for Grade 1 learners' right to be taught mathematics by employing *Amagende* because it advances play-based pedagogy in the Foundation Phase (FP). In other words, this study recommends using indigenous games to teach mathematics in the lower grades as they create interest in imbibing and understanding operational concepts in mathematics (Butler & Wren, 1965). This study asserts that Amagende can develop operational concepts like subtraction and addition because the stones or Amagende are ten in a hole. You take all (stones) out and return 9, then 8, then 7, then 6,5,3,3,2,1, then there is nothing. In the second round, you take out ten, then return 2, then take out eight, return 2, then 6, then return 2, then four, and return two, then two, and return, reinforcing the concept of repeated addition. l Then, early childhood settings and elementary schools should build a strong foundation of deep mathematical understanding, emphasize reasoning and sense-making, and ensure the highest-quality mathematics education for each child in addition to developing Maths vocabulary. Amagende focuses on matching objects and numbers, which can lead to acquiring mathematical skills like counting, subtracting, sequencing, and comprehending underlying concepts. It also fosters critical thinking and problem-solving abilities.

The learners can be motivated to enjoy mathematics, which is essential and exciting to learn in the early grades. In other words, this Indigenous game, *Amagende,* can be a valuable resource in teaching mathematics to young learners. Using the knowledge of Indigenous people (Hewson et al., 2015) in the form of Indigenous games in formal education settings strengthens the inclusive educational approach (Msila, 2009, p. 313) therefore advancing the Idea of Indigenous Knowledge Systems (IKS). (IKS) are localized, dynamic systems of knowledge developed by Indigenous communities over generations, shaped by their interactions with their environment, often transmitted orally, adapting to internal and external changes. In the context of mathematics games, IKS can be integrated to provide culturally relevant and contextually grounded learning experiences, Kaloko and Morican, (1997). This integration is supported by Nkopodi and Mosimege (2009), who affirm that Amagende, including Indigenous knowledge systems (IKS), have been advantageous in enhancing mathematics results in FP classrooms. This is so because indigenous knowledge and games express local people's social realities, which can complement existing context-specific teaching resources. In addition to *Amagende* as a teaching tool, Nkopodi and Mosimege (2009) cite *Marabaraba* (board game) as an example of an Indigenous game that could help learners better grasp and solve mathematics word problems. Dziva, Mpofu, and Kusure (2011) maintain that Indigenous games foster learning by relating real-life experiences to mathematics. In other words, children understand and solve mathematical word problems more quickly when their learning is deeply rooted in traditional activities such as Amagende and marabaraba, which promote play-pedagogy in FP classrooms (Imray & Hinchcliffe, 2013; Moro et al., 2020).

However, three reasons limit Grade 1 teachers' understanding of *Amagende* as a teaching resource: insufficient

professional education opportunities for the majority of Grade 1 teachers, lack of current and traditional pedagogical content knowledge (PCK), and the lack of material resources (Jansen et al., 2018). To mitigate these limitations, a past study by Mweli (2018) found that utilizing resources such as Indigenous games to teach in FP settings assisted learners in gaining confidence to enhance their performance in mathematics. Moreover, Indigenous games like *Amagende* promote diversity within the classroom, which is crucial in endorsing inclusive education (Mweli, 2018). Further, Korjtaas (2019) suggests that teachers can improve their teaching skills through self-reflection and research in IKS. This leads to knowledge acquisition that informs practitioners about the value of Indigenous games like Amagende as a teaching strategy that improves the development of numeracy skills. This paper contends that using *Amagende* when teaching mathematics concepts in a multicultural school environment, especially in Grade 1 contexts, could be a simple approach that facilitates a better understanding of numerical operations (e.g. addition, subtraction, multiplication, and division). This is through repeated counting on of the stones, or subtraction of the stones therefore reinforcing numeracy skills. Moreover, using IKS, including Amagende, as a teaching technique can help understand mathematics.

Teachers' understanding of autonomy in teaching is based on exploring content delivery during lessons, which shapes teachers' professional pedagogy. In this study, teachers' knowledge and skills in planning and delivering mathematics lessons in Grade 1 classrooms represent their conceptual knowledge to increase learners' performance through Indigenous games like *Amagende* (Rowland et al., 2009). Regrettably, the integration of indigenous games into mathematics teaching methods has not yet been incisively explored. None of the relevant current and previous studies focuses on using *Amagende* as a teaching resource in Grade 1 settings - although there are global efforts to preserve Indigenous knowledge systems.

Indigenous Games and Teaching Mathematics

Chiyato in Zambia

Amagende can be equated to Zambia's *Chiyato.* According to Banda (2018), *Chicago* involves throwing a stone into the air while simultaneously scooping some stones back and forth in a small dug-out hole. This game has the potential to advance children's numeracy skills. It is equivalent to South Africa's *Amagende,* which confirms that Indigenous games are prevalent in most countries and can be used to develop numeracy skills in young children. Using traditional games acculturates children to appreciate and apply indigenous knowledge or African philosophies in their daily lives, especially in solving calculations-related problems (Mbigi, 1997).

Nhodo in Zimbabwe

Also, *Amagende is similar* to Zimbabwe's *photo,* which uses learners' knowledge drawn from their culture to 'make -real' what they learn in classrooms - thus, learning from the known to the unknown occurs. According to Moyo and Chinamasa (2022), Zimbabwe's Shona traditional games are valuable sources that enhance primary school mathematics instruction; they are free from language barriers and accessible both in and out of school. Hence, Moyo and Chinamasa (2022) advocate for using indigenous games in teaching-learning situations by asserting that games create meaningful situations for applying mathematical skills like counting, grouping,

comparing, sharing, and problem-solving, thus attracting children's interest in participating and enjoying play activities, especially in FP freely.

Ghana

A study conducted in Ghana (Nabie, 2015) also shows the prevalence of Games as a teaching strategy. This study contented that singing traditional games creates a bridge in the teaching of Mathematics, thereby developing cognitive strategies and numeracy.

Europe

According to Wulansari and Dwiyanti (2021) in Europe, there are different games that children can play. These games reinforce perceptions of traditional games, which relate to increasing children's numeracy skills.

Jackstoness in the *Philippines*

Agenda is similar to *Jackstoness*, a popular traditional game in the Philippines. It is a simple and competitive game where the individual or team with the most points wins. It involves playing with at least two people using five Jackstoness (each about the size of an almond) and a small bouncy ball. Players must use one hand to play the game and be seven or older. If small stones are used instead of Jackstones, small children must be kept from playing the game (Apolinar et al., 2022). According to Delos (2020), the game involves scattering Jackstoness onto a playing surface, throwing the ball into the air, picking up a single stone, catching it, and throwing it again. After a default, the game moves to the next player, who repeats steps 1 to 4 until the team with the highest number of points wins. Jackstones is a popular game among Americans, and it emerged in the USA as a popular game. Jackstones is a competitive game that increases mental and physical agility. Traditionally associated with girls, everyone can play it as it develops skills like ball control, hand-eye coordination, speed, and balance. Despite its unique nature, it appeals to children due to its competitive nature involving manual and mental dexterity (Delos Reyes, 2020).

Indonesia

Wulansari and Dwiyanti (2021) mention using traditional games in Indonesia to teach mathematics to young children, which positively influences the acquisition of numeracy skills that are better grasped in the early stages of life. Although the games differ from *Amagende*, they are preferred as teaching-learning resources. This study, which explored the impact of traditional games on children's knowledge of simple mathematical concepts, found that children demonstrated better numeracy skills when playing the Indonesian traditional game of *Dakon* (Wulansari & Dwiyanti, 2021), while those who were underperforming in mathematics showed an improvement in their numeracy skills. *Dakon* also influences children's psychological abilities, cognitive development, and creativity. This shows that teaching mathematics through traditional games is not only a South African phenomenon.

Most African countries inherited a Eurocentric education system as a result of colonialism. Particularly in the South African context, education was dominated by missionary, colonial, and Afrikaner ideologies (Gelderblom, 2003), such that indigenous knowledge and skills were suppressed to learn new concepts from a worldview other than their own. Hence, it became challenging for most indigenous learners to understand foreign concepts, think abstractly, and engage meaningfully in the learning process.

Research advocates that children must develop early mathematical skills and understanding through culturally oriented activities before formal schooling (Sakakibara, 2014). Also, teachers are encouraged to design resources that enhance their professional development and are relevant to ECCE learners (Long & Dunne, 2011). Nabie (2015) adds that appropriate learning activities like traditional games should align with teachers' teaching styles to achieve the desired results.

Amagende is a Groundbreaking Resource for Teaching Mathematics

The study defines indigenous games as methods that lead to variable and quantifiable outcomes based on rules. Using *Amagende*, learners acquire social skills such as sharing, understanding others' perspectives, taking turns, and interpreting rules (McCay & Keyes, 2001). Aypay (2016) contends that learning values through engaging in Indigenous games are portrayed in learners' behaviors as *Amagende* and embeds cultural principles demonstrated in feelings, thoughts, and actions that reflect sound morals in everyday interactions. Therefore, this approach resonates with UNICEF's goals for equality, inclusivity, and innovativeness to reinforce the principles of SDG 4 (Mundial et al., 2016). Since Indigenous games like *Amagende* create ease of association with numeracy, they increase knowledge and skills in daily practical calculations. Agenda is a tool to improve the quality of mathematics performance in early childhood education, which aligns with the Vision 2030 plan.

Indigenous games like *Amagende* are meant to sharpen learners' intellect and prepare them to solve real-life problems (Mutema, 2013). This study advocates for gamifying Amagende by adopting game principles. This game contains different levels of difficulty. For example, there is repeated addition of ones, twos threes, and this links with Mathematics multiplication and patterns as well as number development. The play must first concentrate on pushing one stone, then two, then three, and then ten stones. The game increases in level of difficulty. To add more engagement, we suggest learners adopt the point system. As students master basic numeracy skills, they can progress to more complex challenges, keeping them motivated and engaged.

Also, visual, and tactile teaching aids, such as the abacus, bead strings, or *Amagende*, assist learners in linking counting to movements. Dewey (1933) asserts that teaching through using local games as play pedagogy assists learners in transforming learning spaces into game-friendly environments to foster better performance in mathematics. Ruzic and O'Connell (2001) maintain that using manipulatives enhances learners' academic achievement because using concrete objects, observations, demonstrations, and modeling leads to internalizing abstract concepts. This study maintains that *Amagende* is a tool that guides learners to mathematics-related concepts, problems, calculations, and other activities, enabling learners to relate to tangible objects that enable the understanding of counting operations. Therefore, *Amagende* as a teaching resource enables teachers to create a

culturally responsive mathematics learning environment that is engaging, meaningful, and aligns with learners' identities, which enhances their understanding, boosts confidence, and accelerates their appreciation for mathematics.

Amagende also Develops Literacy

Mwinsa and Dagada's (2024) study asserts that Indigenous games can effectively promote literacy and numeracy skills in children, showing that not only does Amagende improve numeracy. From the literature reviewed by (Mwinsa and Dagada (2024) and Ogunyemi and Henning (2020), Indigenous games promote literacy and numeracy skills among preschoolers. Teachers found challenges in execution but acknowledged the benefits. Ndlovu et al. (2022). Teachers observed that Indigenous games foster spontaneous interaction and communication among learners, enhancing their learning experience. Tani and Kengnjoh (2034).This study maintains that Amagende, as an Indigenous game, encourages active engagement among players, which is experienced when they communicate verbally and interact with one another. This active participation enhances speaking and listening skills, as players must articulate their thoughts and respond to others in real time. Therefore, it develops language literacy. So, as children play, they are exposed to diverse words and phrases relevant to the game's context, which helps in vocabulary retention and understanding. This exposure is crucial for language acquisition, especially for Contextual Learning learners.

The Theoretical Lens

According to Khan and Ntakana (2023), the collective fingers theory of Mbigi (1997) is based on the ubuntu principles of humanism centered on six values: survival, solidarity, spirit, compassion, respect, and dignity. This theory can be pursued to improve early childhood mathematics education by promoting collaborative learning, incorporating indigenous games, and cultivating ubuntu values. Children can better understand and apply mathematical concepts by fostering teamwork. Traditional African games like *Amagende* reinforce these concepts while analyzing mathematical problems, which can help children connect their cultural knowledge with academic mathematics concepts.

Additionally, modeling ubuntu values like survival, solidarity, compassion, respect, and dignity can foster a culturally responsive, community-oriented learning environment. This holistic approach can enhance young children's early years' engagement, understanding, and appreciation of mathematics. Ubuntu is an indigenous philosophy of African people that highlights the importance of spirituality in understanding human identity, human existence, and the world around us. It suggests common bonds between humans and other creations. Mubangizi and Kaya (2015) affirm that ubuntu is integrated into early education when a sense of shared responsibility for mathematical understanding is practiced.

Research Aim

This research explored teachers' understanding of using *Amagende* as a teaching resource to enrich play pedagogy

in Grade 1 classrooms, which entails using games, understanding concepts, rules, and teamwork to accomplish targeted outcomes.

Research Questions

- What are teachers' perceptions of *Amagende* as a teaching resource?
- How do teachers use *Amagende* as a teaching resource?

Methodology

This interpretive qualitative case study (Creswell & Creswell, 2022) teachers' narratives and their understandings of *Amagende* as a teaching resource. This involved interviews with five Grade 1 teachers who utilized *Amagende* as a teaching resource. All the teachers were registered for a master's degree at one of the universities in KwaZulu-Natal. The interpretive case study design was adopted because of its holistic, descriptive, and contextual nature. The teachers' narratives and conversations produced rich data to understand different teaching resources for teaching in Grade 1 mathematics classrooms (Creswell & Creswell, 2022). The teacher-participants helped to generate in-depth data through semi-structured interview narratives, which helped the interviewer to understand the participants' meaning-making of traditional games to teach mathematics (Hollway & Jefferson, 2008).

Teaching mathematics via *Amagende* allows learners to describe their understanding of the game by relating and sharing its value as a teaching aid in classroom teaching-learning situations. Further, Hiebert, Morris, Berk, and Jansen (2007) confirm that Amagende provides learners with opportunities to be independent decision-makers to become self-reliant, critical thinkers, and problem-solvers.

Sampling and Data Generation

This research adopted the purposive sampling technique, which Creswell and Creswell (2022) recommend enhancing a study's rigor and trustworthiness by aligning it with the research goals and objectives. The five most accessible and relevant teachers (three males and two females) from schools in Durban were selected through purposive sampling. For ethical and confidentiality reasons (Creswell & Creswell, 2018), the teachers were allocated pseudonyms to protect their identities and the privacy of the information they proffered. The findings that emanated from the narratives and semi-structured conversations were presented as a collective. It also emerged from the data analysis that these teacher-participants engaged in professional development.

Ethical Considerations

Ethics in research involves avoiding harm and obtaining approval from the institution's Research Ethics Committee, school gatekeepers, and relevant individuals to uphold confidentiality, non-maleficence, cordiality, dignity, and respect. In this study, the researcher ensured that no harm (physical and psychological) was inflicted on anyone by adhering to prescribed ethics (Creswell & Creswell, 2022). Pseudonyms were assigned to protect

participants' identities and all the information they provided to strengthen the study's trustworthiness. Participants were informed about all the finer details of the study's nature and ethical issues, which ensured participants were aware of all aspects of the research's nature and transferability. As researchers, we ensured that no harm was done to anyone involved in this study. The ethical clearance certificate was issued by the Concerned university.

Data Collection Procedure

The authors collected data through lesson observations where they observed and investigated how teachers were using Indigenous as a teaching resource in teaching mathematics. The teachers were teaching addition of numbers and subtraction. Teacher A used Amagende as an introduction to counting. The Researchers observed how the teachers grouped the learners' Indigenous games as a teaching resource typically involving qualitative and quantitative methods. Below is a structured explanation of how data was collected, coded, and analyzed to create themes from the findings.

Data Collection

Classroom Observations: The researchers observed the lessons, focusing on how teachers integrate indigenous games into their teaching practices. The method allowed for real-time insights into classroom dynamics and the games' effectiveness. The effectiveness of how Amagende was used varied as this depended on teachers' attitudes and ability to use the approach as a resource tool. The class observation was a once-off event per class and was pre-arranged. After the Observation, the researchers then conducted one-on-one interviews with teachers interviews were necessary to gather in-depth perspectives on their experiences and attitudes toward using indigenous games. We evaluated the lessons by applying focused coding where similarities and differences were noted and compared. Each piece of data was assigned a code. Then for interviews, the researchers created codes and then compared the codes across different interviews and findings in classes observed. In the end, themes were created and highlighted. Below are perceptions of teacher interviews.

Findings and Discussion

Question 1: What are teachers' understanding of using *Amagende* as a teaching resource?

> Grade 1 teacher B: *I think that now, using 'Amagende' as a teaching resource is vital to the education of learners and can be used successfully to develop some skills and knowledge while teaching and learning mathematics. One of the critical aspects of games in teaching and learning is the use of language, considering that language is a gateway resource for learning in the early grades. Using 'Amagende' has more meaning for the learners and me in the classroom. I use this game to escape when I see learners struggling with mathematics. Using 'Amagende' as a learning resource allowed so much respect among the learners as they were teaching each other how to count, and they knew that they could learn while having fun.*

Teacher B highlights *Amagende* as an Indigenous game used as a teaching resource for developing skills and knowledge in mathematics. She elaborates that the role of language in games, particularly in early grades, serves as a gateway for learning. The teacher finds *Amagende* more meaningful and relevant for learners because it allows them to engage with the content. Also, it helps 'struggling' learners to better understand and solve mathematical problems while having fun. Moreover, *Amagende* fosters social skills such as collaboration among learners to assist each other in counting and following the game's rules. This confirms that games play a significant role in the socialisation of learners (Potgieter & Malan, 1987).

Several researchers, such as Honeyford and Boyd (2015) and Martlew (YEAR), documented the significant role of learning through play for learners, especially in the lower grades. In this regard, games can be adapted to suit various learners' social, cognitive, and affective needs. Incorporating indigenous games into teaching-learning in the classroom could be a great asset in developing self-confidence, identity, active participation, healthy living, and higher academic achievement among rural learners in most school subjects, especially mathematics. Effective teaching-learning for Indigenous learners is likely to occur if their education is culturally connected, such that Indigenous languages become the language of learning and teaching (LoLT). Additionally, learners construct knowledge through encoding and decoding information, interacting, and communicating with knowledgeable others within educational spaces. Mbigi's (1997, p 32) theory of ubuntu advocates for respect and an " objective, unbiased consideration and regard for the rights, values, beliefs, and property [of all people]". Furthermore, Indigenous knowledge systems (IKSs), a 'new' field in South Africa and the continent, can be promoted through research, teaching-learning, and community engagement programs – these may lead to a plethora of Indigenous knowledge being unearthed.

Mathematics teaching in early grades is also faced with the problem of a lack of support from some institutions' staff members, including management, due to limited knowledge and awareness of the importance of indigenous knowledge in meeting the developmental challenges of the 21st century. For instance, the Curriculum Assessment Policy Statement [CAPS] (RSA, DoE, 2011) is silent about mathematics teachers using Indigenous games to enhance teaching and learning. Most teachers still do not understand the relationship between indigenous knowledge and other knowledge, especially in teaching mathematics.

Question 2: How do teachers use Amagende as a teaching resource?

> Grade 1 teacher D: *I started teaching at a school where resources for teaching were not a challenge. I was then employed in a rural school where providing resources for teaching and learning was challenging. I was doing very well in the fully resourced school because I learned from learners how to play and use 'Amagende' as a teaching resource. I got a permanent post in a school in a rural area, and it looks as if the Department of Basic Education is not supportive of this school. As a result, there is this problem of delivering teaching and learning materials late, and when teachers inquire, they do not find the actual cause; there is no specific answer. No one seems to be committed to the school's functioning.*
> Grade 1 teacher F: *Teaching was challenging at first as the school did not have resources. Also, in high school, we were not taught to use 'Amagende' as a teaching resource as it was an urban university. I*

> *learned that I had to bring in the natural resources in the classroom for the learners; otherwise, it was challenging for the learners to understand when there were no resources.*

From the above evidence, it was clear that there was unanimity among Grade 1 teachers in using resources that learners are familiar with. During the interviews, participants expressed their commitment to using more play-based pedagogies like *Amagende* in their mathematics classrooms. One Grade 1 teacher articulated that teachers were agents of change who have the potential to engender innovative practices through traditional games in mathematics classrooms.

> Grade 1 teacher A: *I want the learners in my classrooms to work collaboratively and feel free to explore all types of materials. I want learners to have a chance to experiment with their materials and get to know them before they use them. If they are going to paint, learners need much more resources to have various apparatuses to use for painting, not just a paintbrush. Let us have sponges, 'Amagende' with sponges, 'Amagende' with soap, and 'Amagende' with water - and see what effect that has on research. Let us see what effect that has on the sand*.

Common themes from teacher interviews indicated that they faced numerous challenges, including resource constraints and pedagogical and interpersonal issues, necessitating a comprehensive approach involving teacher training, adequate resources, institutional support, and practical strategies to attain best practices. Further findings indicated that *Amagende* as a teaching resource in education did not work for some teacher participants as they did not have adequate educational spaces to allow them to use *Amagende*.

Findings on Benefits of *Amagende*

'Amagende' can significantly benefit learners when integrated into teaching-learning situations. It develops essential skills such as hand-eye coordination, concentration, balancing, measurement, counting, accuracy, cooperation, observation, and competitiveness. It also develops children's mental faculties and stimulates their critical thinking processes. In mathematics lessons, Indigenous games like *Amagende* allow learners to relate their out-of-class experiences to classroom concepts, thus enhancing their understanding and engagement with the subject matter. Incorporating indigenous games into the curriculum can promote moral awareness, innovation, cultural identity, diversity, and tolerance. Using *Amagende* and similar games in teaching can improve learning outcomes, self-confidence, and a deeper connection between learners' in-school and out-of-school experiences. This paper confirms that Indigenous games such as *Amagende* can effectively promote the teaching-learning of mathematics by instilling the principles of ubuntu, particularly in early grades. This approach stimulates critical thinking, creativity, and the assimilation of collective moral values in learners because it incorporates culturally specific teaching and learning activities (Nxumalo & Mncube, 2018).

Implications

According to Putri and Suparno (2020), engaging in traditional games generates logical, analytical, systematic,

critical, and creative-thinking skills that promote teamwork and socialisation. Integrating indigenous games into classroom lessons can also boost interest in content areas, particularly mathematics. Effective learning and teaching are likely to occur when education is culturally connected through using indigenous languages in classrooms, especially in rural areas. Through indigenous games and traditional language usage, learners construct meaningful knowledge through interactions with knowledgeable others. Mbigi's (1997) ubuntu theory emphasises respect for voicing one's rights, values, beliefs, and learning in traditional societies. This study revealed that teachers worked collaboratively to analyse *Amagende* through research processes and used various Indigenous resources to facilitate better peer interaction and stimulate higher mental functions.

Recommendations

The evidence gleaned from the data analysis suggests that teachers must reflect on how they can use *Amagende* and attain mathematics learning objectives in Grade 1. Secondly, teachers must be flexible to migrate to play-based teaching-learning strategies to deliver lessons that integrate Indigenous games to teach mathematical concepts and skills in the formal curriculum; for example, *Amagende* can be used in simple number operations such as addition, subtraction, multiplication, and division. Hence, Indigenous activities advance mathematical knowledge by transforming how mathematics is taught and learned in classrooms. Not only do traditional games enable learners to engage in pleasant activities, but they also have the potential to facilitate the connection between concrete and abstract concepts, classroom environments, and activities outside the classroom. Lastly, Amagende can be taught within the aspects and strategies of Western education, either by creating an App where children can play Amagende online or by adopting Game principles to remain relevant to the new educational paradigm shift where we can use rules and strategies of Amagende to teach mathematical concepts, such as counting, addition, and spatial Author information.

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