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Where cultural games count: The voices of primary classroom teachers

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Abstract

This study explored Ghanaian primary school teachers' values and challenges of integrating cultural games in teaching mathematics. Using an In-depth conversational interview, ten (10) certificated teachers' voices on the values and challenges of integrating games were examined. Thematic data analysis was applied to the qualitative data from the interviews. Results indicated that although cultural games count as instructional tools in four knowledge domains, actualizing their value in the classroom appears problematic for lack of game-based pedagogical know-how. The study recommended looking into the classroom for a complete understanding of the values and challenges of integrating games in teaching and learning mathematics.

Key words: African games, Games in mathematics, Indigenous games.

Introduction

Following criticisms that the inherited educational system was detached from the realities of children's lives in Ghana, the Dobro Committee was set up to critically examine the education system and make recommendations (Ministry of Education [MOE], 1974). The committee recommended a new Structure and Content of Education. The recommendations set the pace for the 1987 comprehensive education reform in Ghana. The reform sought ways that would make education more meaningful to Ghanaians. One aspect of the curriculum reform that had the potential to reform mathematics teaching was the introduction of games. Games were introduced into the mathematics curriculum to locate mathematics in the social domain of the child (Nabie, 2011). They make the teaching of mathematics relevant to the lives of learners (Chikodzi & Nyota, 2010). The intent was for teachers to use games as alternative instructional tools to make mathematics relevant, accessible, pleasurable, and memorable.

Several researchers and educators (Booker, 2004; Markey, Power, & Booker, 2003; Moloi, 2013; Nabie & Sofo, 2009; Nkopodi & Mosimege, 2009) who believe in allowing children to make personal mathematical constructions of their own learning and mathematics learning as connected to their lives supported the use of games in mathematics education. Games are activities with integrated opportunities (Nabie, 2012) that lay the foundations for processes, thinking strategies, as well as consolidate existing thinking (Booker, 2004: Gerdes, 2001). The integrated opportunities provide the theoretical and practical justification for the inclusion of cultural games in the curriculum.

Earlier works (Nabie, 2011; Nabie & Nyala, 2009; Nabie & Sofo, 2009) in Ghana show that although many teachers are aware of the many advantages of using games, few experienced them at the point where pedagogical skills are developed. Nabie (2011) argued that if teachers' experiences of games inform and serve as basis for pedagogical decisions, then they must experience indigenous games as pedagogical tools to enable them build effective bridges with the mathematics they teach. Indeed, several studies (Chikodzi & Nyota, 2010; Nabie, 2011; 2012; Powell & Temple, 2001) gave evidence of the significance of cultural games in learning. These studies consistently present cultural games as activities that stimulate children's mathematical imagination and thinking, and are therefore important cultural instruments for engaging children in their intellectual pursuit. In spite of the important role cultural games play in the pedagogical arena, teachers do not seem to have made a connection between the value of indigenous mathematics and the use of games (Nabie, 2011). Specifically, very few teachers translate their experience with games into practice (Nabie & Sofo, 2009) for lack of rigorous knowledge of the mathematical content and grammar of cultural games (Nabie, 2011).

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Limited knowledge of the value of games can influence decisions on their use in classroom practice. The inclusion of games in the curriculum is to promote indigenous mathematics through cultural games. The mathematics curriculum values cultural tools as learning devices, therefore an understanding of how teachers, value cultural games to inform their practice is warranted.

Theoretical Framework

This study was grounded on Schön's (1983) craft knowledge. According to Schön (1983), practice in and itself is a valued form of knowledge. Much of teaching can be viewed as knowing how to act in the instant or as "knowing in-action." Actions are observable and explicit but the knowing underlying action is implicit. In teaching, the teacher "seeks to involve each person wholly – mind, sense of self, sense of humor, range of interests, interactions with other people –in learning" (Duckworth, 1986, p. 490). Craft knowledge, a form of morally appropriate, intelligent and sensible know-how developed by teachers in the context of their practice (Grimmett & MacKinnon, 1992) is understandings gained by professional teachers and used in their everyday practice in response to specific situations (Nabie, 2012). In pedagogical literature, it is the teacher's wisdom of practice (Shulman, 1987), contextualized knowledge (Leinhardt, 1990), occupational savvy (Grimmett & MacKinnon, 1992), or personal practical knowledge (Connelly & Clandinin, 1988).

There were concerns that craft knowledge is a mix of deep, sensitive, location-specific knowledge and disconnected, irrational and inaccurate opinions (Grimmett & McKinnon, 1992) gold and gravel (Barth, 2001), kernels of knowledge and chaff of falsehood (Leinhardt, 1990) and mute (Barth, 2001; McAllister & Rowe, 2003). However craft knowledge research evidence exist that we can have access to teachers, craft knowledge (Brown & McIntyre, 1993; Cooper & McIntyre, 1996; Duffee & Aikenhead, 1992; Lantz & Kass, 1987; Van Driel, Verloop, Van Werven, & Dekkers, 1997) and other researchers (Barth, 2001; Hiebert, Gallimore, & Stigler, 2002; Ruthven, 2002) have explained various ways of by which craft knowledge can be transformed into research-based knowledge.

Researchers (Duffee & Aikenhead, 1992; Lantz & Kass, 1987; Van Driel, Verloop, Van Werven & Dekkers, 1997) presented craft knowledge as a theoretical base for examining curriculum change and implementation. Drawing on craft knowledge as a theoretical framework for using games to teach mathematics, Nabie, (2012) stated that games are activities with integrated opportunities and their use is personal, vary "from individual to individual and heavily influenced by three sources: experience, current situation, and the teachers vision of teaching" (p. 177). Craft knowledge provides a broader view of teacher knowledge that integrates teacher experiences and perspectives in using common and cultural games in the mathematics classroom. Teachers rely on their craft knowledge to make mathematics accessible to learners as it enables the teacher to develop a mathematics classroom culture with opportunities for learning. Teachers' interpretation of games in the curriculum is a reflection of their personal understandings deeply rooted in their implicit theories and values. They interpret and adapt innovations in ways that are meaningful. Ghana's Ministry of Education revised the curriculum to recognize concrete practical activities in all aspects of teaching and learning mathematics, but the mathematical values or knowledge of games that teachers bring to instruction is experientially and contextually based.

Purpose of the Study

While games in the curriculum provide an opportunity for achieving the philosophical goal of incorporating indigenous mathematics to increase relevance in learning mathematics and locating mathematics in the social domain of the child, it is not certain as to whether teachers value cultural games within the curriculum lens. Studies (Nabie, 2011; Nabie & Nyala, 2009) consistently indicate that teachers have different values of cultural games but they do not explain how these values arise. This study was therefore designed to address the following questions:

1. How do teachers value games as tools for mathematics instruction?
2. In what contexts are games used as tools for mathematics learning?

To use a material as a mathematics instructional resource, one must be clear about what mathematics it can help to teach. The purpose of the study was to give voice to classroom teachers' on how they value cultural games in their instructional domain. This would provide an insight into their orientation towards game-based mathematics pedagogy and a glimpse of their personal philosophies of socializing mathematics through games. Furthermore,

the study would inform both the curriculum developer and the educational policy maker on how the reform intentions on games are interpreted by teachers in the classroom.

Methodology

Participants

Participants included a purposive sample (Merriam, 1998) of 10 certificated primary school teachers from one Municipality of the Upper West region of Ghana. Participants' experiences ranged from four to 30 years and were teaching in Primary 1, 2, 3, and 5.

Data Collection

The study values teachers' voice and acknowledges the importance of cultural games in classroom settings. Consequently, one-on-one in-depth informal conversational interviews (IDCIs) were used to probe 10 (seven users and three non-users of games) teachers' experiences on the value of common and cultural games in the mathematics classroom. Of the 10 participants (8 male, 2 females), six were teaching in urban centers and four in rural areas. The seven participants who used games were selected to include experiences from rural and urban locations, the variety of known and played games and the class level taught. This was to widen the window of values at different communities and class levels. Six of the seven game-users integrated both cultural and common games in their classrooms, while one used only common games. For the "non-users" interview group, three participants were also selected to include rural and urban locations and their experience with a variety of known and played games. Throughout the interviews, participants shared their memories regarding the use of games during their education and professional practice.

Data Analysis

Thematic analysis was applied to the interview data. Interview data was transcribed into text. The text data was read through several times to make general sense of participants' descriptions. Coding units were identified in the interviews data which captured participants' expressions of the role of games in society and the mathematics classroom. The coded units were re-examined carefully to develop themes. The analytic procedure located teachers' values of cultural games as tools in four (4) knowledge domains namely: games as tools for cognitive development, social learning, alternative teaching strategies, and acquisition of cultural knowledge.

Games as Tools for Cognitive Development

Interviews were conducted for an in-depth understanding of how teachers viewed games as a vehicle for mathematics learning. Pseudonyms are used throughout the paper. When Vero was asked about the benefits of games in her classroom, she maintained that:

> *Children build up their mental abilities as they play games. They become very critical, very logical about things. They can argue out things for themselves and find out things for themselves and this can be linked to the outside world not necessarily in the classroom alone.*

Continuing, she said: *Games also help you to unveil certain things that you couldn't have discovered just sitting down looking in a book … Cultural games in the long run help in consolidating concepts that are taught in schools.* When I asked her if there was anything further she wanted to add, she returned to her initial standpoint on games for learning and concluded: *Games generally add knowledge to children …. Games help in the establishment of concepts. … So games are usually important to any learning situation especially in mathematics. They will help build-up a lot of situations in learning mathematics.* From Vero's responses, there is a strong emphasis on the value of games for the development of mental abilities such as critical thinking, logical thinking, aiding mathematical explorations, and contributing to and consolidating mathematics knowledge.

Martha also emphasized learning mathematics through games with a description of her own childhood experience using a traditional game, *bombo*:

> *Any time we are playing we count. … When you are counting, you know numbers verbally but … you couldn't identify them until they say this is the number either one or two or three then they write and you say ahaa I have been counting*

When Martha was asked what she liked about using cultural games in teaching mathematics, her response in terms of active learning was:

> *They do it themselves. When they do it they understand it more than hearing and seeing. There is a proverb that when they hear, they forget; when they see, they remember; and when they do, they understand.*

Martha strongly believed that cultural games provided children with opportunities to actively learn mathematics. She, however, indicated that some form of intervention was required to link informal mathematical experience of games to school mathematics for understanding.

Selina also spoke of games as a means to learn mathematics. She described pebble-pushing game (*baabaa)* as a game for *starting children in learning to measure lengths.* When asked if children could learn mathematics in the game alone, she responded: *As for that, they do it in their houses and they learn more concepts*. While initially it appeared as though she believed the children could learn the concepts directly by playing, when I asked how her children make connection between the mathematics in the game and the school mathematics she was teaching, she explained thus:

> *When you start, you have to tell them … our topic is measurement… So they have the idea that they are doing mathematics* [measurement] *in addition to the activity they are doing. If you don't tell them, maybe they will think that they are only playing, but if you tell them ... they will look and see that they are doing what they are going to do later.*

Gevase also commented on the relationship involving mathematics learning and games. When asked about his concerns on the use of traditional games in teaching mathematics he said *the pupils don't know the value of some of these traditional games.* He felt that teachers needed to *let their children know that what they do in their communities they are learning unconsciously.* He also expressed concerns that the games themselves do not explicitly teach the concepts. Therefore, after the game *you take them through the theoretical aspects. That is where you will write on the board and ask them to identify the concepts being introduced.* In another comment he said that *when you are playing this very game it forces you to think like a mathematician.* While Vero appeared to indicate that games could contribute directly to mathematics learning, Gevase appeared to believe that the teacher was needed to make the link explicit through direct teaching.

Paul indicated that there was no direct link between the learning that occurred in the game and the mathematics. Saying, *there are hidden mathematical concepts in the local games*. *Games occupy the children during their free period. They just occupy them and once they play the games, they learn some things unexpectedly*. His role as the teacher was to make the link to mathematics explicit as expressed: *After playing the game for some time I bring in the aspect that I want them to learn. Then… you see that they've already learned that topic without knowing.*

Five participants commented on the role of games on children's cognitive development in learning mathematics. Their responses, however, indicated a wide range of beliefs about the value of games in learning. Vero's comments reflect one end of the spectrum in that she believed that children learned mathematical concepts directly as a result of playing games. At the other end, Gevase and Paul indicated that children do not know the inherent mathematical content of cultural games and the teacher had to take an active role in helping them make the connection between the mathematics in the games and school mathematics. Since the curriculum does not specify what mathematics is learned through games or how that learning occurs, it is not surprising that teachers expressed wide range of beliefs about the value of cultural games in learning mathematics. Nonetheless, Vero, Martha, and Selina's comments indicated that children also develop understanding by socially interacting through cultural games.

Games as Tools for Social Learning

During the interviews, several participants recalled their own experiences as children learning games in their communities as well as the positive and negative social aspects of cultural games in teaching and learning mathematics. Several participants commented on their own experiences on the value of games in learning

mathematics. In many instances, they learned games through other community members. When Gevase was asked how a person would learn the games from the community. He responded:

> *First you sit down to observe others playing. Then after they finish playing you also imitate. Something like "bie buiribu" you also take the marbles and play. Even if you are alone, you will take it that your left is for one person and the right for another. Then you put the marbles into the holes and the left and right will play.*

Martha said she learned cultural games *through my seniors. ... They used to play when I was a child. I used to look at them for some time. Then I also try it myself. Then later on I also* [play with them]. When I asked Vida how she learned to play games from her community she had a similar response:

Vida: *I learned to play ampe and bisogi in the school. …. So when we were at the kindergarten … we see friends will take these stones. … So you watch friends … doing it and you get to know how to do it*
R: So when I observe someone doing something, I should know how to do it?
Vi: *Yah. Through observation you can learn.*
R: So if I observe somebody riding a motor [cycle], I can also ride?
Vi: *Yah. You can observe and do it. I observed and got to know how to ride a bicycle when I came here.*
(Vi = Vida; R = Researcher)

Gevase, Martha and Vida all indicated that cultural games were learned from their peers. A connection between social interaction and learning was mentioned by all participants in their interviews. For example, when I asked Vero what could be learned from the community games that she mentioned, her response was: *In playing games … they socialize.* Intrigued by her response, I asked: In mathematics*?* She explained her reasoning:

> *In mathematics if you can't socialize, you can't do group work. You will be a thorn in the flesh of others. Eha, but if you can socialize, it means you can comport yourself and you can learn together. You have that type of cooperative learning.*

Vero's strong stance on the value of games for learning was strongly connected to her belief that significant learning occurred through social interaction. She further emphasized that *Games let you share and learn a lot from others, it gives you the desire to be able to win or to lose, to co-operate with others, socialize, get interested and all that.* Similarly, Selina also thought about the social benefits of cultural games in terms of group learning. After describing a particular cultural game involving measurement, I asked her about the benefits of the game to a teacher, the child, and the community as a whole. Her response that connected the social aspect of games with learning was:

> *The benefits? OK … they are group activities so they relate to one another and the community too. The group brings friendship. It brings close relationship… they learn from one another in the group. If you are not able to measure, you will see your friend measuring and you will also stretch your fingers and measure.*

Both Vero and Selina stressed the social value of cultural games in learning mathematics. In their view, the social nature of cultural games enable positive social relationships. Children learn from each other through group work and discussion. Although Vero and Selina saw the value of social interaction in games, they also commented on the negative effects games may have on learning. When I asked Vero whether children talk in her game-based lesson, her response was *Yeah. They talk. They communicate. Sometimes they argue and even to the extent of being very aggressive*. This is where Vero indicated that the teacher has a role in ensuring they play *"fairly"* if the benefit of children learning together through cultural games is to be actualized. Similarly, Selina, reflecting on her measurement game classroom activities, focused on the nature of children's talk and reactions to others trying to win by unfair means and said: *children discuss and even sometimes they will quarrel. When you measure and want to cheat, others will not agree*.

The views shared by the participants suggest that the social nature of games provide an important avenue for children to learn. However, the social atmosphere may also interfere with learning. This is particularly so when disagreements, quarrels, and aggressive behaviours occur, and that will disturb learning in other classrooms.

Games as an Alternative Teaching Strategy

During the interviews I examined some aspects of the games as a teaching strategy— teachers' awareness and knowledge of the mathematics of the games and conditions for using the games in the classroom (space, health and cleanliness)—for a greater understanding of the instructional values and challenges of using games in the classroom.

Awareness of Mathematics in Games

A determining factor of the value of games in the classroom is their use or non-use as instructional tools. The use or non-use of games in the mathematics classroom depends on teachers' awareness of their mathematical value and their knowledge in using them for teaching. Since the curriculum neither gives explicit information of what games to use nor specify the mathematics content the games could teach, I explored participants' awareness of what mathematics a child might learn from cultural games. When I asked participants what mathematics children can learn from cultural games, Gevase who mentioned several games but, in practice, only uses a pebble-sowing game said:

> *With that game the children can learn … angles, lines, even counting …. That game involves a whole lot of mathematical ways of thinking because you should know the sort of hole to play your marble in order to win the game. … The concepts are many. For instance, if you take the addition, I mean counting in general, is one of the concepts that one can learn from the game.*

However, for the many cultural games that he mentioned and described in his community, he said *because I don't use them, I can't say anything about them.* In her response, Jane indicated that children *can do subtraction, and maybe division, and then multiplication* in her stone-passing game. Similar to Jane, Edith often uses stone-passing game to help children *"learn addition and even subtraction* and the hopping game to *learn subtraction.*

Paul seemed to have a wider knowledge of the mathematics children might learn from a variety of games. He mentioned four games that he often uses to teach mathematics. In describing his instructional procedures, I asked him what mathematics children might learn from his pebble-sowing game (*bie-ziɛbu).* He said: *children really will learn numeration– say counting of numbers, more than, or less than. They also learn computation, division, and multiplication.*

Although Selina was able to identify many games that could be used to teach mathematics, she only uses pebble-pushing in her classroom. When I asked her what mathematics concepts are developed in this game, her response was: *Counting. When you are measuring with the palm, you count the number of times you have measured … Measuring, counting, and drawings are all there*. Martha who uses the jumping game *ampe* to supplement the number line concerned herself with number concepts and said counting was a major concept. She noted that during play, they count in the mathematical language used in the classroom and so *when they are counting, they count in the English language and they* [become] … *fluent in the English language.*

Even though Vero uses only common games, she knew that *cultural games help in the establishment of concepts.* When I specifically asked her whether she knows the mathematics of cultural games, she demonstrated her awareness of the mathematics of various games in this response:

> *If you are talking about the local game like baa, they measure, they count, and they also learn measurement at the same time. If you are talking about the bie, you are counting while collecting* [the marbles].

Cultural game users tended to exhibit their awareness and knowledge of the mathematical value of at least one type of cultural game they mentioned. Although Vero does not use cultural games, she demonstrated knowledge of mathematics found in cultural games. The non-users gave similar responses as to what mathematics children might learn from cultural games. When Doris, said *children easily learn from the games,* I asked her what mathematics children might learn from the stone-passing game, *kuriyee-kuriyee,* she mentioned. Her response was simple: *They can learn addition from that*. Ruth did not identify any specific cultural game but she felt that they could be used *to learn prime numbers, odd numbers, and what have you. Then even subtraction and division you can learn from them.* Vida also responded that *there is a lot of mathematics in games.* But when I asked her to talk of the traditional games in particular, she said: *The traditional ones, it is recently I realized there is mathematics. I didn't know.* She continued:

> *From the day you talked about the games in the questionnaires… Then we took some of the games and then we realized that if the children are playing ampe, they count…. That is where I realized that if we take this particular game, counting and other aspects of mathematics come in.*

Among the non-users, while Doris and Ruth were aware of and know the mathematical value of some cultural games, Vida was neither aware nor had knowledge about the mathematics of cultural games until her involvement in this research. When I asked Vero what one needs to know in order to use a game to teach

mathematics, she said: *You must know the concepts you are going to develop or whatever topic you are teaching.* You must also know how children *play the game and play it well in order to be able to grasp the concepts. Otherwise children will be fumbling with things without knowing what they are doing*. Based on what one needs to know in order to use games, she expressed her worries about games in the textbooks that she may not know as a stumbling block.

> *My only worry is in the classroom situation where I use the textbook and a game is mentioned and I don't know how to use it. That is my only worry. Apart from that, when I know how to do it and know it is for a purpose— to help children learn and learn properly, I don't see any problem using games.*

Gevase also lamented that *teachers, even including the pupils, don't know the value of some of these traditional games.* Similarly, Jane pointed out *we didn't even know the importance of using games for teaching as there were no games in our teacher training programme*. Also, when I asked Vida why she does not use games, she explained *we do not know how to use them in teaching* while Doris personalized this limitation saying *I don't know of any traditional game to use in teaching mathematics. … I don't know what games to use to teach mathematics.* In expressing her concerns Jane argued that *even if you stress that we should use the games, yes, we go into the classroom* [and if] *we don't know the games ourselves how are we going to use them? That is my concern. We don't know the games*. Edith also felt her knowledge was deficient by her comment: *You will be doing it but you don't know whether you are correct or wrong*. It also accounted for Doris's assertion that anytime she saw games in the curriculum *I don't do anything. I just ignore them.*

Even though participants mentioned a wide variety of games within their localities, most demonstrated knowledge of the mathematics in only a few and did not know how to use them in their practice. Nonetheless, in the few games that participants did mention there was an awareness of their mathematics potential in the curriculum. Actualizing the potential of games in the classroom appears problematic to teachers for lack of know-how in game-based pedagogy.

Health and Cleanliness

Health related issues were raised by some participants as a challenge and I sought to understand how using cultural games in teaching mathematics may result in health related problems. Selina recounted the many games she used to play during childhood at home. When I asked her whether they also played these games in school, she responded *we used to play but these days they say children will make their things dirty, so they don't allow such games to be played*. In particular, she remembered her popular game *baabaa* and said: *We played it in school*. From her earlier response that they do not allow cultural games to be played in her school, I questioned whether it was the school or an educational policy that disallowed their play. She responded: *you know as for this school even playing ball when it is not time for games they don't allow it. … A play that children will wear their uniform and sit on the floor is not allowed in our school.* When questioned whether playing cultural games in school is allowed, Gevase responded: *Yes. Even when I was in college I used to play them.* Similarly Vida's response was: *Yes. When we were in the primary school, most of our break time we used to play ampe*. *Bisogi too. We used to do it during break time.* When I asked specifically about playing games in the classroom, Vida responded: *Not in class.*

Participants remembered that they played various cultural games when they were in school but not in the class. Only Selina indicated that only official games like football may be played at designated times but cultural games, many of which are played on the ground, are prohibited in her school for health reasons. Vida also stressed the issue of health. She said: *some of these games are to be done outside. …* [Children] *will be playing with sand and get dirty. So, the children will be dirty — their clothing.* She indicated however that *it is not applicable to all games*. Vida further expressed her concern that when using the playgrounds *children's clothing will be dirty.* I explored the potential health risks with Vida by asking her whether children become dirty in all games. *No.* She responded. *It is not all. Like ampe and kuriyee-kuriyee children will not get dirty. But there are some that involve the sand. … they will definitely use their hands.* When I asked which games she was referring to, she said: *Let's say kuriyee-kuriyee they use stones but if it is outside you know they will definitely touch the floor. They will use their hands on their books and maybe their dresses.* Don't they wash their hands after the game? I questioned. *Yeah. That is, if the school is provided with basins and water. But you know children at times they will see the water and they will use their hands on their bodies.*

Both Selina and Vida suggested that there was a health risk involved with games where children use sand, sit on the ground or play in the sandy playground. Although few participants commented on health related issues, the idea is that using cultural games in dusty environments poses potential health risks.

Games as Tools for Cultural Knowledge Acquisition and Values

In response to the question "What do you think is the purpose of playing games in the community?" participants stated that cultural games sustain and keep the cultural heritage alive or, in general, promote the acquisition of cultural knowledge. I explored how the use of cultural games in teaching mathematics provides space for the acquisition of cultural knowledge and values in their communities through interviews. Participants were asked: "What are the benefits of cultural games to the community?" Selina explained the value of these games to the community and the school saying:

> *The children when they play games in school, they know that games are valuable. They will see that children come together …. If the parents are talking about it they will say that madam has used that thing to let us learn in the classroom. So the parents will know that games are very valuable in school.*

Similarly, Vero believes that using cultural games will educate the community and help them recognize the value of games as instructional tools:

> *When children play, it amuses the community. For instance, when they begin to play the games that the community members are already aware of, they are impressed that even children going to school still take part in these local games that we have. They are amused and they will sit down and just admire them. They are impressed about the way children are doing certain things which sometimes even adults cannot do. So they admire the little ones.*

She continued to describe how playing cultural games in school links the school to the community saying:

> *Children will come to school and before you are aware, before you make anything formal ... they are doing the golaa, they are doing the ampe. No one will instruct them to go and do ampe,* [or] *go and do what. …They bring the community to the school and so during break nobody instructs them to do anything* [but] *you see them doing the games that they like most.*

Martha made efforts to link her topic in the classroom with children's games. For example, she noted that children *have been playing ampe any time they go out for break.* When they return to the classroom she uses the children's ideas on the game to connect *addition of numbers, and adding numbers using the number line.* Paul also focused on the learning relationship between home and school in his use of cultural games. In his view, cultural games provide opportunities for indigenous communities to acquire formal mathematical knowledge without formal schooling. Paul explains:

> *In fact … the community also learns as well. … They also learn —the mathematical sense or the mathematical concepts that these games have. Like if the children come to school and you teach them that this game has got these mathematical concepts, they will take it back to the community and tell their parents or other children and teach them. So by the time you realize the whole community is even learning mathematics without your knowledge.*

For Paul when learning mathematics through cultural games in school, other children in the community will get to know some formal mathematics *even though they haven't been into the classroom.* In this way, cultural games create local community relations, foster access to knowledge and provide opportunities for distributing new knowledge. As children re-unite with their friends after school and share the new knowledge learned in school with them, Martha felt that through such sharing *a clever child may also get to know what they have been doing in the classroom*. In particular, through informal interactions on cultural game use, formal mathematics is distributed across the community *as they will go around telling the others that this fellow came and taught me how to count* or do other things in a particular game.

The participants' comments seem to indicate that cultural games in the mathematics classroom do not only influence community relations but also serve as a mechanism for the distribution of mathematical knowledge between schools and across the community. Vero, Martha, and Paul felt that using cultural games in teaching mathematics brings the community to the school. Not only is indigenous knowledge brought into the school by the children, but the knowledge is further processed and then returned to the community at a higher level of awareness, appreciation and understanding. Participants appeared to believe that cultural games bring joy to the community and contribute to the intellectual development of the child, the teacher, and the community through knowledge distribution.

Games as Tools of Motivation in the Mathematics Classroom

Participants also stated motivational attributes as an advantage for using games in teaching mathematics. I further explored interviewees' views on the value of cultural games from the motivational perspective. When asked about the benefits of games to a teacher, Vero laughed and said: *Interesting*! *…. The lesson is interesting… when I walk around to observe what the children do, I enjoy it. And to the children, they enjoy playing games.* As a game-user and a lover of games, she liked games because *it is interesting to partake in a game.* Similarly, Paul said *the benefits of these games are that they make my lessons very interesting*. Summarizing what he liked about cultural games, he said: *One thing I like about these games is just the fun and the satisfaction they give. They create fun, you laugh a lot and they make mathematics easy.* He used specific games to explain his reasoning as:

> *Let's take the game paasaa, for instance…. it involves the pupils more in the lesson. So pupils pay much more attention on whatever I am going to teach. It arouses their interest. The bombo and the bie-ziɛbu–these games also create fun and satisfaction and sometimes they occupy the children during their free period. …. The amina as I told you … it arouses their interest, create fun for the children. It is fun. Yeah. When children play, I am happy about them*.

Martha expressed similar sentiments on the benefit of games to children in her response:

> *… You know children. They like playing and when you put mathematics in that form they feel it is just a play and through that they achieve their aim very fast. Even the lazy ones can also act. …, children become very active … and once they are active you will get much attention easily. Their attention is always captured very fast. Everyone will want to take part.*

Gevase expressed the effect of interest on participation:

> *When you sit there, if you don't take care the whole of that day you will not even like to eat because it is so interesting. …. It keeps you there because if somebody wins and you think that you are also good, you will like to play back. So it will just keep you there forever and if you don't take care you will not get up for the whole day.*

Children's participation is enhanced not only because the games are interesting but also, as Edith indicated, because *the games make the lesson practical and they are motivated. Everyone will like to take part.* Since interest encourages participation, Jane felt that games should be introduced into mathematics to activate learners anytime they are inactive. In particular, she said *in the process of teaching sometimes … when you see that a number of children are sleeping you can let them … play a game, and when they play they will be active*.

Views shared by game-users suggested cultural games motivate both the child and the teacher in different ways. I asked Selina what motivated her to use a cultural game in teaching mathematics. She said: *First, the game helps the children to pay more attention. Second, all the children will be involved. It is a kind of motivation so that children will participate in the lesson. … It is very interesting* and she liked using it because of *the competition* [and] *the way the children enjoy it.* Selina also advised that a *game that is in line with your topic can be used to bring the children's attention to the lesson.*

Ruth, although she does not use games, thought that *if we are using games, the children will develop the interest at once*. She argued that *these days children like playing so I think it is good to use play*. Similarly, Doris does not have any interest in using games to teach mathematics, but acknowledged that *it is good to use games to make the mathematics learning interesting because games make the lessons interesting.*

In view of the motivational functions of cultural games, Vero advised that:

> *You don't stop children from playing games either at home or in school because games … ginger the children up. Some sleep in class but when they are … involved in games they jump around. They come back more alive than before. They sit more awake and more critical about what is going on in class than when you make the class so boring.*

She however, cautioned that excessive use of games may de-motivate *those who are not interested in games*. From the interviewees' stories shared here, all share the view that cultural games are catalysts for learning mathematics. They make the lesson interesting not only for the child but also the teacher. Most participants believed that because the games are interesting, they focus children's attention on the learning situation and induce active participation in the learning process. Only one participant cautioned that the excessive use of the games will not be beneficial to students who are not motivated by playing games.

Discussion and Conclusion

The study explored the value of games in the mathematics classroom. In-depth conversational interviews with 10 classroom teachers allowed space to listen to the teacher's voice regarding the value of cultural games in their professional practice. The participant interviewed revealed varied interpretations of the value of games as resources for cognitive, social, instructional, and cultural development. Teachers in the present study valued cultural games in terms of their overall development of the child and community in several ways. Teachers described the games as alternative social tools of instruction with opportunities for skill and concept development. Specifically, they provide space for developing cognitive, practical, and social skills. Cultural games provide authentic engagements that stimulate children to learn and build solid foundation skills for learning. As alternative social tools of instruction, games engage children to discover new concepts and to consolidate already existing concepts. These findings support earlier studies (Booker, 2004; Chikodzi & Nyota, 2010; Mustafa, Khan & Ullah, 2011; Nkopodi & Mosimege, 2009; Powell & Temple, 2001) that non-technological games motivate learning, integrate the social, affective, and cognitive aspects of learning and embody many mathematical concepts, skills, and social values that children and teachers can benefit from.

The results also suggest that cultural games in school is a way of connecting school to the community and foster the distribution of mathematical knowledge across the community. Teachers consider playing cultural games as a social enterprise where children, teachers, and community members interact to learn and share mathematical ideas and values. These findings are consistent with other research results (Gerdes, 2001; Moloi, 2013; Nkopodi & Mosimege, 2009; Powel & Temple, 2001) that the indigenous games in the classroom is an opportunity for teaching, learning and sharing. Games are used for learning at home, school and the community at large and are avenues for operationalizing knowledge distribution. The results affirm that cultural games are used as endogenous knowledge and demonstrate the fact that mathematical concepts are not exogenous (Moloi, 2013). Cultural games operationalise indigenous knowledge system, which in turn brings in authentic engagement from which one can learn mathematics. The study revealed that children observe, imitate, discuss and work together in the course of learning to play and playing games. In playing cultural games, children's learning path tends to follow the sequence observation, imitation, discussion, and end up with group work. This suggests that cultural games provide space for developing mathematics learning trajectory (Clements & Sarama, 2010) in logical sequence and for operationalizing interactive learning.

Although most teachers recognized the educational value of cultural games the data tends to indicate that their values cannot be translated into practice. There were worries that some teachers did not know their instructional value and some could not use the games for lack of game-based pedagogical know-how. This stems from the fact that games were not valued in that capacity at the point where pedagogical skills are developed (Nabie, 2011; Nabie & Sofo, 2009). Knowing that most participants interviewed had limited opportunity to experience the use of cultural games at the point where pedagogical skills are developed, it was not surprising to find that many participants seemed to have limited knowledge of the instructional value of cultural games in the mathematics classroom. Also it was not surprising that there were disagreements on whether games directly teach mathematics. Nonetheless, participants' understanding that people count, use numbers and ordinals among others informally in the course of playing games suggests that games directly introduce some concepts to children. Games informally set the base for learning mathematics during play but some intervention is required to enable formal mathematical cognition. That is, in the classroom setting, teacher intervention is needed to link concepts and games.

The interviews provided in-depth understanding of the value of games in teaching mathematics and further revealed the challenges teachers' experience in using cultural games in the classroom. Generally, participants did seem to be aware of several cultural games in the school communities and that the games are valuable in the mathematics education of the child. However, what is reported here reflect teachers voice outside the classroom. Looking into how games are valued in real classroom context will make the understanding of how games are integrated to achieve the curriculum goal of locating mathematics in the social domain of the learner provides another phase for study.

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