

Research Article

Using Morabaraba to teach number operations in a grade 5 class: A case of initial ethnomathematical implementation

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There have been numerous strategies to improve Mathematics education in schools globally. In Africa, strategies are promoted that decolonise and contextualise the way Mathematics is taught and learned. However, Mathematics education remains a challenge in many African countries, especially in South Africa, as attested to by the poor results achieved in most national examinations. In an endeavour to enhance Mathematics education in a district in Limpopo, Ethnomathematical indigenous games were used to teach Mathematics in Intermediate Phase classrooms (Grades 4 to 6). The aim of this study was to examine how a particular indigenous game was implemented in one Grade 5 classroom to teach addition and multiplication. Using a qualitative single case study, a teacher participant from a school in Limpopo was interviewed and observed as he taught 56 learners using a game known as Morabaraba. Findings demonstrate that, through the use of the game, the teacher attempted to engage all learners in working collaboratively to interpret and understand mathematical concepts. The game also enabled the acquisition of several skills related to addition and multiplication, such as financial Mathematics. The learners' excitement at participating in the game was evident in their noisy chatter as they solved problems using mathematical concepts. Based on evidence of the game's promotion of mathematics teaching and learning, the school management board encourages the use of indigenous games to enhance Mathematics lessons, but has been unable to equip the teachers with the necessary training to do so. The study recommends the use of indigenous games to teach mathematical concepts and the possible inclusion of indigenous games in the curriculum. This should be coupled with the necessary training to assist teachers to teach more complex and abstract mathematical concepts through indigenous games. Training should also be provided on managing large class sizes when using games in the classroom. Future research should examine how mathematics may be taught and learned through other indigenous games.

Keywords: Addition; Ethnomathematical indigenous games; Financial mathematics; Groupwork; Morabaraba board game; Multiplication

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1. Introduction

Decolonisation and Africanisation are strategies used to encourage change in the teaching of Mathematics in Africa. Decolonisation is a broad endeavour to overcome colonial strategies of teaching, while Africanisation is one component of decolonisation (Hungwe & Mkhize, 2022). The principles of both approaches underpin this article. Africanisation makes use of and perpetuates the rich indigenous knowledge systems inherent to Africa. South Africa is home to diverse cultures

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that offer a great deal of material for teaching and learning; Ethnomathematics makes use of the wealth of mathematical knowledge embedded in them (Meeran, 2024).

It is unfortunate that the colonial system of control through teacher-centred strategies is still prevalent in South Africa (Potgieter & Van der Walt, 2022). The use of outdated teaching strategies has produced low learner performance in the Trends in International Mathematics and Science Studies [TIMSS], the latest being the 2023 TIMSS – the seventh TIMSS in which South Africa has participated. Mabena et al. (2021) found that teachers' knowledge, experience and personal attitudes play a significant role in learners' performance, and that inadequacies in any of these areas translate into learners' poor performance. Chetty et al. (2024) found disparity among the performance of learners in different socioeconomic settings, with disadvantaged communities still producing poor results owing to lack of resources. This finding goes against the Curriculum and Assessment Policy Statement [CAPS], which urges social transformation through learning, using real-life contexts and collaboration (Department of Basic Education [DBE], 2011).

In an endeavour to improve Mathematics teaching and learning in under-resourced schools, a project was undertaken to workshop teachers in rural Limpopo on using Ethnomathematical indigenous games to teach Intermediate Phase Mathematics. The aim of this chapter is to explore how an Intermediate Phase Mathematics teacher used the indigenous game of Morabaraba to teach addition and multiplication to a class of 56 Grade 5 learners. The research question for the study was as follows:

RQ) 'How does a Mathematics teacher integrate the concepts of addition and multiplication into the use of the Morabaraba board game?'

Many studies have explored the potential of indigenous games for teaching mathematics in Africa and beyond (Assegaff & Bonyah, 2024; Chahine, 2020; Mosimege & Egara, 2023; Powell & Temple, 2001), however, there is a lack of research on the teacher's role and professional preparedness when introducing indigenous games in under-resourced, large, and diverse classrooms. This research identifies both a practical gap and a contextual gap. The practical gap has been highlighted by Kusi and Bonyah (2025) through a systematic literature review where they found that even though curriculum integration through teacher training was repeatedly cited, systematic barriers posed a problem to the adoption of ethnomathematical games in the classroom. The teacher in this study shows how the Morabaraba game can be integrated into the CAPS curriculum. Regarding the contextual gap, few studies have been conducted with actual observations of how indigenous games are used to teach mathematics in the intermediate phase of rural schools in South Africa. A study conducted in the Free State Province of South Africa showed the use of Kgati in grade 4 to involve word problems in mathematics (Moloi et al., 2021). Meeran et al. (2024) discussed the Morabaraba Game in the Intermediate Phase in KwaZulu Natal but through the reflections of team members who observed the lessons. Hence, the gap that this study covers is the actual observation of a teacher from rural Limpopo teaching Grade 5 addition and multiplication through the Morabaraba Game Board.

2. Literature Review

2.1. Cultural Integration through the Use of Ethnomathematics

Ethnomathematics offers an approach to challenging the historical privileging of Eurocentric mathematical knowledge by recognizing mathematical ideas embedded in diverse cultural practices (D'Ambrosio, 2020; Gerdes, 1994). Within African educational contexts, this perspective contributes to efforts to Africanise and decolonise mathematics education by connecting formal mathematical concepts with learners' indigenous knowledge and cultural experiences (Bukari, 2026; Meeran, 2024). Gerdes (1994) argued that children develop mathematical understandings before entering formal schooling and that conventional mathematics instruction may marginalize these existing forms of knowledge when mathematics is presented as culturally neutral. In South Africa, despite curriculum reforms following the end of apartheid, difficulties remain in accommodating learners' sociocultural backgrounds within mathematics classrooms (Meeran &

Van Wyk, 2022). These continuing challenges highlight the importance of culturally responsive pedagogical approaches that recognize and integrate indigenous mathematical knowledge rather than treating formal school mathematics as disconnected from learners' cultural experiences.

Ethnomathematics offers an approach to making mathematics more meaningful and accessible by connecting formal mathematical concepts with learners' cultural experiences and everyday practices (Bukari, 2026; Kurniawan et al., 2024). Such connections can provide opportunities for mathematical reasoning and problem-solving while helping learners recognize the relevance of mathematics within their own cultural contexts. In Indonesia, ethnomathematics has been explored across a wide range of mathematical topics. Reviewing 30 studies published between 2015 and 2020, Hidayati and Prahmana (2022) identified applications involving geometry, measurement, numbers and operations, algebra, and modular arithmetic, with geometry representing the most frequently examined domain. More recent meta-analytic evidence from Indonesian classrooms has also reported positive effects of ethnomathematics-based instruction on mathematical achievement and learning attitudes, with particularly favorable results in elementary education and problem-solving tasks (Hartoyo et al., 2025).

As mentioned, Africa's many diverse, rich cultures constitute an educational resource that may be drawn from in formal learning situations. Arismendi-Pardi (1999) claims that Mathematics is a cultural product with its roots in Africa. South Africa has a diversity of cultures and cultural games and artifacts such as 'round huts (rondavels), wire cars, beadwork, woven basketry, the South African flag, South African architecture, and the Ndebele mural art' (Machaba & Dhlamini, 2021, p. 63). Machaba and Dhlamini (2021) also highlight the South African flag as an artifact that may be exploited for lessons on mathematical concepts such as angles, lines, proportion, tessellation, symmetry, reflections, and geometrical shapes. In fact, every cultural artifact allows for multiple concepts to be learned and reinforced. Therefore, Ethnomathematics is a solid choice for contextualising the way Mathematics is taught.

2.2. Using Indigenous Games to Teach Mathematics

Traditional games rooted in children's cultural experiences can provide familiar and engaging contexts for integrating ethnomathematics into mathematics instruction (Fouze & Amit, 2018; Savard & Manuel, 2020). Such games can create opportunities for mathematical and logical reasoning, while recent empirical evidence suggests that structured traditional-game activities may also support the development of critical thinking among primary school pupils.

Cultural games have been used in many countries in Africa to teach Mathematics. For example, in Ghana, the game Alikoto is used to teach algebra and probability (Owusu & Obuo-Addo, 2023); in Cote d'Ivoire, the game Nigme Alladian is used to teach probability (Ki-Zerbo, 1990); and in Egypt, the game Seega is used to teach geometry and algebra (Fouze & Amit, 2018).

In South Africa, many indigenous games hold a wealth of mathematical knowledge. The game Black Toti may be used to learn number properties and operations, as well as algebra (Feza, 2019). The game Tsheretshere (similar to hopscotch) may be used to teach quadrilaterals, perimeter and area, common fractions, and the properties of 2-D shapes (Meeran et al., 2022). Diketo (stone throwing and catching) provides lessons on measurement, estimation, counting, number patterns, addition, and subtraction (Meeran et al., 2022). Malepa (a string figure construction) may be used to teach the properties of triangles, quadrilaterals, and symmetry (Mosimege, 2016). Kgati (a skipping rope game) yields lessons on geometric shapes, geometric and numeric patterns, and problem-solving (Moloi et al. 2021). These are just some of the games from which a variety of mathematical lessons may be derived.

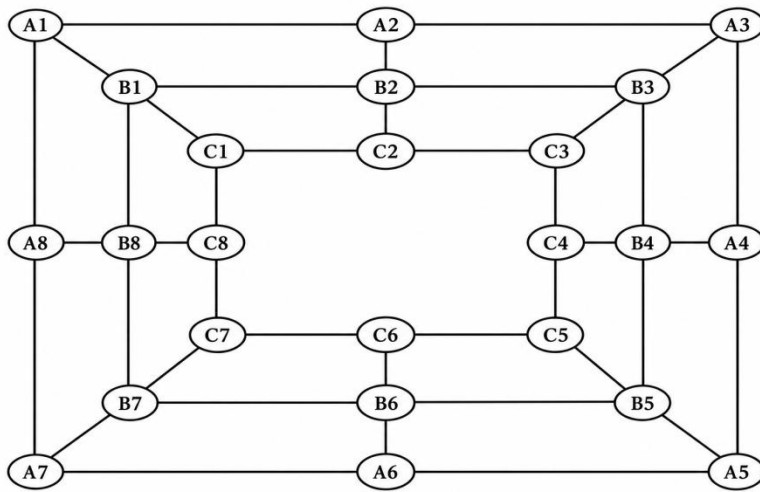
2.3. The Morabaraba Board Game

Morabaraba is a version of a board game played in many cultures under different names. It is played by two people, each starting with 12 tokens of a different colour from that of their opponent. The game starts when one player places a token (referred to as a 'cow') on a vacant spot, from where it may be moved horizontally, vertically or diagonally (Bayeck, 2018).

Figure 1 shows a representation of the game (Figure 1) when it begins, while Figure 2 shows a game underway.

Figure 1

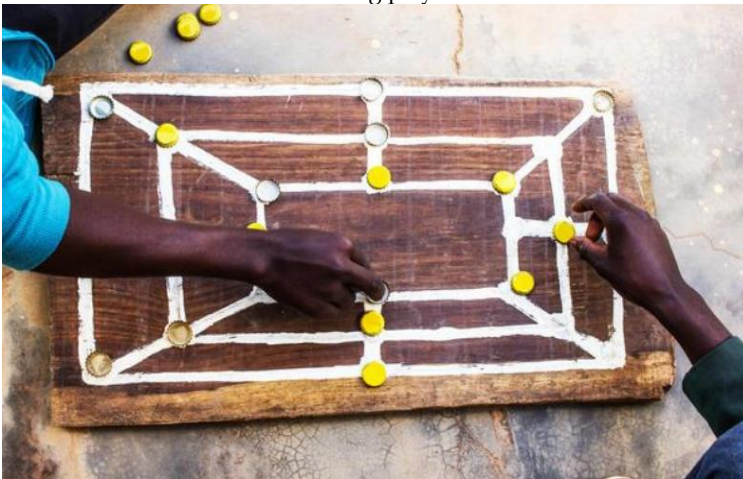
Illustration of a Morabaraba Game Board



Source. Machaba and Dhlamini (2021, p. 67)

Figure 2

The Morabaraba Game Board being played



Source. Mhlolo (2024, p.12)

Figures 1 and 2 shows how the game is being played. Mhlolo (2024, p. 11) describes the process as follows:

When three tokens of the same colour form a straight line, the player to whom those tokens belong is eligible to take one token (cow) from his opponent. All the tokens from player 'A' are laid out on the board one at a time, while the opponent (player B) will try to prevent player 'A' to get three cows in a row. They are thus arranged strategically all over the board. The aim is then to get them three in a line, called *isibhamu* (translation is 'gun') as quickly as possible. Once they are all placed, the cows move (*ayahamba*) on the lines and try to take as many cows from the opponent as possible. If there are three cows left for each member (a draw), the cows are allowed to 'jump' to reach *isibhamu*, hence the winner. The shooting goes on until the loser remains with less than 3 objects.

Many mathematical concepts are associated with this game; according to Nkopodi and Mosimege (2009), these include quadrilaterals, ratio and proportion, symmetry, logical deduction, counting, and addition and subtraction. Meeran et al. (2024) found that the game could also be used for more abstract concepts such as factorisation. Morabaraba also encourages collaboration, a central element of Vygotsky's Sociocultural Theory, the chosen theory for the study.

3. Framing the Study through Sociocultural Theory

Vygotsky (1979) believed that social interaction was the primary source of human development and that individual learning was secondary to the overall development that occurs in social settings. Games involve interaction and learning, with the learning often not recognised; however, when they are incorporated into formal learning settings, their value is recognised. Vygotsky (1979) also held that although children learn from more knowledgeable peers, they also bring something of their own to the learning situation, gained from their cultural and historical backgrounds. Indigenous games are widely played by families and communities (Moloi et al., 2021) and teach the young child many skills that are not always recognised for their inherent educational value.

Vygotsky (1979) emphasised that development occurs when a child interacts with family, community members, and peers in their natural environment, where learning is internalised. Consequently, when learning activities are based on cultural artifacts such as indigenous games, learning and internal development take place naturally. Much of the learning gained aligns with the curriculum. In addition, indigenous games are inherently inclusive in nature. If properly organised by the class teacher, the use of these games can lead to learning that meets the needs of all learners rather than a select few. Without having to focus on the individual learner, the games impart knowledge and understanding to all with relative ease.

4. Method

4.1. Research Design

The chosen research design is a single case study. Yin (2014, p.16) defines a case study as ‘an empirical inquiry that investigates a contemporary phenomenon (the “case”) in depth and within its real-world context.’ The case in this chapter was bound by the phenomenon of how a teacher taught addition and subtraction through the indigenous game of Morabaraba. It is a single case, as it involves just one teacher. To enhance the accuracy and depth of the findings, the case was triangulated through the use of two research methods – an interview and observation, with each method compensating for the weaknesses in the other.

Although 14 teachers were trained on how to use indigenous games in their classrooms, each teacher brought a special focus on a particular game and the concepts on which they wished to focus. This particular teacher was chosen as he had never taught Mathematics using an indigenous game before. Furthermore, there was a need to see how he used the game to teach a large Grade 5 class of 56 learners.

4.2. Participants

An Intermediate Phase (Grades 4 to 6) Mathematics teacher from one of 14 schools in one district in rural Limpopo, South Africa, was identified as a participant for the study. He was purposively sampled, in that he was qualified and experienced in teaching Mathematics in the Intermediate Phase, and had participated in initial teacher training on the use of indigenous games in the Mathematics classroom. Therefore, the selection of the participant was a deliberate choice, as prescribed for the qualitative approach (Bertram & Christiansen, 2020). The 56 learners in the classroom came from the Sepedi culture but the language of instruction at the school was English.

4.3. Background to Data Collection

The project from which this study arose was initiated to provide teachers with alternative methods of teaching Mathematics. It spanned three years, beginning with the collection of data from community elders in the Mpumalanga, KwaZulu-Natal, and Limpopo provinces about how to play indigenous games. The community elders discussed games such as Morabaraba, Moruba, Kgati, Tsheretshere, Diketo, Jukskei, and Dibeke. This data was then integrated with relevant mathematical concepts in the Curriculum Assessment Policy Statement [CAPS] for Intermediate Phase Mathematics. This was done, first, by identifying which Mathematics concepts were evident

in the game. Then these concepts were located in the CAPS curriculum. Thereafter, lesson plans and worksheets were developed to show how the CAPS content area and the game could be used together. Subsequently, an intervention programme was conducted with participants in Mogodumo District in Limpopo, to train the teacher participants on how to use the different games in relation to the mathematical concepts outlined in the CAPS curriculum. The training included discussions on Ethnomathematics and its theoretical significance, instructions on how to play the indigenous games, and ideas on how to integrate the games with mathematical concepts using worksheets and resources made from scrap materials. Participants were organised into networking groups, with these groups further trained on how to develop their own worksheets and resources for use in their classrooms.

The teachers were then expected to implement the Ethnomathematical game approach in their classrooms. To sustain their use, an online blog platform was created on which teachers could share their lesson plans, worksheets and reflections on the use of the games and assist each other to implement them. Thereafter, one of the teachers from the group of 14 was observed as he used the Morabaraba board game to teach addition and subtraction to Grade 5 learners. It was his first experience in using an indigenous game to teach Mathematics.

4.4. Data-collection Methods

Two data collection methods were used to collect data. The first was observation of a lesson, and the second was a semi-structured interview, conducted to clarify what had been observed in the classroom. An observation schedule was used to focus on certain aspects, based on the following questions:

- Q 1) What Mathematics concepts were used and how were they taught?
- Q 2) How was the indigenous game used to elicit learning of these concepts?
- Q 3) What learning strategies were used?
- Q 4) How did the learners react to the use of the indigenous game?
- Q 5) What resources were used?
- Q 5) How did the teacher manage the classroom during the lesson?

The questions for the semi-structured interview were developed by the research team members and piloted amongst each other. The lesson was 60 minutes long and the semi-structured interview lasted approximately 45 minutes.

4.5. Analysis of Data

The observation and semi-structured interview were audio- and video-recorded to facilitate accurate transcription of the data. Thematic analysis was conducted on the transcribed data in accordance with the six steps recommended by Clarke and Braun (2013):

Familiarisation with the data: The interview transcript was checked by the participant to verify accuracy. Familiarisation involved reading and rereading the transcript. The narrative of the observation was also written and read several times.

Coding: Commonly used terms were identified. These were: Morabaraba board game, addition and multiplication, CAPS curriculum, classroom management, and learner participation. Each was colour-coded and data related to each of these was similarly colour coded.

Searching for themes: The colour-coded themes and data under each one were reviewed as part of the search for themes that answered the research questions.

Reviewing themes: Initial themes were synthesised into four themes on the use of the Morabaraba board game to teach mathematical concepts.

Defining and naming themes: The themes were then carefully reviewed to find appropriate names that were interesting and relevant to the phenomenon under investigation.

Writing up: Where appropriate, data was added to the themes and analysed, and a final report was written.

4.6. Ensuring the Trustworthiness of the Study

The participant confirmation technique was employed to ensure the trustworthiness of the study, with both the observation schedule and interview transcript provided to the participant to verify whether they were true accounts of what had been observed and said. During the interview, questions were posed to the participant to facilitate probing and verify previous responses. Thick descriptions were also used to enhance the validity of the data.

4.7. Ethical Considerations

Ethical clearance for the broader project was obtained from the institution's ethics committee (Ref No.: 2020/09/09/90441435/10/AM). The university policy stipulated confidentiality and the protection of participants' identities before, during, and after interviews. The participant was labelled 'T' and the learners 'Ls', so that they could not be identified. Pictures used in the findings blocked out all identifying features. The names of the winners of the game, shown in Section 5.1, are shortened versions of names so that they would not be easily identified. The teacher, parents and learners were provided with letters of consent stating that their participation was voluntary and that they could withdraw from the study at any time. The importance of voluntary participation and the option to withdraw from the study was emphasised during the semi-structured interview.

5. Findings

The findings are arranged with the observation narrative first, followed by a presentation of themes developed from the semi-structured interview.

5.1. Narrative of the Observation

This was a Grade 5 class with 56 learners present. The classroom appeared to be overcrowded.

5.1.1. Introducing the cultural context of Morabaraba

The teacher began by presenting basic information on the Morabaraba board game. Figure 3 presents the Morabaraba board game used in the classroom.

Figure 3

The Morabaraba Game being played in the classroom



Figure 3 shows the actual board game used in the classroom. Learners sat in groups while 2 players versed each other. The game had 24 beads/tokens. Each player had a set of 12 beads of the same colour. They had to match three in a row to win. The opponent must block the proponent

from making matches. As the players were playing, the teacher asked them questions based on the board as follows:

T: I will ask you questions based on the board you have – that is, Morabaraba. On the Morabaraba, we have some spots. Count those spots. You count those spots and you tell me how many are there?

He went on to discuss how the spots on the board are used to play the game.

T: Count them silently ... how many are there?

Ls: 24

T: Our game is played by two people. That means you are going to see two people in your group playing the game.

The excerpt above is a simplistic way of how the learners counted the spaces for the beads. Yet it also allows learners to understand how the game is played and how the 24 spaces are divided equally between 2 learners, so that they each get 12 beads. This is how the teacher was able to scaffold the learners, one step at a time, so they could learn the rules of the game. The problem here is that the teacher does not check whether learners can obtain the information themselves or whether they know how to play the game.

5.1.2. Organising group participation in a large class

The class was placed in six groups, each having 9 or 10 learners and sharing a board. Learners were already seated in their groups before the observation.

Figure 4 shows the teacher interacting with each group.

Figure 4

The teacher working with a group of learners



Figure 4 shows how the teacher went to each group to explain what needed to be done. The teacher approached each group in turn, co-selecting with the learners a pair from each group to play the game. Below is an excerpt of the teacher coordinating the selection of the players in each group.

T: Understand ... let's see – in your group, who do you choose to play the game? Who do you choose to play the game? You choose this one? You understand how to play the game? ... This side – who do you choose to play the game? You want to play? This side – sit against the board ... and this group, this side. Do you know how to play the game? Let them sit in the middle so that you can play this game with your friend.

From his interactions with the learners, it was apparent that the teacher had a fatherly manner, and that the learners were comfortable with him. He gave each group the choice of who to select to play the game. What can also be noticed is that he did ask them whether they knew how to play the game and those learners were allowed to play the game. It would have been assumed to be better if he allowed the learners to teach the other members in the group how to play the game. This would be good peer-assisted learning from more knowledgeable peers.

5.1.3. Using cows/tokens for counting and equal grouping

He gave each player 12 tokens, each set of 12 being a different colour. He asked them questions about the cows, which he referred to as cows below:

T: These are the cows. Are the cows the same?

Ls: No.

T: Why do you think? Why are they not the same?

Table 1

Board game spots related to mathematical concepts

<i>Classroom Activity</i>	<i>Mathematical Concept</i>	<i>Evidence</i>	<i>Possible Extension</i>
Counting the 24 board spots. Distributing 12 cows per player, checking whether group totals balanced to 24	Addition Division	T: Different colours. You have to use different colours. If you use the green colour you put on the square ... 12 of each colour. You don't have pieces, you have cows. Count the cows. Are they 12?	Relate to multiples and factors Equivalence Word problems

Table 1 refers to the teacher's use of the board game to discuss addition and division. The table shows how the addition and division could be extended to other mathematical concepts. From the evidence we can see that the teacher asks questions on the number of tokens and the colours that are used.

However, no response was received but he continued handing out the tokens. By moving on without getting a response, the teacher missed the opportunity to relate classification by relating to cows being different, so colours are different and how they make similar sets. Furthermore, he could have prepared learners for the actual structure of the game and what using different colours meant to proponent and opponent. It is also important to note that the teacher refers to the tokens as cows, yet he assumes that the learners already know the cultural significance of cows and how it relates to the tokens used for the Morabaraba Game. He should have explained the cultural context to make it relevant for the learners.

The teacher then went on to tell the players that they had to use 12 beads of the same colour and the opponent had to use a colour that was different from the proponent as is shown below:

T: Different colours. You have to use different colours. If you use the green colour you put on the square ... 12 of each colour. You don't have pieces, you have cows. Count the cows. Are they 12? The cows are not of the same colour?

Here again, the teacher relates the tokens to cows. Perhaps he assumes that the learners know the cultural context of personifying the tokens to cows. Yet, using the cows is sociocultural mediation that the teacher is exhibiting.

Figure 5 presents the teacher handing out tokens (beads) to each group.

Figure 5

The teacher handing out beads/tokens to play the game



Figure 5 shows the teacher moving from group to group to hand out tokens and to clarify any confusion that learners may have had. He brought in the cultural context of the beads by referring to the beads as cows. He went on further to use make the cultural context of a cow relevant to the learner by asking them what a cow is referred to in their home language of Sepedi as is demonstrated below:

Ls: Yes.

T: These are cows, what are cows in Sepedi?

L: Dikgomo

The teacher switched to Sepedi to explain the game to the learners. Code-switching allows a cultural context for understanding what cows are in the African language of 'Sepedi'. This is culturally relevant as the teacher is engaging the learners in the cultural significance of language and the value of it. The excerpt from the teacher below reveals how the teacher blends cultural knowledge into the game.

T: Are they all in your kraal? These are called cows ... three in a line - and you are going to see the third cow in the other kraal, and then you going to see ... then you take a cow from the other person and you take him as reward. Now I want to see how you play. You may start playing.

The learners seemed to understand the game and confirmed that they knew how to play it. Furthermore, he refers to the kraal which is an African term referring to where livestock is kept. The association of culture in the learners' daily lives with the playing of the game becomes significant to promote the understanding of how to play the game

The learners moved their tokens along the lines, interacting with one another as they did so, as shown in Figure 6 below. What is interesting is that although the groups were large and only two players per group played the game, all the other group members seemed involved in the game showing affective engagement as they eagerly watched the two to anticipate their next move. Their involvement suggested that all interested in the game as if they could anticipate each move in relation to winning the game.

Figure 6

Group collegiality in playing the Morabaraba game



Figure 6 shows us how learners negotiated the game through collaborating with each other. The teacher moved from group to group to assist the learners with playing the game.

T: Where is the last cow? You have already put the last one ... now you can move ... You have to obstruct him so that he cannot make a row.

Figure 7 presents evidence of how the teacher guided each group. This figure allows us to see how the teacher went to each group and facilitated the playing of the game. The class was noisy because of peer collaboration, as learners were completely engaged in the task set for them, collaborating in playing the game. Furthermore, the language the learners used to communicate with each other was mostly in Sepedi, hence this demonstrates that the learners were more comfortable discussing the game and the mathematics involved in their home language. However, the noise did distract other groups and the teacher was busy with a group and failed to manage

the noise. Hence, more lessons using indigenous games would be needed for the teacher to manage the class better. One could notice that this was the first time he was introducing such a lesson.

Figure 7

Teacher offering support to learners



5.1.4. Recording results and balancing totals

When all games were completed, the teacher wrote the names of the winners on the board, with the number of 'cows' that each person had won. As he did so, he checked with each group how many tokens each player had left. He reminded the learners that there should be 24 cows altogether. Figure 8 presents the chalkboard showing calculations of winnings from each group.

Figure 8

Calculation of scores

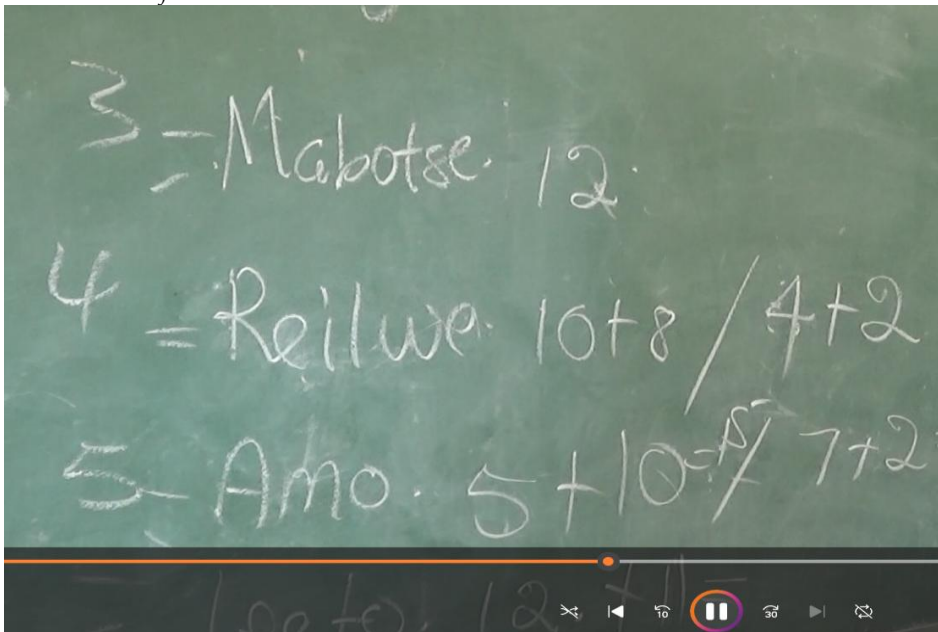


Figure 8 above shows how the results were calculated. Table 2 was based on the calculation of the winnings using the mathematical concepts of addition and subtraction. The calculations were written on the board by the teacher from information provided to him by the different groups.

Table 2

Mathematical aligning to calculating the winnings

<i>Classroom Activity</i>	<i>Mathematical Concept</i>	<i>Evidence</i>	<i>Possible Extension</i>
Calculating the winnings of the board game on the class board.	Addition Subtraction	Group 1: Kgop – $10 + 2 / 9 + 3$ (Although the results balance, in that the sum of all the figures is 24, the teacher got the order incorrect.) Group 2: Phenyu – $12 + 10 / 2 + 0$ (Balanced.) Group 3: Mapotse – $12 + 10 / 2 + 0$ (Balanced.) The teacher did not write out the way it balances to 12 per player. It should have been $12 + 10 / 0 + 2$. Group 4: Refilwe – $10 + 8 / 2 + 4$ (Balanced) Group 5: Amo – $5 + 10 /$ (now) have 15 cows) $/ 7 + 2 = 9$ (Balanced.) Group 6: Reto – $12 + 11 /$ (This group did not complete the game).	Equivalence Number Patterns Tallying Logical deduction

The groups' results were recorded as follows:

Group 1: Kgop – $10 + 2 / 9 + 3$ (Although the results balance, in that the sum of all the figures is 24, the teacher got the order incorrect.)

Group 2: Phenyu – $12 + 10 / 2 + 0$ (Balanced.)

Group 3: Mapotse – $12 + 10 / 2 + 0$ (Balanced.)

The teacher did not write out the way it balances to 12 per player. It should have been $12 + 10 / 0 + 2$.

Group 4: Refilwe – $10 + 8 / 2 + 4$ (Balanced)

Group 5: Amo – $5 + 10 /$ (now) have 15 cows) $/ 7 + 2 = 9$ (Balanced.)

Group 6: Reto – $12 + 11 /$ (This group did not complete the game).

Some groups gave results in the incorrect order, but the teacher was too busy keeping the noise down to pay attention to the order of the results. Hence, we see a missed opportunity here to correct such misconceptions because of classroom management pressures. However, he did finally make sure that all groups had given correct results. Learners were very excited, and the teacher struggled to calm them down. It seemed that as the teacher asked each group for its results, the group nearest them wanted to give their results, too – hence the noise. See the excerpt below that shows the struggle the teacher had with classroom management.

T: I noted you. Keep quiet! Quiet! Group number one, two and three – who won in group Number One? Group Two? Group Three? [And so on.] Keep quiet and look at me!.... She won one, and you must have 11 and not 12. How many do you have now? 12 plus 11. So how many cows does the loser have: Only one cow. ... What do you observe between Group 2 and 3?

Ls: Are the same?

Although the sums were simple, the learners benefitted by adding and subtracting repeatedly. Furthermore, all learners were involved in the process. The teacher acted as a mediator, allowing learners to find the answers themselves. However, the teacher led most of the formulation of sums; learners could have been asked to generate their own number sentences.

5.1.5. Extending the game to multiplication and financial mathematics

The teacher then went on to assign monetary values to the cows/tokens that each winner had. Again, the multiplication involved in this exercise was very basic, as the teacher assigned a value of R2 to each cow. However, the activity could have been extended to repeated addition, multiplication tables, division, comparison, or profit/loss scenarios. He could have related the

multiplication to what learners knew already from previous curriculum implementation of multiplication, hence extending their understanding.

However, as teacher and learners become more familiar with indigenous games, higher values could be used for elements of the various operations. From the observation, the teacher gave these learners a good basic understanding of addition, subtraction, and multiplication.

Table 3

Monetising the winnings

<i>Classroom Activity</i>	<i>Mathematical Concept</i>	<i>Evidence</i>	<i>Possible Extension</i>
Multiplying winnings by R2 to determine actual cost of winnings	Multiplication Financial Mathematics	T: You sell each cow that you won for R2. [Teacher switches to Sepedi so that all learners understand.]. That group – no. 5! Group 5 won 15 ... how many cows did you win? 7 plus 8 = 15 ... L: 30	Higher Word Problems Group 2 and 3 had the same results so equivalence as number sentences Multiplication using larger digits per Rand value

Table 3 above shows how the teacher taught learners to calculate their winnings in a culturally responsive way using cows. The relevant concepts were multiplication and financial mathematics.

The excerpt below demonstrates how the teacher explained to the learners.

T: You sell each cow that you won for R2. [Teacher switches to Sepedi so that all learners understand.]. That group – no. 5! Group 5 won 15 ... how many cows did you win? 7 plus 8 = 15 ...

L: 30

The fact that the teacher code-switched to Sepedi shows that he knew his learners and that they still struggled with the word problem he proposed in English. Hence, using Sepedi allows learners to comprehend and relate financial mathematics to their cultural language. This can also be noted as culturally responsive teaching of mathematics concepts used in financial mathematics.

He explained further by working with individual groups as follows:

T: You sell the cows that you won for R2.00. How many cows did you win? Group no. 4: $10 + 8 = 18$. What can you tell about this, Group 2 and Group 3? Just listen. Refilwe's group: $10 + 8 = 18$. You are going to sell the cows that you won R2.00 each. Tell us, how much money do you have? ... Your group is No. 6 – 11 cows, how much money? R22.00.

The teacher is relating everyday language to mathematics as is noticed above. He asks them to add the winnings. Then relates the winnings to the cultural context of the cow, which learners understand. Hence, learners can calculate their winnings based on the number of cows they have won. Therefore, the teacher is able to veer from cultural, everyday language common to the learners and relate it to the mathematical operations of addition, multiplication, and financial mathematics.

5.1.6. Classroom management and learner participation

Figure 9 presents the teacher ascertaining how many cows were won in each group. Figure 9 shows how the teacher worked with the learners to determine the actual winnings.

It was noteworthy that the teacher physically moved to each group when ascertaining the total number of cows won. At first, the learners identified individual players as having won the game, but it was apparent that each group's identification with the game was such that all felt they had 'won'. Collaboration with learners in a group shows that peer learning could take place and the guidance that the teacher offers shows him as a mediator.

Figure 9

Determining the winnings

5.2. Semi-Structured Interviews and Themes

The semi-structured interview about the lesson revealed four themes, as presented in the following sections.

5.2.1. The teacher's experience of using Morabaraba to teach Mathematics

When asked the question, 'What are your experiences of using Ethnomathematics in the classroom?' the teacher participant responded as follows: 'What I presented it was fun for the learners. Previously, I was doing it orally with the learners. We were not always doing Morabaraba with them, but we always talk about Morabaraba being played.'

The teacher recognised that the game imparted enjoyment to the lesson, as was also apparent in the class observation. Hence, it shows learners' engagement in the game. However, his answer indicates that he had very little experience in using the game to teach Mathematics. It seems that in the past, he had just spoken about it with the learners, and that this was his first experience in using the game to teach Mathematics. Perhaps, that was the reason why he did not explain the cultural significance of the tokens being referred to as cows during the observation, as he may have discussed this with the learners already. Furthermore, it can be noticed that he does not relate the game to mathematics as the question inferred.

He went on to discuss the future plans he has with using the game. 'I was thinking of playing, constructing a Morabaraba on the cement.' This comment suggests that using the game was a positive experience for him and that he would be using the game in different ways in the future. What could be realised, is that the learners' engagement with the game was what he found motivating to continue using the game, however, he still does not relate the game to mathematical concepts he could use when playing the Morabaraba game.

5.2.2. Resolving class management challenges when using Morabaraba

The participant was asked about the challenges he experienced in implementing the game and what challenges he could foresee in the future. He said, 'The challenge is because this is fascinating to them, until they make a noise ... then sometimes it is difficult to control them ... that is a challenge.' His answer indicated that the only challenge he had was maintaining control of the class owing to the learners' excitement. Before I was able to probe his answer, he provided a possible solution as follows: 'I think if we can make smaller groups - smaller groups [so] that I could concentrate on one group, the other group maybe looking at a worksheet and answering the worksheet while playing.' This solution was feasible, and showed his many years experience. Yet,

his comment also suggests he could have been better prepared for the lesson if he had used the solution he proposed. Keeping the children occupied with worksheets would also allow the learners to translate learnings from the game into mathematical notations on their own. Hence, the relevance to actual conceptual understanding of the number operations could have been realised.

5.2.3. Integrating Morabaraba with the mathematical concepts of CAPS

The teacher was asked what mathematical concepts he taught through the Morabaraba board game and the current requirements of the Annual Teaching Plan (ATP) and he answered, 'Additions, finance.' He was able to recognise two of the concepts he used, omitting to mention multiplication. He could have done more with subtraction as well. His understanding was correct, but he could have had the learners counting the tokens that were left and creating their own sums based on what had transpired, rather than taking such an active role in leading the formulation of sums. Maybe, then the learners would have had a better conceptual grasp of the number operations as they would have worked it out themselves.

When asked, 'What concepts are being taught at the moment in CAPS?', he replied, 'I can't remember, but I think it is multiplication and division, but I did not concentrate on division today.' This was enlightening. One might assume that teachers follow the ATP for the CAPS curriculum rigorously, but this teacher did not even remember what concepts were currently the focus of the ATP. This could have been because he taught several grades and not just Grade 5s. Hence, it seems he does not follow the curriculum policy for mathematics rigorously during curriculum implementation.

5.2.4. Access to Morabaraba without knowledge of how to use it

The teacher was questioned about the Morabaraba boards and whether they were bought by the management of the school. He said: 'This one they did not, but we received as a gift from other sources a long time ago.' When asked why he had not used the boards before, he said, 'I did not know how to use it before, but since you have worked with us on how to use it to teach Mathematics, I now know how to use it.' The response indicates that where educational games are provided to schools, teachers need assistance on how to integrate them into their mathematical teaching. Without such training, the value of these assets is lost. Moreover, as the observation also revealed, teachers need to sustain the use of the game in the classroom for actual mathematics learning to occur. The teacher was able to relate the cultural significance of the game through the use of the cows, but he needed more practice for culturally responsive teaching for mathematics learning.

6. Discussion

Classroom observation showed that the teacher did attempt to integrate the concepts of addition and multiplication into the Morabaraba board game. He began by discussing how the game should be played and locating the game within the culture by referring to the tokens as cows, a convention also noted by Bayeck (2018) and Mhlolo (2024). Cows are regarded as wealth in many African countries; therefore simply through the designation of the tokens as 'cows', the game provides a rich cultural connotation. The reference to cows gave the game an added appeal to the learners, providing an underlying metaphor for their playing and motivating them to want to acquire tokens.

The use of the Morabaraba game as a cultural component for learning mathematics is evidenced by proponents of Vygotsky's (1979) Sociocultural Theory. Firstly, the teacher referred to the tokens as cows and called the board game a kraal, which shows mediation through cultural tools. Furthermore, as cows relate to wealth in African culture (Mhlolo, 2024), referring to the tokens as cows underscores that the game's value and its use of this cultural language also enriched the learners' culture.

Observation also revealed that the game encouraged collaboration (Meeran et al., 2024), an essential element of social learning, as noted by Vygotsky (1979). Vygotsky (1978) believed that a

child's learning begins with interaction with others, which the teacher implemented through group work. Learners were able to interact with each other to understand the game and related mathematical content and, in turn, learned from more knowledgeable peers as well as the teacher. In this way, they could reach the Zone of Proximal Development, where independent learning could take place (Vygotsky, 1978), through scaffolding provided by more knowledgeable peers and the teacher. The collaboration among the learners facilitated peer learning; however, the cultural significance should also be emphasised. Working together is also an African perspective of 'Ubuntu,' which Eyesan (2025) refers to as the interconnectedness amongst individuals through the collaboration we see in a group.

During the lesson, the teacher code-switched to Sepedi, which is also culturally significant as it promoted learners' understanding of what the teacher was trying to mediate. Hence, Vygotsky (1979) would refer to it as sociocultural mediation through learning from cultural and historical backgrounds. By the teacher using the home language of Sepedi, learners could internalise what was being mediated, which could lead to mathematical learning. Fortunately, the groups were homogeneous as learners all belonged to the Sepedi culture, so the teacher code-switching to Sepedi was relevant to all the learners in the class, but it would have been difficult if learners came from diverse cultures.

The use of Morabaraba facilitated group work and helped the teacher manage a large class of 56 learners. Although noise levels were high, most learners appeared to remain engaged in the assigned activities. Greater classroom structure might have further supported participation, although this cannot be established from the observation alone. The lesson also suggested that Morabaraba provided opportunities for learners to practise addition, subtraction, and basic multiplication within a culturally meaningful context. Similar findings were reported by Meeran et al. (2024), who demonstrated how teachers adapted Morabaraba to incorporate mathematical operations. Consistent with Nkopodi and Mosimege (2009), the observed interactions extended beyond those directly playing the game. Learners watching their peers appeared to engage in logical and strategic reasoning as they attempted to anticipate subsequent moves. These observations can be interpreted through Vygotsky's (1997) sociocultural perspective, which emphasises the role of social interaction and cultural tools in learning. Thus, Morabaraba appeared to create opportunities for collaborative mathematical reasoning and participation. However, further evidence would be needed to establish whether these experiences resulted in sustained conceptual understanding.

The first theme that emerged from the interview – the teachers' experience in using this game – showed that although both he and the learners knew how to play the game, the teacher had very little experience in integrating it into the teaching of mathematical concepts. As Vygotsky (1979) noted, a learner can learn from their own cultural setting and environment, but if that knowledge is not formally recognised (Gerdes, 1994), it is treated as irrelevant and is devalued. If used creatively and intentionally in the classroom, the Morabaraba game, as well as many as other games, can be meaningful and stimulate logical and critical thinking (Fouze & Amit, 2018). This was evident in the lesson observed. The teacher himself seemed impressed with the results of the lesson, as he said, 'I was thinking of playing, constructing a Morabaraba on the cement.' Hence, he confirmed the value of the game as a cultural product that has many mathematical applications (Arismendi-Pardi, 1999).

The second theme concerned the challenge of classroom management when implementing the game. The teacher recognised but already had a solution to this challenge – smaller groups and differentiated tasks arising from the game. The use of groups can create worthwhile learning opportunities even with large class sizes, if well managed. Sunzuma and Maharaj (2019) noted that two of the challenges of using Ethnomathematics were teacher competence in managing classes, coupled with teachers' experience and professionalism. In confirmation of their findings, this study found that the teacher had difficulty in managing the class during the use of the

Ethnomathematical game of Morabaraba; however, his vast teaching experience allowed him to find a solution, which was to occupy some learners with worksheets.

The third theme was the integration of addition and multiplication into the game. It was evident that even though the teacher was not entirely sure of the stipulations of the ATP for that time of the year, he managed to integrate addition and multiplication into the game. The playing of traditional games is a strategy that may be used to teach mathematical concepts in the curriculum (Meeran et al., 2022). As recognised by Sociocultural Theory, Ethnomathematical games are social and cultural constructs that make mathematical learning engaging and inclusive.

Under the final theme of access to the game, it was evident that even where assets such as games equipment have been donated to schools, if teachers are not trained in how to use them, they may be of little value. Teacher training through workshops is essential for using the games (Pradhan, 2023). The provision of games equipment such as Morabaraba boards and more widespread training in how to use them would provide teachers with a rich resource to use in classrooms in a variety of creative ways.

7. Conclusion

This examination of how one Mathematics teacher taught Mathematics concepts using a Morabaraba board yields the following findings: Learners did engage in this way of learning to develop a collegial way of working together even though only two actually play the game at a time; the use of the game imparts understanding of basic mathematical concepts; even though the teacher had limited experience of using the game to teach Mathematics, one experience of it was sufficient to ignite his enthusiasm for this way of teaching; the game could be effective when using groupwork and could be used to manage large class sizes if the teacher had more experience in using the game; the game could be used effectively within the CAPS curriculum; and finally, even if resources are available, if teachers do not know how to use them, they will not make use of them.

In light of socio-cultural theory, the Morabaraba game and other traditional games may be seen as a culturally-laden way to enhance Mathematics education, drawing on the principles of collaboration, social learning, enjoyment and culturally grounded learning. Both learners' enjoyment and the constructive effects of the game promote its continued use.

It is recommended that more teachers be trained in using cultural games so that their use may be sustained. A recommendation is that indigenous games be included in the Mathematics curriculum policy. Future research could focus on the way in which other indigenous games may be used to teach particular concepts in Mathematics. The use of the Morabaraba game demonstrates that learners are able to learn Mathematics. With continued use, the teacher would be able to introduce more abstract concepts through the game.

Data availability: The datasets generated and/or analyzed during the current study are not publicly available due to ethical and privacy considerations but are available from the corresponding author upon reasonable request.

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