

MATHEMATICAL GAMES AS TOOL FOR MATHEMATICS TEACHING IN THE FOUNDATION PHASE

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ABSTRACT

Mathematics performance is a universal outcry. Children as early as foundation phase are unable to solve mathematical barriers. In her analysis Naledi Pandor, Minister of Education in South Africa noted in that only 35% of children in South Africa can read, write and count. The aim of this paper is to explore the importance of the use of educational games in teaching mathematics in the Foundation Phase (Grade zero to three) classes in South African primary schools. This research is qualitative in nature and explores the views of Foundation Phase teachers regarding the using of mathematical games as tool for mathematics teaching in the foundation phase. The concern is if the problems are not addressed in the Foundation Phase it might be too late to deal with them in the higher school grades. In fact it is known that the performance in mathematics at Grade 12 is poor as seen from the TIMMS results. The research specifically reveals that the significance of teaching children through the use mathematical games is to help inculcate strong number-sense competencies for the love of mathematics. The paper highlights the use of mathematical games for motivating and improving children's performance and takes into account the assistance teachers should give in order to improve mathematical thinking when playing mathematical games. This paper concludes that mathematical games assist children to practise mental calculations and addresses mathematical language barriers. Teachers should teach the children to ensure that they enjoy and actively participate in the use of games when learning mathematics.

Keywords: Mathematical games, mathematics, Foundation Phase, Grade zero to three, mathematical language barrier.

INTRODUCTION

In considering the use of games for teaching mathematics, educators should differentiate between a game and an activity. Gough (1999) argues that a game needs to have two or more participants who take turns in competing to reach a winning situation of some kind. Each player should be able to exercise choice about how to move during the play. In this sense, 'Snakes and Ladders' is not a game because winning relies totally on chance. The players make no decisions, nor do they have to think further. Oldfield (1991), charges that mathematical games involve a challenge against one or more opponents. Games have a set of rules and have clear underlying aims, distinct ending point and specific mathematical cognitive objective (Li & Ma 2010).

Alridge and Badham (1993) argue that teachers should ensure that the game match the mathematical objectives, they use games for specific purposes and they keep the number of players between two and four to expedite turns. The game should have an element of chance so that it allows weaker foundation phase children to feel that they have a winning chance. The

game completion time should be short so that the children easily become familiar with the rules. Teachers should vary the mathematics content rather than the rules. Provide an established game for a child to take home with as homework and request children to create their own board games or variations of other games they may know (Rutherford, Farkas, Duncan, Burchinal, Kibrick, M.,Gaham, Martinez, 2014).

REVIEW OF LITERATURE

Good mathematical games are those whose rules and structure are aimed at understanding the game and winning. Much of mathematics teaching pivots around giving foundation phase children practice in skills gained and enforcing and revising already introduced skills. Games afford a way to take away the toil out of the practice of skills and thus making the game more efficacious. Games can provide more practice than flashcards or workbooks. Foundation phase children do not mind repeating certain facts or procedures over and over when playing a game (Baek, 2008).

Research indicates that games are an effective way to train and reinforce children's skills with fundamental number facts. Playing games demands engagement. Successful mathematics teaching depends on the active involvement and application of the learner. Piaget, Bruner, and Dienes charge that games play a very important part role in learning mathematics. Dienes further suggests that all mathematics teaching should start with game playing (Baek, 2008).

Children need to talk about the mathematics they are learning. Mathematical games required mathematical communication. This can be emboldened by having foundation phase children working in partnerships. There will not only be meaningful conversation between the two partners, but between other children as well. The partners must co-operate in order make the game effective. Thus playing games provides an important life skill and opportunity for children to work co-operatively (Demirbilek & Tamar 2010).

Games encourage foundation phase children to work mentally. The ability to do mental work is a skill that we should spend sufficient time on. When people are presented with a mathematical problem, most would first try to do it in their heads. It takes time for foundation phase children to gain courage to do mathematics in their heads. The teacher should show them a variety of methods to do mathematics mentally in order to build their desire to think more creatively (Baek, 2008).

In a classroom situation, foundation phase children have a few opportunities and little incentive to verify and vindicate their work. Games provide a strong motivation for children to check each other's mathematical abilities and challenging unjustifiable moves. "Possibility" is a mathematics standard not fully addressed but games bring about the chance to do so. Foundation phase children think about "probability" while playing games (Li & Ma 2010).

The most compelling reasons to introduce games into the mathematics classroom is the excitement, fascination and joy that children will experience when playing these games. Foundation phase children are intrinsically motivated and totally involve themselves in the games. In this way, their attitudes towards mathematics are positively impacted. Games provide children with the opportunity to experience joy, success, excitement, opportunity to participate actively, and gain confidence in their abilities (Li & Ma 2010). Games are able to teach or stress many skills that are taught in a formal curriculum. Formal learning sometimes mistakenly leaves out the element of fun in teaching mathematics (Baek, 2008).

THE ROLE OF PARENTS IN MATHEMATICAL GAMES

Mathematics is a subject that is necessary for optimal adequate functioning in society. Therefore mathematics is a subject that should be more enjoyable than it sometimes is. The appreciation and pleasure of mathematics is one of the aims for mathematics education. Thus every parent today is faced with the task to nurture the children's abilities to apply their mathematical knowledge in solving everyday real-life challenges they may face (Rutherford, Long & Farkas 2017).

A parents' attitude toward mathematics has an impact on his/her children's attitudes. Parents who show interest and enthusiasm for mathematics around the home will more likely influence their children in that direction. Parents have an opportunity to communicate the value of mathematics to their children and become more involved in the children's mathematical instruction. Parents can teach their children good study habits, and provide activities through which the families can make mathematics a part of daily activities (Baek, 2008).

It is essential that during the vacations, parents use creative and eventful mathematical learning experiences for their children with games. Playing mathematical games with children is a very effective way that parents can accomplish the responsibility of developing the children's abilities in mathematics, while simultaneously having fun as families and encouraging positive attitudes to mathematics.

Teachers know that several months off on vacation can considerably have a drawback in the mathematical skills of foundation phase children. Consequently children who regularly practice mathematics do not have a problem transitioning back to school. (Demirbilek & Tamar 2010).

THE VALUE OF MATHEMATICAL GAMES ON HOMEWORK

By the end of grade three children in foundation phase, should be able to add and subtract whole numbers and be adept at adding and subtracting fractions and decimals by the end of fifth grade. One of the ways that foundation phase teachers traditionally give children more practice on their mathematics skills is homework. Despite this, eighty-four percent of children would rather do menial work or visit the dentist than do mathematics homework (Li & Ma 2010).

Nowadays, children no longer memorize their addition facts and multiplication tables. Teachers cannot afford to take the time to ensure that foundation phase children learn the basic mathematics facts, as the curriculum is extensive. Parents as partners in the teaching-learning process would offer greater opportunities for their children to succeed in mathematics if they support the learning of rudimentary elements at home. Mathematical games provide an interesting way for parents to take part in their children's education. Parents do not have to be experts in mathematics to be able to play a game or worry about burdening their children. A parent only has to propose a game to his/her child and start to play (Demirbilek & Tamar, 2010).

Mathematical games for families are one of the most effective activities that parents can employ to develop their children's mathematics skills without undue pressure and instruction. Mathematics study involves an element of repetition. This is a vital part of learning new concepts and cultivating automatic recall of facts. Number facts are boring and monotonous to learn and perform. Although a game can take a whopping amount of practice, it does not lead to children

complaining. Playing an interesting game is one of the best ways to master mathematical facts. (Li & Ma 2010).

THE ADVANTAGES OF MATHEMATICAL GAMES

Playing games is a worthwhile endeavour to apply mathematical aptitude and children freely elect to participate therein. Games provide favourable occasions for children to grow in self-confidence and love towards mathematics. Games also reduce the fear of failure in children and increase learning as they are informal, interactive and make it possible for children to test each other and their problem solving skills. (Baek, 2008).

In playing games, children gain language from each other and improve their thinking capacities. Games help introduce new concepts to children, improve understanding of concepts and reinforce previous knowhow (Eastwood, & Sadler, 2013). Teachers can easily assess children in a relaxed atmosphere during a game without the latter even being aware. Mathematical games also provide children with tasks that they can do both at school and at home in collaboration with others and without the teacher's involvement. The rules of the game and the children's motivation usually keep them on the task (Baek, 2008).

Mathematical games are very effective teaching children who do speak the language of instruction because it becomes easier for them to learn concepts through play. Some games have basic structures that are similar in many cultures, and the rules of the games can be easily mastered by observation. Consequently children that may be shy to participate in the game because of language barriers tend to join in. In this way they engage with others and benefit from the mathematical lessons the game imparts (Ketelhut & Schifter, 2011).

TEACHERS' EFFICIENCY ON MATHEMATICAL GAMES

Some teachers find it difficult to complete the curriculum content within the school year. They would thus find it more burdensome to include mathematical games that are not even part thereof. The teachers do not know that by incorporating games into their instruction would be a huge benefit to them and the children. (Demirbilek & Tamar 2010).

The use of mathematical games is a very effective strategy to encourage and increase learner participation. By using games, rote learning and memorization of facts and concepts could be eliminated in the classroom. Lessons would become more engaging and less boring. Studies have illustrated that children at foundation phase acquire learning more readily if they are actively engaged in what they are studying. In juxtaposition to this according to (Rutherford, Long & Farkas 2017), foundation phase children tend to display a negative attitude towards the textbook, show no interest and assume that the math would be too difficult. The advantage of incorporating games into mathematics instruction is that it gives room for the teacher to use various methods. Mathematical games at foundation phase can be also used to help children to acquire content and actively interact with the others and the text (Li & Ma 2010).

RESEARCH METHODOLOGY

In order to explore how mathematical games as tool for mathematics teaching can be used in the foundation phase. A qualitative case study design was conducted (Cilliers-Du Plooy, Davis and

Bezuidenhout 2014). The qualitative approach was most relevant in that it allowed the researcher to understand the practical experience of participants, as well as deduce how meanings are formed from the perspective of cultural differences and how they address the problems of computation (Cilliers-Du Plooy et al 2014). Data were collected using semi-structured interview. In the context of this study, the semi-structured interview was considered appropriate as it allowed the interviewer to rephrase and repeat questions to help participants how mathematical games as tool for mathematics teaching can be used in the foundation phase. Five teachers from different previously disadvantaged schools were interviewed and observed while conducting lessons in class. The semi-structured interviews were conducted with the permission of the participant, the school principal and governing body. These took place during school hours and lasted approximately 30 minutes. The semi-structured interviews were conducted in a face-to-face setting with each individual participant (Creswell 2016).

i) Statement Of The Problem

Mathematics underperformance has become a concern in South Africa. This is evidenced by the report of the former Minister of Education Naledi Pandor. She stated that only 35% of children in South Africa could read, write and count The Star (November 2008:6).

ii) Research Method and design

The investigation in this study was conducted by means of the qualitative method of research. According to Henning (2004:3), a qualitative approach emphasises participant observation and in depth interviews, makes it possible to obtain first hand information. Furthermore, as Creswell (2016) emphasises that the reasons for using the qualitative research method allows participants to explain and to give their views. In the case of this research the method will assist in identifying the source of the problem and how teachers have grappled with it. The research design used in this research study is a case study, Creswell (2016) explores how mathematical games as tool for mathematics teaching in the foundation phase.

The rationale for the choice of the design would allow the researcher to focus closely on the issue at hand. The design would also make it possible to establish how Mathematical games as tool for mathematics teaching in the foundation phase.

iii) Sampling

All the purposively selected participants were interviewed using semi-structured interviews. The participants went through a number of interviews as a way of obtaining in-depth understanding of how mathematical games as tool for mathematics teaching can be used in the foundation phase.

iv) Data Collection

The researcher collected data at the local setting of the school site over a period, in line with (Creswell, 2016). The study's questions were answered using the participants' analysed and interpreted responses. The participants responses were verbatim and were documented in typed

transcripts. The rationale for indenting the responses was to highlight and comprehend the participants' responses. The discussions of the findings are presented following the research questions asked to generate themes from all participants' responses (Machaba 2013). This means that the participants' verbal responses are used to answer the research questions and this strategy was used to highlight their direct responses.

v) *Data Analysis*

Qualitative data analysis is an ongoing process by which a researcher tries to find out how participants are making meaning of a specific phenomenon. The researcher analyses their feelings, attitudes, values, knowledge, understanding, perception and experiences in an endeavour to approximate their construction of the phenomenon (Creswell: 2016)

The researcher analysed the data after every interview. This reduces the volume of raw information, sifting significance from trivia, identifying significant patterns and constructing a framework for communication the essence of what the data reveals as in line with (De Vos 2006). This made it easier, in that, the researcher sifted through the data and collected that which she deemed relevant for the study.

The researcher read the transcribed data and field notes from beginning to end for a number of times in order to get the initial sense of the data. The reason for reading the whole materials to enter vicariously into the lives of participants, feel what they are experiencing and listen to what they are telling us as in line with (Corbin and Strauss 1998).

RESEARCH FINDINGS

Research findings are presented follows: both the findings from the observation and interviews were presented.in their groups.

i) *Finding from the observation*

In my observationin class, the teacher explained the rules of the gameto the children seated in their groups. She did not discuss the rules with each specific specific group. Theafter,the leaners start to play the game in their groups. Some children did not participate. They seemed not to understand the game and how it should be played. I realised that the teacher had not explained explained the rules to individual children or tried to find out whether they all understoodby asking them questions during the explanation.

Since they did not understand the rules of the game, there faild to take active participationin the game for fear to be labelled as unable to play the gameby their peers. They elected to rather remain aloof thanto be ridiculed. Children need to taught the rules,, discuss themand be given a chance to practice the game before throw into the deep end.

ii) *Finding from the interviews*

Teachers were interviewed in order to explore their experience, on mathematical games as tool for mathematics teaching in the foundation phase

An interview guide was used during the interview and interviews were conducted in English. Interviews were focused on the research questions .. The same interview schedule was used for all participants in order to increase the validity and credibility of the findings.

All participant responses were arranged under each question asked. The said responses were typed, edited and indented. The rationale for indenting the said responses was that it would be an indication that this is a summary of the general responses of all the participants. The discussions are arranged per question (all participants responded to each question) the rationale for this arrangement was to retain direct verbal responses of the participants to the questions in order to not lose their original meaning, validity and credibility.

Various themes emerged from the data drawn from the said responses. The researcher summarised the common themes from the participants' responses; this formed the findings. In the findings, the researcher also indicated the themes that did not appear often. The researcher categorized the data into patterns and themes, the patterns and themes are from the interview questions.

CONCLUSION

Considered overall ,the objectives and findings of this article clearly suggested that the teacher should ensure that she explains how the game will be played before she let the learner to play and practices with them. As reported in this article, most provinces have developed an intervention system. However , these should be monitored, evaluated and, if necessary refined. Futhermore, the advantages of the teaching of mathematics using games as mathematical games assist children to practise mental calculations and addresses mathematical language barriers and also mathematical games provides opportunities that will make a real and lasting difference in learner's lives. Also the teacher should make an undertaking to use games in mathematics instruction to enhance the foundation phase.

ACKNOWLEDGEMENT

Special thanks to the Unisa research directorate for organising the research workshops which was of great help particularly for the novice researchers.

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