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GAMES, CAN THEY BE USED IN TEACHING MATHEMATICS? THE CASE OF KAJIADO COUNTY KENYA

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ABSTRACT

Studies have proposed that children learn through social interaction and actively exploring concepts with their peers, and that mathematics games are valuable for stimulating and encouraging mathematics learning. However, little studies have been carried to ascertain this claim. The purpose of this study was to establish the use of games as a medium of teaching mathematics in pre-schools in Kajiado County. The specific objective of the study was to establish the mathematical games used in teaching mathematics in pre-schools. This study employed a descriptive survey design. Stratified sampling technique was used to ensure proper representation of the whole region. Standardized formula was used to arrive at a sample size of 29 pre-school teachers. Data was analyzed using descriptive statistics such as frequency, percentages. The results are present in tables. The findings indicated that majority of the teachers had knowledge on the use of games in teaching mathematics in pre-schools. Games used included snake and ladders, Big Ten, cross-number puzzles and mathematic bingo. The study concluded that games play a large part in the early development of children, certainly in the more developed countries of the world.

Key words: Games, teaching, teachers, mathematics, pre-school, use of games

1. INTRODUCTION

Barta and Schaelling, (1998) state that games have been for years always part of human life throughout time immemorial. Several anthropologists and scholars have for many years done a lot of research in relation to games that were played in ancient days putting into consideration the period, location and the environment which accompanied the different games. Bright, Harvey and Wheeler (1985: 1) argued that “games have evolved along with civilization and it seems that games survive and are played because people enjoy playing them”. Games can bring people together in a communal atmosphere, and it has been suggested that the tradition and ritual of games offer opportunities to link learning with cultural and historical understandings. According to Erdogan and Baran (2006) among the many goals of pre-school education, raising children who are fast thinkers and beginners is one of the major aims of pre-school education. Early childhood education also enables learners to be sensitive to themselves and to their environment, whose communication skills are developed and who can think in a scientific manner. The use of games in teaching mathematics courses can be stressed back in the beginning of the twentieth century. When teaching mathematics, the incorporation of various games creates a desire in learners for learning the subject and makes it easy for children to gain interest in learning mathematics, and take it as fun by using mathematical concepts in solving problems in the community. According to Aral, Gursoy and Yasar (2012) when children are attending their school and get involved in various games, this gives them a chance to easily understand some of the mathematical concepts learned in class and through simulations done by their teachers. During mathematics simulation classes, the teacher may create real life scenarios in which the children can experience real life occurrences. However, some of these real life situations can be imagined ensuring that the impact of education is evidenced for a longer time and in many generations. Imagining realized by seeing, hearing, tasting or smelling something that does not really exist requires mental processes, which improves the intellectual capacity of the child. Thus, many subjects become realistic and more life-related. Aral (2009) further state that most of these concepts and skills in all mathematical subjects and other science subjects learned in early childhood education that may share the same content in terms of basic concepts and procedures can be learnt with ease and better understanding by simulating real life situations. For example, creating a shopping environment for children and counting vegetables and fruits in this medium are suitable mathematical settings for children. Mathematics teaching that is accompanied by other activities such as games and simulations usually changes the basic mathematical procedures acquired by the learners. Therefore, it is the responsibility of family members together with educators to provide a conducive learning environment for all children to enhance mathematics teaching (Peterson, 2004). A study by Kabita, Marea and Grace (2013) in Botswana revealed that majority of teachers engaged in various activities to hone children’s mathematical and science skills. Kabita et al (2013) further revealed that majority of teachers did mathematic activities like number concepts, exploring numbers, counting numbers orally, writing numbers, sorting, classifying, sequencing, matching, identifying, ordering, addition, subtraction, sets, measuring, among others. This also shows that the teachers generally limited young

children's' ability in geometry and spatial relations, algebraic thinking and data analysis which is paramount in young children. The advantages of using games in mathematical concepts were compiled in an article done by Davies (1995) who researched on the literature that was available at the time. Most of the games are similar across many cultures in terms of the basic structures and the skills and procedures of the most common games and can be easily learned by means of observation. Children who are reluctant to participate in other mathematical activities because of language barriers will often join in a game, and so gain access to the mathematical learning as well as engage in structured social interaction (Davies, 1995). However, during the use of these games when teaching mathematics concepts, pre-school teachers are required to be able to distinguish between an 'activity' and a 'game' as applied in different events. Games have been reviewed as per the following mathematical skills taught.

i. Addition and Counting

a. Hopscotch

The game is played by having one player standing on one foot at the centre of a square with different numbered squares (Jonker & Van-Galen, 2004). Starting with the center number, the player hops in any direction. If the center number is 2 for example and the player hops into the square numbered 4 then he/she must give the answer 6 as the sum of 2 and 4. If he/she has given the correct answer he/she will go back at the center to start again and hops to a different number and the game continues. If the player did not get the correct answer another player will go to the center to start the game. If the game is played as a team game, the group that has the most points is the winner. Different numbers can be used in the centre to give practice to all the basic addition facts (Lowe, 2000).

b. Auntie Lulu

Skipping rope is used among girls of six to nine years.Two children turn the rope while one child skips/jumpsover the rope.Those turning the rope will say '1, 2, 3 Auntie Lulu.'On the count of '3' the child who has skipped 3 timesmust stoop, while those turning, swing the rope aboveher head saying 'Auntie Lulu', before resuming to count'4, 5, 6' to which the child has to skip 3 times again. Ifshe does not keep the rhythm by jumping back into therope, immediately after 'Auntie Lulu' is said or if she istouched by the rope, she is 'out': If the child skippingkeeps the rhythm, she remains in the game. The counting continues '4, 5, 6 Auntie Lulu,''7, 8, 9 Auntie Lulu', at which point, counting continues'10 Auntie Lulu,' '11 Auntie Lulu', '12 Auntie Lulu,''13 Auntie Lulu', speeding up the game.Then the children start the count again and thechild skipping remains until she is 'out'.This game strengthens counting and concentration, develops coordination and makes players to cooperate in activities.

c. Spinning Game

During the spinning game, a stick and a stiff piece of paper or board are used and the player pushes the stick through the center of the board and then spins it like at the top (Lowe, 2000). The player scores the number shown on the edge where the card stops. He/she then spins the card again and adds the first score to the second one. The second player does the same. The player with the highest score wins. The purpose of the spinning game is to practice addition.

d. Cinderella

Two children turn the rope, while one child skips. Those turning the rope will be saying 'Cinderella, Cinderella dressed in her kanga went down town to meet her Mama. How many kisses did she get? 1, 2, 3, 4, 5, etc. The counting and skipping continue until the rope touches the foot of the skipper and the rhythm is lost. Then another 'Cinderella' starts skipping. The game enhances counting and concentration among children. Sindalia Kumaganda Children form groups of three or more. Two children stand at points that fit the length of the rope. The third child goes to the centre. The two start turning the rope in a circular manner as the child in the centre skips. She does so while singing and counting. If they count up to 10, she wins the game; but if she fails to skip or steps on the rope, she loses. The game is played in turns.

I didn't eat the beans (x 2)
I am skipping once (x 2)
I didn't eat the beans
I am skipping the second time
I didn't eat the beans
Mother you have cheated on me

This game creates counting rhythms which in daily life have the advantage of security, keeping one on the right track. However taken too far, a “rhythm” could mould the child to function only in set situations, and not to be ready to deal with the “out of rhythm” situations.

e. Hide and seek

One child is required to count to either 50 or 100 while the others go and hide. At the end of the count, the child who was counting goes to find one of the hidden children. The child found first now has to do the counting while the others hide. Note that the counting can be done from 1 to 50, increasing by one each time as is normal, or count in multiples of 2 i.e. 2, 4, 6... 50. Other multiples of counting using 3s up to 5s may be used as agreed at the beginning of the game. This game helps the children develop counting and knowledge of multiples of chosen numbers, anticipation, creative thinking, getting clues from the environment, and using these to help locate the object.

f. Skittle Game

Ten skittles are arranged in a row or a pattern and the participants are required to knock the skittles down from a distance using a soft ball (Lowe, 2000). The players take turns at throwing the ball to knock a number of skittles. Each learner counts the number of skittles knocked down and the number that are left standing. A minimum of 2 players and a maximum of 12 players are suitable for the game. One player is chosen to be the leader (Lowe, 2000). The leader will have his/her face covered so that he/she does not see the directions taken by the rest of the players. He/she counts up to a certain number for example seven. While the leader is counting the other players must run and hide. They must hide before he/she finishes counting up to the agreed number. Immediately the leader stops counting he/she will go round looking for the hiding players until he/she finds them all. The last player to be found becomes the leader for the next game. The leader must count loudly enough for all the players to hear well. The purpose of the game is to drill in counting (Fletcher & Tobias, 2006).

g. Shiswecheli

A piece of broken pottery, a ten-cent coin or a shapely stone. A pattern drawn on the ground and played by one to four children, mainly girls outdoors. The first child/player throws a piece of pottery, or ten cent coin or stone, into the first segment of the pattern. She jumps on one leg over this compartment into the second compartment as she plays. She then jumps into all the other compartments until the last one. At the 4thand 5th compartments, she stands astride with one foot in the 4th compartment and the other in the 5th.The same is repeated at compartments 8 and 9 before she proceeds. At compartment 10, she turns back the same way she came until she reaches the compartment before the piece of pottery, she bends, picks it up, and jumps over this compartment to the outside with the piece. She then throws the piece into the second compartment, and continues the game, jumping over the compartment with the piece to the last compartment, and turns back the same way she came, to the outside. This is repeated with the piece being thrown into each successive compartment until the last one has been covered. At this juncture she steps into compartment 10, with both feet still facing the front, and throws the piece over her head without looking back. If the piece falls well into one of the compartments, it becomes her territory. If at one point the child aims at a compartment and misses, she loses, and another child takes over the game. A minimum of 2 players and a maximum of 12 players are suitable for the game. One player is chosen to be the leader (Lowe, 2000). The leader will have his/her face covered so that he/she does not see the directions taken by the rest of the players. He/she counts up to a certain number for example seven. While the leader is counting the other players must run and hide. They must hide before he/she finishes counting up to the agreed number. Immediately the leader stops counting he/she will go round looking for the hiding players until he/she finds them all. The last player to be found becomes the leader for the next game. The leader must count loudly enough for all the players to hear well. The purpose of the game is to drill in counting (Fletcher & Tobias, 2006). In a different activity, hiding game entails counting of numbers by a leader of a group of more than five participants (McDaniel & Telep, 2009) and when he/she counts one up to 10 the rest hide in a place. The first player to be found will assist in finding others who are hiding while counting starting from the number the first leader stopped. This is purposefully conducted to master counting and sequence in numbering.

h. Big Ten

Big ten is a counting and addition game and is suitable for pre-primary level of ages between 3-5 years children (Lowe, 2000). It helps to develop such educational concept and skill as reinforcement of addition of numbers up to ten and logical thinking. This game also assists with learning to count up to ten and also assists with memory development since the children soon learn where numbers are located to make up to ten, particularly after the numbers have been uncovered and re-covered a number of times during the game (Kirriemuir & McFarlane, 2004). Cross-number puzzles are suitable for a variety of ages ranging 7 years and over. The puzzles are similar to

crossword puzzles except that the questions and answers are mathematical in nature. Each puzzle is keyed to a clearly defined objective.

i. Guessing Game

Different cards with numbers 1-10 are arranged following a sequence such as 3, 4, 5, 6, 7, and 8 on the number line (Lowe, 2000). All the learners except one must close their eyes. This player will take away one number from the sequence and hide it. The others guess which has been taken away. The player who guesses correctly first, will become the leader to hide the card number. The purpose of guessing game is to practice the position of numbers for example up 10 or beyond. In another way, guessing game involves labeling papers or cards from numbers starting from one up to 30. During the game, two cards share one number. The players participate in turns whereby one has to tap on a twin card. This is meant to enhance mastery skills of participants with respect to counting (Bose & Seetso, 2016).

j. Kikumbusho

Kijonjo is played using a piece of broken pot (Ikijonjo). Children draw a rectangular – like shape (like in Shiswecheli) on the ground, and divide it into ten parts. When this is done, the children take the Ikijonjo and divide it into further parts. One child starts playing while the rest watch. The player tosses the Kijonjo into the nearest square and starts hopping into the squares, while taking care to hop over the square that has the Kijonjo. If the player hops into, or accidentally steps into the square that has the Ikijonjo, she/he loses the game. The next child starts playing. When the Kijonjo has been thrown into all squares, children who are successful stand at the far end of the drawn figure, and throw the Kijonjo into the designated areas of squares, while facing in the opposite direction. The child who is able to throw the Kijonjo into the correct place wins that square and it becomes his/her 'House'. The rest of the children should take care not to step in that square as their turn to play comes. If a child fails to hop over, he loses the game and falls out.

ii. Recognition of shapes

a. Jigzaw Puzzles

These can be bought in the market. They consist of pictures broken up into small pieces with irregular shapes. While glancing at the overall picture which is on the box containing the Jigsaw, the pieces are to be fitted together to obtain the picture as seen. Invariably new players do not know how to start as they have no strategy. It is recommended that the pieces for the ends or corners are identified with a view to working inwards. Teaches players to recognize shapes and to think logically. It helps them to recognize that the problem is more easily solved if they have a planned strategy. Students frequently meet unfamiliar problems, and are unable to develop a strategy for their solution. Jigsaw puzzles develop techniques for a strategic approach to problem solving and learning to work together to achieve a common goal. Children are able to make their own Jigsaw puzzle to encourage creativity and design techniques.

b. Ikiato

Played using sheet of paper with a rectangular figure where three stones and three bottle stoppers or six bottle stoppers (each player uses three – one turns them up, the other down).
Children draw a four-sided figure (a rectangular figure). It is then divided into four equal parts with lines that cross at the centre, then divided further by two lines that cross at the centre and end in the corners. The final figure has nine points. Each player places his/her stones or bottle stopper alternately on vacant points on the figure in an effort to get them in a straight line, or to prevent the opponent from so doing. The child who first gets his stoppers or stones in a straight line wins. Stoppers/stones may be moved around the board, on the straight line adjoining, to a vacant position. No jumping over opponent's stoppers/stones is allowed. Appreciation of straight lines, centre of a line, a point through which several lines pass, and develops a strategic approach to problem solving. This game teaches drawing and counting skills. Depending on the age group the children can design the playing board using their mathematical set. Young children can colour the shapes that they find. In later years, the implications of the diagram for mathematics learning.

c. Trees and River

Requires a die (dice) for throwing, or strips of paper numbered 1 to 6. These strips of paper are concealed before drawing. A uniquely identifiable pawn for each player. The die is thrown by each player, or each player selects a strip

of paper, and the player with the highest number plays first. Each player moves his pawn in accordance with the number thrown. If the number ends at the foot of a tree, the player moves to the top of the tree; if the number ends at the top of the river, then the player goes down to the end of the river (river mouth). The first person to reach the end of the board, which is at the top right hand corner, wins. The pineapple offers a bonus point of 10.

d. Jacks

Players are seated in a circle indoors or outdoors**.** At the outset the number of games being played is decided. The first player holds the jacks in his or her palm, and throws them up in the air, with the objective of catching all six or ten on the back of the hand (backanie).The number of jacks which fall off have to be taken up one at a time, until all six or ten are in hand. This is done by throwing up the ball, picking up the jack, then catching the ball after the first bounce. Then the jacks are thrown/spread out cautiously, and it is time to take them up in twos (without touching adjoining jacks and catching the ball as before, after the first bounce). This process continues until 3s 4s etc., right to 6 or 10 are taken up. This constitutes another way of completing a game. Remember, if you touch any that are not being taken up, or the ball runs away, then you defer to your partner who goes through the same process. The first person to reach the number of games agreed is the winner. This game develops ability to count, concentrate and recognize batches/sets.

e. Tsikoora

Played when children sit in a small circle and one of the children starts the game by placing five small stones on the ground. She picks one of the stones, tosses it into the air. Before it comes down she skillfully picks one of the remaining four stones, and then gets hold of the one in the air into the same palm. She puts one of the two stones aside, and again tosses the remaining one into the air, picks one stone from the ground and catches the one in the air. She repeats the processes, picking the stones up one by one until they are over. She gathers them and repeats the game by throwing one stone in the air, and picking them up, two by two, then three by three, until she picks up all four at once. Finally, she will put all the five stones in her palm, and toss them into the air, but not too high, and attempts to catch them using the outer part of the palm. Whatever number she manages to get hold of adds up to her points.

iii. Concept of arithmetic progression and matching skills

a. Musical Chairs

Children stand behind the chair and start the music and children move around the chairs. By stopping the music, and any one not sitting on a chair is out. The child sitting when the music stops is the winner. Concept of arithmetic progression and subtraction are enhanced through this game. The main intention of tossing game is to practice counting numbers for example 1-5 (Fletcher & Tobias, 2006). The game is played with a tin and five stones. The tin is placed about two meters from the player. The player will try to toss the stones into the tin one by one. When all the stones are tossed, the numbers of stones that have landed inside the tin are counted and the player with the highest number of stones inside the tin is the winner (Bose & Seetso, 2016).

b. Matching

The game is played with different shapes drawn on chalkboard which are filled with several patterns and numerals (Lowe, 2000). Working in groups, one member of the group is asked to match a number pattern to a numeral. This can be made into a team game. Each team gets a point for a correct answer. The team which will have the highest points becomes the winner. The purpose of the matching game is to practice matching numerals with their groups.

iv. **Identification** of numbers

a. Number Bingo

The game requires number cards and bottle tops (Lowe, 2000). The caller will have her card and other similar number cards for the players. Different numerals are written on each card. The cards are placed facing downwards on the table. The caller will take any number and call out the number shown on it. If another player has that number, on his card he /she will use a bottle top to cover it. The first player to cover all the numbers on his /her cards will shout 'Bingo'! He/she is the winner and becomes the caller for the next game. The purpose of this game is to practice recognizing numerals (Harris, Mishra & Koehler, 2009).

b. Hopping game

During the hopping game, a large square is drawn on the ground and divided into nine smaller squares. In each square, a numeral is written on it (Lowe, 2000). Two groups stand on opposite sides of the square. One of the players in team 'A' will stand in the middle square. Then one of the players from team 'B' calls out a number. The player in the middle of the square will hop on to the square which contains the numeral. If he/she gets it right his/her team wins a point, if he/she makes a mistake the other team wins a point. The teams take turns. The purpose of the hopping game is to practice recognizing numerals (Harris et al., 2009).

v. Listening and Concentration Skills

a. Stagger Lee

A leader (Stagger Lee) is chosen and the rest of the children numbered off. Hence if five children remain, they are numbered from 1 to 5.
Stagger Lee: (Starts the rhythm by clapping his/her hands, then thighs, back to a hand clap which the other children pick up and keep going together.) Zim Zim Zee, I'm Stagger Lee, who stole the cookie from the cookie jar? Number 1 stole the cookie from the cookie jar.
Number 1: Who me?
Stagger Lee: Yes, you.
Number 1: Couldn't be.
Stagger Lee: Then who is it?
Number 1: Number 3 stole the cookie from the cookie jar.
Number 3: Who me?
Number 1: Yes, you.
Number 3: Couldn't be.
Number 1: Then who is it?
Number 3: (Continues the dialogue by choosing any number at random, or even Stagger Lee.)
Any child who loses the rhythm by not picking up his or her cue when his or her number is called, or changes the procedure as outlined above, is out. This continues until one child remains and becomes the winner. Stagger Lee chose 1 and number 1 chose 3 – any number could have been chosen by these players at random.

b. Remembrance

A deck of cards is dealt placing the cards in rows face down on the table. The player on the left of the dealer has a chance to turn over two cards. If the cards match in numbers, then the player retains the match, and is allowed to play again. If they do not match, the player returns them to the position they previously occupied, and the next player plays.
Each player should make a mental note of the cards replaced, in order to assist them in selecting matches for them. The player with the most matches when all the cards are removed from the table wins the game.

c. Who is wanted?

The game may need about twenty players. A player is sent out to be the "knocker". All the remaining members are each given a different number. Then the leaner that has been sent out knocks at the door a number of times for example six times. The member of the group whose number is 6 will say "I am six". Then it is his/her turn to go outside and become the knocker (Fletcher & Tobias, 2006).

2. METHODOLOGY

Descriptive survey research design was used in this study. Descriptive survey design was appropriate for this study because it enabled the research to directly collect data on use of games in teaching mathematical concepts as they happen and without manipulation. Through descriptive survey design, the researcher was able to describe pre-school teachers' opinions, frequency and attitudes on the use of games in teaching mathematical concepts in selected pre-schools in Kajiado County, Kenya. Kerlinger (1969) points out that descriptive studies are not only restricted to fact finding, but may often result in formation of important principles of knowledge and solutions to problems. Descriptive research design also helps to collect information on people's attitudes, opinions and habits hence was used to establish the extent to which pre-school teachers use games as a medium for teaching

mathematical concepts. The variables of the proposed study were; dependent variable of the study was the status of teaching mathematics based on games and the independent variables included the different games used by the preschool teachers, Games used in teaching mathematical concepts:-this was measured by assessing the types of games used by preschool teachers in teaching maths

a. Location of the Study

The study was conducted in Kajiado County. The purposive sampling was used. Kajiado County is about 90km south west of Nairobi along Nairobi – Namanga road. Kajiado County borders Narok County to the West, Nakuru, Kiambu and Nairobi Counties to the north, Machakos, Makueni and Taita-Taveta Counties to the east and Tanzania to the south. It has a population of 406,054 and an area of 21,903 km². The main ethnic community of Kajiado County is the Maasai who are renowned for their strong cultural heritage and exquisite jewelry. There is an increased influx of other people from various regions of the county who flock the area and boost the millions acquired from tourism sector of the County.

b. Target Population

The target population of this study was teachers in all public pre-schools that had been in existence for the previous one year within Kajiado. There are approximately 5,000 pre-school teachers in Kajiado County. However, this study targeted 290 pre-school teachers specifically in Kajiado Central Sub-County.

c. Sampling Techniques

Kajiado Central Sub-County is sub-divided into three zones (Enkorika, Elangata, and Kajiado Zones). Therefore the three zones formed the strata of the study. Subsequently, stratified sampling technique was used to proportionally select 13 pre-school teachers from Enkorik Zone, 9 pre-school teachers from Elangata Zone, and 7 pre-school teachers from Kajiado Zone leading to a total sample of 29 pre-school teachers.

Sample Size

Formula by Kothari (2004):

$$n = \frac{t^2 \times p(1-p)}{m^2}$$

Where: n = required sample size.
t = standard normal deviation at the required confidence level.
p = proportion in the target population estimated to have the characteristics being measured.
m = the level of statistical significance set (margin of error).

The sample size was estimated within 95% confidence interval (t=1.96) and a significance level of 0.05 as follows;

$n = (1.96)^2 . (0.019) . (0.981) / (0.05)^2 = 29$ (approximate)

For this research a total sample size of 29 was adequate. Stratified sampling was used to proportionately select a total of 29 pre-school teachers in three zones (Enkorika, Elangata and Kajiazo Zones). This represents 10% of the total pre-school teachers in the Sub-County. This is in accordance with Best and Kahn (2006) who argue that at least 10% sample size is ideal for a bigger population and 30% for a smaller population. Table 1, presents population and sample size of pre-school teachers.

Table 1: Population and Sample Size

Zone	Population of Teachers	Sample size	Percentage
Enkorika zone	130	13	10%
Elangata zone	90	9	10%
Kajiado Central zone	70	7	10%

Total	**290**	**29**	**10%**

3. FINDINGS

I. Games and mathematic activities used in teaching mathematics in pre-schools in kajiado

The study sought to establish the games used in teaching mathematics in pre-schools in Kajiado, to achieve this objective, teachers in pre-schools were asked to state the games they used in teaching Mathematics. All teachers who participated in the study confirmed that they had knowledge on the use of games in teaching mathematics in pre-schools. Table 2, shows the various games used when teaching mathematic concepts in pre-schools.

Table 2: Games Used by Teachers in Enhancing Learning Mathematics

Responses	Frequency	Percentage
Snakes and ladders	26	89.7
Big ten	24	82.8
Cross-number puzzles	21	72.4
Mathematics Bingo	17	58.6
Hiding game	11	37.9
Guessing game	8	27.6
Matching game	6	20.7
Catching ball	9	31.0
No response	4	13.7

N=29

Findings in Table 2, shows that 26(89.7%) of teachers used snakes and ladders as the major teaching game-based method. Findings further indicated that Big Ten game was used by 24(82.8%), cross-number puzzles by 21(72.4%), mathematic bingo by 17(58.6%), hiding game by 11(37.9%), guessing game by 8(27.6%), matching game by 6(20.7%) and catching ball game by 9(31.0%). Conversely, 4(13.8%). of the teachers did not respond implying that neither knew nor used games for facilitating teaching mathematics in pre-schools..

The study findings harmonize with those of Erdogan and Baran (2006) which noted that mathematics Bingo games are suitable for primary grades for ages 6 years and above and the number of players is 9 or more. Although this game is for mathematics the same would apply for any topic or subject. Through the use of bingo cards, the child should be able to answer specific questions about a subject or topic, follow specific rules in playing the game, and show honesty and sportsmanship in playing the game. This game is used as a revision game either at the end of a teaching block or at the start of a new topic.

The use of various games by the teachers of the pre-schools under the study signified the enhancement of mathematic skills. These were based on affective behaviors among children which include interest, curiosity, experimenting and appreciation. These findings implied that even though various games were employed in teaching mathematics concepts, most teachers did not adequately explore other significant games such as tossing, finding partners, catching the ball, hopscotch, spinning, matching, hoping, skittle, and hiding games which were comparatively easier to plan.

Catching ball as a game was rarely used by pre-school teachers in the current study. Brown, Butler & Ndahi (2004) in a study on social and environmental factors associated with pre-schoolers' non-sedentary activities also revealed that majority of the respondents used balls during lessons; this disagrees with the findings of the current study.

II. Reasons for Using Games to Enhance Teaching Mathematics in Pre-Schools

Teachers were further asked to state how they perceived the use of games in teaching mathematics. Table 3, illustrates the frequency and percentages of pre-school teachers' opinions regarding the use of mathematical games in teaching mathematical concepts.

Table 3: Teachers' Perceptions on Use of Games to Teach Mathematics

Activity	F/%	Agree	Neutral	Disagree	Strongly Disagree
I have fully embraced the use of mathematical teaching activities in this school.	F %	15 51.7	12 41.4	2 6.9	--
Through the use of games, I have given children chances to learn many mathematical concepts.	F %	9 31.0	14 48.3	4 13.8	2 6.9
I have enhanced children's performance in mathematics through the use of games in teaching mathematics in pre-school	F %	8 27.6	13 44.8	5 17.2	3 10.4
My use of games has enhanced mastery of concepts in mathematics among learners.	F %	8 27.6	10 34.5	9 31.0	2 6.9
I have stimulated creative thinking and problem solving abilities in children through the use of games in teaching Mathematics	F %	15 51.7	11 37.9	2 6.9	1 3.5

N=29

Findings in Table 3, revealed that majority 15(51.7%) of the teachers in pre-schools agreed that they had fully embraced games in mathematical teaching activities in their schools. Correspondingly, 15(51.7%) agreed that they had stimulated creative thinking and problem solving abilities in children through the use of games in teaching mathematics. Likewise, 9(31%) of the respondents explained that they had given children chances to learn many mathematics concepts through the use of games.

The findings in Table 3 also indicated that many teacher respondents indicated neutrality to most of the items. This implies that some teachers did not utilize games to teach mathematics even though they were conversant with the game-based activities that could enhance counting skills and learning of mathematics in the pre-schools, enrich the educational environment, help structure the knowledge more easily and contribute to the reinforcement of knowledge gained in mathematics. Moreover, the pre-school teachers who participated in the study expressed positive opinions about having game-based activities in teaching mathematics though was not adequately implemented.

These findings are similar to those of Erdogan and Baran (2006) who pointed out that when teaching mathematics, the incorporation of various games creates a desire in learners for learning the subject and makes it easy for children to gain interest in learning mathematics, and take it as fun by using mathematical concepts in solving problems in the community. In support to this notion Aral, (2009) noted that during mathematics simulation classes, the teacher may create real life scenarios in which the children can experience real life occurrences and hence gives the children a chance to easily understand some of the mathematical concepts learned in class and through simulations done by their teachers.

4. CONCLUSIONS

This study sought to establish the games used in teaching mathematical concepts in pre-schools in Kajiado Sub-County. The findings indicated that all (100%) teachers who participated in the study confirmed that they had knowledge on the use of games in teaching mathematical concepts in pre-schools. Big Ten was the majorly used game in teaching Mathematical concepts by teachers in pre-primary schools.

Most teachers do not utilize games to teach mathematics even though they know that games enhance counting skills and learning of mathematics in the pre-schools. Some game-based methods do not work better because due to poor selection, preparation and planning of the game-based activity. Teaching objectives in mathematics can only be achieved through selection of the right games to achieve a specified objective. It was evident that none of the pre-

schools had computers which could help implement the use of digital games which would otherwise complement the local games.

5. RECOMMENDATION OF THIS STUDY

Teachers should be active and creative in the use of games. When teaching mathematical concepts. This is based on the notion that the use of games as teaching strategy assists to simplify instruction, revision, summarizes concepts, capture children's attention and help to enhance retention of concepts learned.

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