INFLUENCE OF LEARNER CLASSROOM ACTIVITIES ON MATHEMATICS COMPETENCY AMONG PRESCHOOL CHILDREN IN LOWER YATTA SUB COUNTY, KENYA

By

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A Research Project Submitted in Partial Fulfillment of the Requirements for the award of the Degree of Master of Education in Early Childhood Education to the Department of Educational Communication and Technology, University of Nairobi.

AUGUST, 2015

DECLARATION

This research project is my original work and has not been presented for any academic award at any other University

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BENARD MUTUKU KIOKO

This research project has been submitted for examination by my authority as the University Supervisor

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DEDICATION

I dedicate this research work to the Almighty God for the gift of life and strength during the time of writing this research project. Secondly, I dedicate this work to my late Dad, Kioko Maseka and my mum Beatrice Kioko for bringing me up and implementing into to me the virtue of hard work at a very tender age. This has inspired me to aim higher always. This research work is also dedicated to my wife Mrs. Emmah and my children Charity, Gladys and Mark for it is because of their support that has made me that far.

ACKNOWLEDGEMENT

I wish to thank God for His unconditional love for me and for seeing me through my research project. I thank all those who assisted me in making this research project a reality and especially my supervisor Dr. Boniface Ngaruiya for his inspiration, encouragement and his guidance from beginning of this study to the end.Great appreciation should be felt by all the respondents, that is, preschool teachers and preschool children in Lower Yatta Sub County; where the study was undertaken for their genuine cooperation during data collection.

Deep appreciation is also expressed to Mr. Fred Momanyi, for his computer SPSS data analysis and Mr. Mathew Nzuki for his excellent typesetting and formatting of the research work. My very deep and heartfelt appreciation is expressed to my children Charity, Gladys and Mark for their understanding throughout this study and my wife Emmah for taking responsibility of the children in my habitual absence.

ABSTRACT

The study was designed to find out whether learner classroom activities have influence on developing mathematics competencies among the preschool children. This study is significant to learners because child classroom activities create an environment that is mathematically empowering and mediating the children's experiences in the environment. This was done through the following three specific objectives; to observe classroom activities used towards developing mathematics competency, to investigate relationship between type of activity and children's competency in mathematics, determine relationship between the duration of classroom activity and mathematics competency and to investigate the teachers' perceptions on usefulness of learner activities towards mathematics competency. The study used two research instruments namely questionnaires and observation schedule. The questionnaire was used to collect data from children and preschool teachers. The observation schedule was used to get data regarding timing of lessons. A sample was used to represent the whole Lower Yatta District and data collected was coded and keyed in SPSS package version 20 for statistical analysis. The established that classroom activities had an influence on mathematics competence of preschool children'. The study also found that there was relationship between classroom activities and competency in mathematics. The duration of activities also did affect the children' competence in mathematics. Teachers perceived mathematics as a logical and constructivist understanding.

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ACRONYMS AND ABBREVIATIONS

ECE:	Early Childhood Education
EV:	Extraneous Variable
IV:	Independent Variable
DV:	Dependent Variable
ECDE:	Early Childhood Development and Education
B.ED:	Bachelor of Education

CHAPTER ONE

1.1 Background to the Study

Early mathematics education research has uncovered that, children bring more mathematics knowledge and experience to school than previously believed (Ginsburg, 2003). Preschool children were observed frequently engaging in a range of mathematics, including pattern and shape, magnitude, enumeration, spatial relations, classification and dynamic change.

For significant learning, we need to revisit ideas, ponder them, try them out, play with them and use them (Hein, 1991). If you reflect on anything you have learned, you soon realize that it is the product of repeated exposure and thought. Learning is a constructive process in which the learner is building an internal illustration of knowledge, a personal interpretation of experience (Bednar, 1995). This representation is continually open to modification, its structure and linkages forming the ground to which other knowledge structures are attached. Children's learning is active, self-regulating and constructive in problem situations and is related to existing knowledge as they act upon their environment (Scardamalia, 1996). Teachers of young children must be aware of children's cognitive development and how they teach (Piaget, 1983) described the development as a sequence of learning that goes beyond simple rote learning. At pre-operational stage (2-7 years) of piaget's stages of cognitive development, a one-to-one correspondence is developed. The child is able to learn how to count, add and subtract. The basic skill required is matching, beginning with similar objects and advancing to the matching of different objects and sets of objects. Seriating skills begin with simple ordering of objects by size, texture, taste or colour.

Ideally, manipulative serve as learning tools to help children build their understanding and explain their thinking to others. Ministry of education in Ontario, 2003 knowledgeable educators begin planning by carefully observing children at play or engaged in other activities in order to identify their everyday mathematics. Next, they accurately interpret the mathematics understanding the behaviors' and how it fits into the key mathematical concepts and curricula (Ginsburg, 2008). Once identified, educators can create activities which allow assimilation of new concepts into the children's prior knowledge.

One of the best ways to foster early mathematical concepts and skills in young children is to make pre numbers, numbers and measurement concepts fun and relate them to everyday experiences (Mwangi, 2009). Unfortunately, most instruction that children receive does little to promote mathematics competencies, beyond rote counting and numerical recognition. Children in Lower Yatta Sub County receive direct instruction from the teacher who does most of the talking while children passively listen instead of being constructors of their own knowledge. The general poor mathematics competencies are due to poor instructional methods used by the teachers. The teacher takes control and dominates by taking an active role in the actual instructional process. The learners have very little influence over the choice of exposure.

There are expected abilities of a child of a given age to perform a given task or set of tasks (GoK/MoE Kenya School Readiness Assessment Tool, 2009). Although the development of the competencies is related to the processes of maturation, it is greatly enhanced by exposure to relevant learning experience and a stimulating environment as clearly stipulated in the ECDE syllabus by KIE, 2008. The competencies are expressed in

various ways which can be observed and rated. Mathematics competencies which start at an early age are the acquisition and development of number classification and measurement concepts and skills (GoK/MoE Kenya School Readiness Assessment Tool, 2009).

This approach tends to suffocate learning (Gichuba, 2009). An active participation of learners is ignored and learner's individual needs are not given attention. The teacher dictates the choice of the content, the methodology, activities to be carried out and the learning resources without involvement of the learner. In the previous years, Lower Yatta Sub County has been registering a consistent deteriorating in mathematics competence in its preschools every year. When compared to other activity areas such as language competencies, physical/outdoor competencies and creative art competencies, mathematics competency has been very poor. This has been a cause of worry and a source of anxiety on the part of parents who have been seeing their children as a window of their future hope. The poor results have raised concerns to very many stakeholders in the sub county. That is why the researcher was prompted to carry out a study to find out whether learner classroom activities have influence on mathematics competency among preschool children.

In addition, gaps in mathematical knowledge between some children and other can be narrowed considerably by educational interventions. Children who experience high quality early childhood education have a better chance of achieving to higher levels than those who do not. The researcher therefore established whether learner classroom activities influence development of mathematics competencies.

1.2 Statement of the Problem

When children first come to school, they bring inquisitiveness, energy, active range of social, intellectual and emotional experiences and an abundance of mathematical knowledge gleaned from their everyday experiences (Lipton & Speike, 2003). In child classroom activities, teachers support learning by providing activities and materials that find engaging by facilitating learning, supplying a developmentally appropriate environment and interesting materials and adequate time to explore play and interact. The national ECD curriculum contains sufficient information for correct pedagogy (The ECDE syllabus-Kenya, 2000). It emphasizes on child classroom interaction and holistic development. However, many ECD teachers in Lower Yatta Sub County use teacher classroom approach where children largely get direct instruction from the teacher who does most of the talking while the learners passively listen. The teacher takes control and dominates by taking an active role in the actual instructional process. He or she is thus viewed as a sole provider and custodian of knowledge.

This approach tends to suffocate learning (Gichuba, 2009). An active participation of learners is ignored and learner's individual needs are not given attention. The teacher dictates the choice of the content, the methodology, activities to be carried out and the learning resources without involvement of the learner. In the previous years, Lower Yatta Sub County has been registering a consistent deteriorating in mathematics competence in its preschools every year. When compared to other activity areas such as language competencies, physical/outdoor competencies and creative art competencies, mathematics competency has been very poor. This has been a cause of worry and a source of anxiety on the part of parents who have been seeing their children as a window

of their future hope. The poor results have raised concerns to very many stakeholders in the sub county. That is why the researcher was prompted to carry out a study to find out whether learner classroom activities have influence on mathematics competency among preschool children.

1.3 Purpose of the Study

The purpose of this study is to find out whether learner classroom activities have influence on developing mathematics competencies among the preschool children.

1.4 Research Objectives

The objectives of this study are:

1. To observe classroom activities used towards developing mathematics competency
2. To investigate relationship between type of activity and children's competency in mathematics
3. To determine relationship between the duration of classroom activity and mathematics competency
4. To investigate the teachers' perceptions on usefulness of learner activities towards mathematics competency.

1.5 Research Questions

1. What are the classroom activities used towards developing mathematics competency
2. What is the relationship between type of activity and children's competency in mathematics
3. What is the relationship between the duration of classroom activity and mathematics competency
4. What are teachers' perceptions on usefulness of learner activities towards mathematics competency.

1.6 Significance of the Study

This study will be significant to preschool teachers because from the findings they will acquire a thorough understanding of how child classroom activities influence development of mathematics competencies. The study will be significant to Early Childhood Education field officers because it will facilitate proper decision making on how to guide ECD teachers in child classroom activities approach when teaching. The study will enable the head teachers and preschool managers to get to know the importance of provision of teaching and learning materials.

This study will be significant to learners because child classroom activities create an environment that is mathematically empowering and mediating the children's experiences in the environment. The approach keeps children busy, happy and relaxed as they construct their own knowledge. The study will motivate the policy makers on the

need for policies on quality early childhood programs that help children reach key developmental milestones and close learning gaps. They will see the need for formulating policies on procurement of teaching learning materials and motivation of teachers especially in remuneration.

1.7 Limitations of the Study

The major limitations of the study were the intervening and extraneous variables. If all factors were constant, the researcher would have established the influence of learner classroom activities on developing mathematics competencies among preschool children. But intervening variables like nervousness or anxiety of the preschool teachers might have made them not to write true information when filling the questionnaires. Extraneous factors such as type of the school and training of the teachers would have an influence on the study. Another limitation of this study was the use of survey research design because data was collected from a relatively large sample.

1.8 Delimitation of the Study

This study was on influence of learner classroom activities on developing mathematics competencies among preschool children in Lower Yatta Sub County. The study was to establish whether child classroom activities had effects on mathematics competencies. The study was conducted through survey research design. It was done in Lower Yatta Sub County which borders Ikutha Sub County to the South, Kitui Central Sub County to the East, Matinyani Sub County to the North and Yatta Sub County to the West. The target groups that provided information for the study were pre-school children

and pre-school teachers of the selected pre-schools. The data was collected by the researcher using questionnaires, observations and tests.

1.9 Basic Assumptions

The study was guided by the assumption that, learning occurs when learners are actively involved in a process of meaning and knowledge construction as opposed to passively receiving information. The study was also be guided by the assumption that child classroom activities influenced mathematics competencies. The study assumed that children learn from some form of guided discovery where the teacher avoids most direct instruction and attempts to guide the child through questions and activities to discover, discuss, appreciate and verbalize the new knowledge.

1.10 Definitions of Key Terms

Learner Classroom Activities: An approach that lays great emphasis on the learner as the center of interest

Competency: The ability to perform or execute a given task

Preschool children: Children between the ages of three and five or seven prior to the commencement of compulsory education at preschool

1.11 Organization of the Study

The study was organized into five chapters. Chapter One highlighted the background of the study, statement of the problem, purpose, objectives and research questions, significance or justification, limitation and delimitation of the study, basic assumptions, definition of key terms and the organization of the study. Chapter Two covered the review of related literature and Chapter Three was on research methodology which highlighted research design, population, sampling procedure and sample size, instruments, validity and reliability, procedure for data collection, data analysis and ethical concerns. Chapter Four covered findings and discussions and Chapter Five was about Summary, Conclusions and Recommendations.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

The study presented literature on child classroom activities and developing mathematics competencies. It also presents the theoretical and conceptual framework.

2.2 Mathematics Competencies

In early childhood education, mathematics is not simply "a static network of terms, rules and procedures that are conveyed by teachers and absorbed by children for recall upon demand" (Campbell, 1999). Rather mathematics is a way of thinking about relationships, quantity and pattern via the processes of modeling, inference, analysis, symbolism and abstraction. The basic tenet of constructivism, as described by Heddens and Speer, 2001 is that "learners construct their own meaning through continuous and active interaction with their environment. Social constructivism, informed by Vygotsky recognizes that learning is a process that occurs within social interactions emphasized by social collaborations and negotiated meanings (Klein, 2000). Social constructivism theory recognizes that children's social and material interactions with their environments are the means through which they learn. Early childhood curricula also recognizes the value of play and use of concrete materials in children's mathematical development, Perry & Dockett, 2002)

Early mathematical skills and concepts are not only critical to ensuring that young children begin school with the tools they need to perform well academically, but they are also the foundation for development of rational and logical thought processes (Mwangi,

2009). Learning mathematics is understood as a constructive process of conceptual growth, often involving the reorganization of concepts and growth of general cognitive abilities, such as problem solving and metacognitive processes.

Early mathematical concepts lay the foundation for later learning by providing children with underlying mathematical structures which are built upon over time. In this way, although early mathematical concepts may appear to be basic, they are, in fact, fundamentally important and complex (Ball, 2008). From an analysis of six longitudinal studies (Duncan, 2007) found that early mathematics skills were more powerful predictors of later academic achievement in mathematics (Klibanoff, 2006).

Since children arrive at school with intuitive mathematical understandings, a teacher needs to connect with and build on those understandings. This is done through the use of mathematical experiences that allow children to explore mathematics and to communicate their explorations in a meaningful dialogue with the teacher and their peers. As well, the activities that teachers provide need to be appropriate to the developmental stages of the children.

In their daily activities children develop numeracy, reasoning, thinking skills and problem-solving through the learning and application of mathematics. We also believe that mathematics is a subject of enjoyment and excitement offering the children opportunities for creative work and moments of enlightenment and joy (Rozali, 2006). Mathematics ideas are in children's play and everyday experiences. Young children develop some mathematics concepts through self-guided discoveries. Adult support is essential to maximize learning (Engle, 2006).

Number sense is much more than merely counting. It involves the ability to think and work with numbers easily and to understand their uses (Blocking, 1989). Number sense is about understanding the different uses for numbers. For example, describing quantities and relationships, using informational tools and ordering. Number sense is the ability to count accurately and competently to be able to continue counting or count on, from a specific number as well as to count backwards (Blocking, 1989).

2.2.1 Classroom Activities and Mathematics Competency

Child-classroom approach addresses the needs and interests of the learners (Gichaba, 2009). This approach appreciates the fact that children possess unique interests that need to be considered if any meaningful achievement is to be realized. In this approach, the learner takes an active role in the lesson. He or she forms the center of focus during the learning process, while the teacher's role is merely to guide the learners in the activities rather than doing it for them. According to (Gichaba, 2009) in the learning process, the learner's age, ability and their interest are put into consideration during planning. The teacher should use a variety of teaching and learning materials and make the environment conducive for learners. They should be busy, happy and relaxed. The learners individual differences are catered for, especially when they are allowed to advance at a convenient pace.

Active participation refers to a situation whereby children take a center stage in the classroom learning process. According to (Jacinta and Regina, 1981) "Nothing is learnt unless we are active", when children are allowed to be actively involved in their own learning, there is a tendency of correcting wrong concepts and refining the imperfect ones, (Simiyu, 1996).

Children need many opportunities to learn the words for numbers, to count things and to learn to read and write numbers (Bush, 2001). You can help children learn about numbers and counting by pointing to and counting objects in part of your daily routine. For instance, as you pass out the juice cups at snack time point and count the cups or as you pass out pieces of paper for an art project, point to the paper and count the pieces. As you point and count, get the children to count with you and then without you. Children need to hear and practice things a lot in order to learn them. Teach the children counting songs and rhymes. You can play counting games with many different actions, such as jumping and clapping. As children learn more number words, they can count more actions (Bush, 2001).

Counting and becoming familiar with numbers with help your child understand all other aspects of mathematics children must learn to quantify and measure concretely at first and increasingly more abstractly as they mature. They must learn to estimate mathematical quantities and to represent and communicate mathematical ideas in the language of mathematics (Blocking, 1989). Counting is a surprisingly intricate process by which children call number values by name. Children learn the number names by imitating adults and older children (Mwangi, 2009). As young children practice counting, they often say non-conventional sequences of number names such as “one, two, five, eight, three, six”. This counting may sound strange but it is perfectly natural (Mwangi, 2009).

Children need many activities in classification skills before they can master counting, mathematics activity (Mathematics Activity Book KIE, 2008). However, from an early age children may count without understanding and without always keeping the

number sequence. This is what is referred to as rote counting. Teachers should therefore provide plenty of activities and materials to help children to learn how to count in sequence and provide the foundations for counting with understanding (Mathematics activity book, 2008).

Counting in sequence is not always easy especially for young children. The teacher must therefore give them a lot of practice through various activities to ensure that they are able to count properly. The teacher is advised to introduce the counting of only a few numbers at a time. For example, she may introduce the counting of 1-3 and give practice until the children are able to count properly up to three. When doing so, she may ask them to jump, skip or clap. (Mathematics Activity Book, 2008). After they have mastered, she can then introduce another two or three numbers in the same way. This should be done until children are able to count at least up to ten in sequence. When teaching counting, the teacher must help children to practice counting in as many activity areas as possible. For example, in outdoor, she may ask children to count as they skip.

In order to build mathematics readiness, skills, preschool children should be involved in a wide variety of activities aimed at developing number recognition, sequences and one to one correspondence (Holt, 1991). Preschoolers are beginning to recognize, describe, reproduce, extend, create and compare repeating patterns. Preschool children need to be involved with concrete materials to develop these pre-mathematics skills. Recognizing and repeating patterns in stories another way to reinforce the concept of patterns with children (Holt, 1991).

Number recognition is the reading of number symbols (Mathematics and Environmental Activities Book 3 NACECE, 2008). To help children to recognize numbers easily the teacher must make sure that she writes all her numbers very well. The teacher is advised to trace the numbers if she cannot write them properly. This is difficult to develop. The teacher is therefore advised to use as many activities and materials as possible in order to ensure that all the children develop the concept (Mathematics and Environmental Activities Book 3 NACECE, 2008). It is important that children be able to recognize the numbers before they start writing them. The teacher should deal with a few numbers at a time. Most children learn best by doing. For this reason, early childhood education teachers see that the children engage in hands-on-experiences and other interactive activities (Gottfredson, 1996). Recognizing the importance of play, teachers guide the children to help them learn from these activities. They also provide the children with opportunities to observe, question and investigate (Gottfredson, 1996). In symbolic knowledge, children are able to use abstract symbols to represent objects, relations or operations in the problem solving process. The child uses numerals rather than the objects to experience mathematical ideas or to solve problems (Bruner, 1980).

In order to help children recognize numbers easily, the teacher must make sure that he or she writes all numbers clearly and properly (Mwangi, 2009). Children need to experience many activities in order to be able to recognize a number. They need to recognize numbers before they can write them. The teacher should introduce to children a few numbers at a time.

Number value is the quantity of any number, for example, four means four objects, five means five objects. Even though children can do rote counting in a

sequence, they do not often know the value of the numbers they count (Mathematics and Environmental Activities Book 3 NACECE, 2008). The concept of number value is very important because it is the foundation of such operations in mathematics as addition, subtraction, division and multiplication. The teacher should therefore provide appropriate materials and activities which will help the children to acquire the concept of number value properly (Mathematics and Environmental Activities NACECE, 2008).

In number value, two means two objects or the "twoness" of two. Five means five objects or the "fiveness" of five (Mwangi, 2009). For the child to grasp the value of a given number, he or she should have experience with many sets of that number. For example, to learn number value of "two", the child needs to see many sets of two objects, such as two bottle tops, two cups, two spoons, two camels, two cows and two dogs. Through these experiences, the child is able to see the similarity between these sets (Mwangi, 2009). Through child classroom activities children should be able to match items with the number corresponding to their value. Children can count objects and then put them against the number that represents their value.

Ordering by the young children means arranging objects or sets of objects so as to have an origin, a direction and to reflect some rules (Wambiri, 2005). For example, when a child is asked to order five pencils of different lengths from the shortest pencil, direction is the order of increasing length and the rule is that each pencil must be longer than the pencil that follows it. As children engage in ordering activities, they are helped to acquire a vocabulary of comparative words such as "longer than, shorter than, older than and taller than" (Wambiri, 2005).

Ordering helps children to realize later that numbers are always put in order of sequence (Mathematics and Environmental Activities Book 3 NACECE, 2008). The teacher must observe the children very closely as they carry out the activities. This will help her to find out children who are developing the concept correctly and those with problems. She or he will therefore be able to assist and encourage those who need help immediately. The teacher should create as many games as possible as these are interesting to the children and therefore help them to acquire the concept faster (Mathematics and Environmental Activities Book 3 NACECE, 2008).

2.2.2 Type of Activity and Children's Mathematics Competency

Learning is an active process in which the learner uses sensory input and constructs meaning out of it (Dewey, 1952). An active learner needs to do something; that learning is not the passive acceptance of knowledge which exists "out there" but that learning involves the learner in engaging with the world. For significant learning, we need to revisit ideas, ponder them, try them out, play with them and use them (Hein, 1991). If you reflect on anything you have learned, you soon realize that it is the product of repeated exposure and thought.

Learning is a constructive process in which the learner is building an internal illustration of knowledge, a personal interpretation of experience (Bednar, 1995). This representation is continually open to modification, its structure and linkages forming the ground to which other knowledge structures are attached. (Vygotsky, 1934) emphasizes that knowledge is constructed in practical activities of groups of people as they interact with each other and their material environments. It is generally accepted today that

children's learning is active, self-regulating, and constructive in problem situations and is related to existing knowledge as they act upon their environment (Scardamalia, 1996).

Teachers of young children must be aware of children's cognitive development and how they learn (Piaget, 1983) described the development as a sequence of learning that goes beyond simple role learning. At pre operational stage (2 – 7 years) of Piaget's stages of cognitive development, a one-to-one correspondence is developed. The child is able to learn how to count, add and subtract. The basic skill required is matching, beginning with similar objects and advancing to the matching of different objects and sets of objects. Seriating skills begin with simple ordering of objects by size, texture, taste or color.

(Bruner, 1980) focuses on hierarchy of learning process. He believes that the three levels of knowing related to instruction include: - enactive, iconic and symbolic. Enactive knowledge involves the physical manipulation of concrete objects and is one's own physical movement. This concrete level of knowledge is demonstrated in mathematics by the ability to sort objects such as books, bottle tops, seeds, stones and leaves. Numbers can be understood and presented through the manipulation of concrete objects. Iconic knowledge involves the mental manipulations of concrete objects that are representations of objects. Symbolic knowledge involves the ability to use abstract symbols to represent objects, relations or operations in the problem solving process.

(Vygotsky, 1934) developed the idea of social construction. Much learning from age four onwards takes place between children in a group but this process needs to be well-managed by an adult. Vygotsky described the difference between what children can

do unaided and what they can achieve with a little help from their friends or teacher as the zone of proximal development causes the education to rethink how to intervene, what mediation or action on his part will help this particular child make the next step in his understanding. Sensitive teacher interventions can enable children to operate the higher level of their zone and that should be considered developmentally appropriate. Recent research on early mathematics education has uncovered that, children bring more mathematics knowledge and experience to school than previously believed (Ginsburg, 2003). Preschool children were observed frequently engaging in a range of mathematics, including pattern and shape, magnitude, enumeration, spatial relations, classification and dynamic change.

Ideally, manipulatives serve as learning tools to help children build their understanding and explain their thinking to others. Knowledgeable education begins planning by carefully observing children at play or engaged in other activities in order to identify their everyday mathematics. Next, they accurately interpret the mathematics understanding the behaviors' and how it fits into the key mathematical concepts and curricula (Ginsburg, 2008). Once identified, educators can create activities which allow assimilation of new concepts into the children's prior knowledge. One of the best ways to foster early mathematical concepts and skills in young children is to make pre number, numbers and measurement concepts fun and relate them to everyday experiences (Mwangi, 2009). Unfortunately, most instruction that children receive does little to promote mathematics competencies, beyond rote counting and numerical recognition.

According to Bruner 1980, children learn by doing. They learn through action and so they need to manipulate objects. They should be allowed to experience first-hand as

many objects and events as possible so that they can develop mathematical skills and concepts. Children should participate in all mathematics-related activities such as sorting and grouping, matching and pairing and patterning. Piaget 1983, states that children should be given concrete materials. Teachers of young children should use concrete materials, otherwise, it will be very difficult to understand some skills and concepts in mathematics. Materials such as blocks, stones, leaves, seeds, books and pencils may be used.

Introduction of concepts and skills should be done sequentially and be appropriate to the child's level of development, Piaget 1983. The teacher should understand the child's level of development and provide activities that are appropriate for their age. Activities that are too hard and complex may discourage the child from attempting a problem. At the same time, easy problems may cause boredom and restlessness in the classroom.

2.2.3 Duration of Classroom Activity and Children's Mathematics Competency

Successful early learning occurs when both teachers and children are actively engaged. The challenge for teachers is to help children to think, explore, talk about concepts, and practice new skills. This pedagogical approach requires far more than simply transmitting facts to the children and emphasizes opportunities that foster high-order skills. Optimally, early literacy teaching strategies allow teachers to explicitly and systematically help children develop a conceptual knowledge base that underlies the meaning of words rather than only focusing on letters and sounds.

2.2.4 Teacher's Perceptions on Usefulness of Learner Activities towards Mathematics Competencies

Teachers are the most important resource for developing children's mathematical identities (Cobb & Hodge, 2002). They influence the ways in which children think of themselves in the classroom (Walshaw, 2004). In establishing equitable arrangements, effective teachers' pay attention to the different needs that result from different home environments, different languages and different capabilities and perspectives. The positive attitude that develops raises children's comfort level, enlarges their knowledge base, and gives them greater confidence in their capacity to learn and make sense of mathematics. Confident in their own understandings, children will be more willing to consider new ideas presented by the teacher, to consider other children's ideas and assess the validity of other approaches, and to persevere in the face of mathematical challenge.

Honoring children starting points enables educators to build n children's mathematical knowledge with an enquiry-based approach, developing purposively and meaningful mathematical experiences in the classroom. It is also important to realize that the ways in which young children's think in mathematical situations can be quite unique. Educators must be particularly careful not to assume that children see situations, problems or solutions as adults do. Instead good teachers interpret what the child is doing and thinking and attempt to see the situation from the child's point of view (Clements & Sarama, 2009).

A carefully planned mathematics environment enables the use of manipulatives, whether commercial or found objects, sometimes brought in by the children themselves. Ideally, manipulatives serve as learning tools to help children build their understanding

and explain their thinking to others. Research has shown, however that manipulatives themselves do not carry mathematical understanding. Rather they provide concrete ways for children to give meaning to new knowledge. (Ontario Ministry of Education, 2003). Children need the opportunity to reflect upon their actions with manipulatives and through discussion, articulate the meaning they generate so that the link between their representations and the key mathematical ideas is apparent (Clements and Sarama, 2009).

Knowledge for mathematics for teaching is necessary not only for understanding mathematics but also for being able to impart that understanding to others. It requires the ability to unpack mathematical concepts, "making features of particular content visible to and learnable by children" (Ball, 2008). Early mathematics concepts lay the foundation for later learning by providing with understanding mathematical structures which are built upon over time. In this way, although early mathematics concepts may appear to be basic, they are in fact fundamentally important and complex.

Gaining knowledge for teaching mathematics is by no means an easy task and requires both access to the knowledge and practice in applying it. The investment is worthwhile, however, since the benefits can be great. The teacher's mathematics knowledge is significantly related to child achievement gains, (Ball, 2008).

Knowledgeable teachers begin planning by carefully observing children at play or engaged in activities in order to identify their everyday mathematics. Next, they accurately interpret the mathematics underlying the behaviours and how it fits into the key mathematical concepts and curricula. Once identified, teachers can create activities which allow assimilation of new concepts into the children's prayer knowledge

(Ginsburg, 2008). As teachers observe child-problem solving, they can document what children say, do and present in order to make both planned and "in-the-moment" decisions about how to respond, challenge and extent child thinking. After children have worked through solving a problem, teachers facilitate consolidation time (either with individual children or with small groups or large groups) in order to allow children to talk about their thinking (Sarama & Clements, 2009).

According to Hausfather (1996), guided instruction involves both teacher and children exploring mathematics problems together, and then sharing their different problem-solving strategies in an open dialogue. Winkins (1975) believed that the teacher should have only one concern – the academic development of the children under his/her care, in order to promote their growth and achievement. He believed that teaching involves the interaction of so many personal and professional elements that is impossible to separate them.

As cited by Johnstone-Wilder (1986) Margaret observed that it is critical for the mathematics' teacher to have an understanding of the manipulation of teaching/learning materials, and to have a positive attitude towards teaching the bigger mathematical concepts, rather than just simple arithmetic. Both pre-school teachers and lower preschool teachers should be oriented to understand the methods they use when teaching children mathematical concepts (Eshiwani, 1984). By so doing that would change their beliefs and attitudes, as well as the perspective they currently use in the pre-school programme. Many parents, and those in the community involved in education, are concerned about the current low level of achievement in mathematics in lower

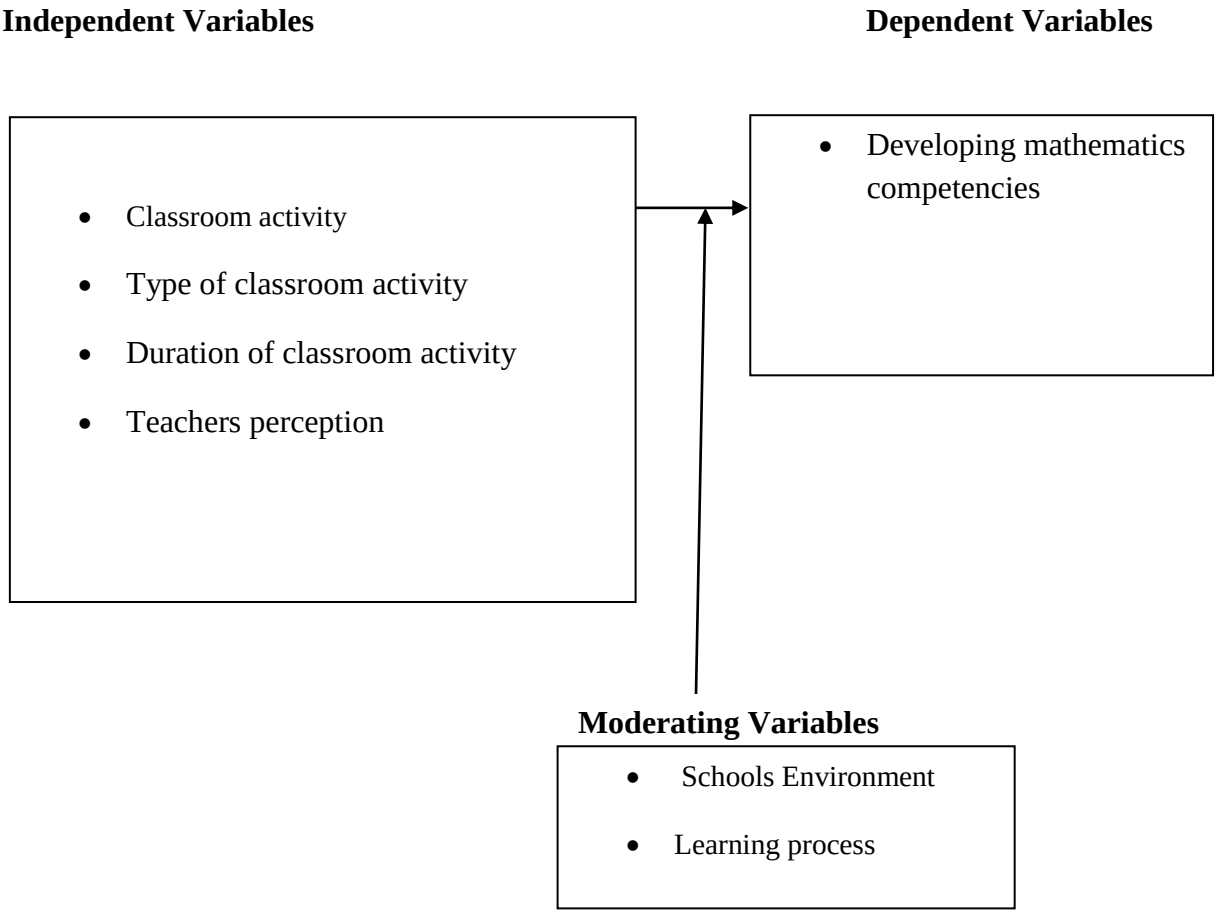
preschools. Maranga (1983) has pointed out that an acceptable performance in education, including mathematics is wanting.

2.3 Theoretical Framework

This study was guided by the constructivist theory of (Bruner and Vygotsky, 1934). In this theory, learning is a constructive process in which the learner is building an internal illustration of knowledge and a personal interpretation of experience. This representation is continually open to modification, its structure and linkages forming the ground to which other knowledge structures and attached. Piaget's role in the constructivist teaching suggests that we learn by expanding our knowledge by experiences which are generated through play from infancy to adulthood which are necessary for learning.

Constructivist learning theory says that all knowledge is constructed from a base of prior knowledge. This theory will be adopted for this study because it is assumed that children learn best when they are actively involved in the learning activities. They need a democratic environment where the teacher facilitates a process of learning in which children are encouraged to be responsible and autonomous.

2.4 Conceptual Framework



2.5 Gaps in Literature Review and Summary

Though studies have been carried out on how child classroom activities have been used in primary and secondary schools in Kenya, focus on preschools has been limited. There are many factors that are responsible for poor mathematics competences. The teacher needs a good knowledge of the ways learners understand the functions of mathematics and accept that even low achievers are still teachable and do their utmost to motivate them.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section aimed at describing the research design, the target population, sampling procedure and sample size, research instruments, validity and reliability, procedure for data collection and data analysis.

3.2 Research Design

The research design used in this study was survey/descriptive. It enabled to study the situation and to explain the relationship between variables. The study therefore, applied descriptive designs to gather data, since it accurately portrayed the profile observed in the pre-school learners' performance. This was crucial for the interpretation of the results. It facilitated the achievement of the objectives of the study. The design was not only appropriate for data that was obtained by the use of a questionnaire, observational checklist and tests, but it was also an appropriate mode of enquiry for making inferences about the large group of people from the data drawn on the relatively small number of individuals from the group (Leedy, 1980).

3.3 The Target Population

According to Borg and Gall (1989) target population describes all members of real or hypothetical set of people, events and objects. The target population was 105 preschool teachers and 2100 preschool children from 105 public preschools in Lower Yatta Sub County (Lower Yatta Sub County DEOs report, 2014). The schools were

located in 3 zones i.e. Kwa-Vonza Zone with 20 preschools, Yatta Zone with 42 preschools and Kanyangi Zone with 43 preschools.

3.4 Sampling Procedure and Sample Size

Mugenda and Mugenda (1999) define samples as a smaller group obtained from a population. This sample is representative of the whole population with the relevant characteristics. The minimum sample for a survey of a small population is 20% and that of a larger population is 10% (Gay, 1992). The study used stratified random sampling. In this kind of sampling, strata was created as zones. A representative 20% of participants were selected in each zone, that is, Kwa-Vonza Zone 4 preschools, Yatta Zone 8 preschools and Kanyangi Zone 8 preschools. The research therefore sampled 20 preschool teachers and 80 preschool children from 20 public preschools in Lower Yatta Sub County. The research sampled 4 public preschools where 2 children were chosen from each school and administered a tool test. The stratified random sampling took care of all representatives and therefore generalization could be done.

3.5 Research Instruments

3.5.1 Observation

The study used observation schedule to capture data from pre-school children on the approach used in developing mathematics competencies in the classroom. The tool captured data on how learner classroom activities influenced development of mathematics competencies. The study also observed the children at their natural setting, that is, in the classroom. This technique aimed at gaining first-hand experience of the children when learning.

3.5.2 Questionnaires

Questionnaires were provided for the pre-school teachers to fill. By filling the questionnaires, the pre-school teachers provided data concerning the approach he/she used when teaching mathematics activities to preschool children. This instrument was suitable for preschool teachers because the whole population of preschool teachers was literate and the data needed could be easily described in writing. Questionnaires could also collect a lot of data over a short period of time.

3.5.3 Tests

The study used test to collect information about the children's mathematics competency. The research instrument was suitable for preschool children because it tested their mathematics competencies which could not be directly observed. The data collected by the use of the test was easily analyzed.

3.6 Validity and Reliability

3.6.1 Validity

Validity of a research instrument is the measure of degree to which a research instrument measures what is intended to by the study (Borg and Gall, 2004). The research instruments were constructed in consultation with the supervisor. A pilot study was done by giving the instruments to a section of respondents to check on how they would respond to the questions. Based on their responses, the study clarified any item before the main study. Validity was the accuracy and meaningfulness of inferences, which was based on research results. The study ensured that the content items in the instruments were representative and related to the study. The research instruments were covered all

the important areas and objectives of the study and ascertained that each text item would measure only what was purported to measure. Thereafter, a sample size of 20% of the total population was selected which was large enough to provide a reliable data. Use of different research instruments such as observation, questionnaires and tests was used to address the same issue.

3.6.2 Reliability

Use of test-retest techniques was used. This involved preparation of instruments after establishing that they were reliable through the use of experts' judgment. The instruments were administered and the result which was obtained from these administrations was analyzed. The same instruments were administered to the same participants, their responses were analyzed and then the results of the first administration was compared with the results of the second administration and the findings agreed, then the instrument was taken to be reliable.

3.7 Procedure for Data Collection

This was done by developing the research project under the guidance of the supervisor. The researcher sought permission from the school of education panel after defending the proposal to proceed with the study. Once the permission was granted, the researcher proceeded to collect data. The data was collected from the sampled respondents by using questionnaires, observations and tests.

The questionnaires were distributed to the preschool teachers to fill in answers in written form. The filled-up questionnaire forms were collected with the completed information after a week. Data was also collected from the sampled preschool children by

use of tests. Observation method was also used to obtain data from the sampled preschool children.

3.8 Data Analysis

Because of qualitative data collected, the study used content and thematic analysis. The study analyzed both quantitative and qualitative data by using statistical techniques such as frequency distribution tables, percentages, mean and standard deviation, ANOVA, regression and descriptive analysis. The study used descriptive statistics to summarize and interpret data. The findings were presented to describe their implications for the target population under study.

3.9 Ethical Concerns

The study was concerned with privacy and confidentiality of the respondents. The study did not undertake research that had a negative effect on others. Facts about the research were given to the participants in order for them to make an informed decision about participating or not. The study observed confidentiality of the information to protect the respondents from psychological harm. The study concealed the identity of the respondents because it was dealing with children and personal attributes. The respondents were not deceived or manipulated to provide information. The study did not refer to any other person's work without acknowledging the author or get involved in plagiarism. The researcher produced his own original work.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND DISCUSSION

4.1 Introduction

This chapter represents data findings of the study in demographics, key areas and objectives. Each specific objective is analyzed in relation to main objective of the study and conclusion made thereof. This chapter contains data analysis, results and discussion of the findings on the influence of learner classroom activities on mathematics competency among preschool children in lower Yatta Sub County, Kenya. The data was analyzed with the help of a computer program, SPSS version 11.5. This enabled the research data to be presented in frequencies, percentages, tables and figures. The chapter was organized into the following sections, results and Discussion of the findings.

4.2. Results

This section contains the findings of the study. The findings are presented under the following sub-headings: Questionnaire return rate, background information, Classroom activities and mathematics competency, type of activity and children's mathematics competency, duration of classroom activity and children's mathematics competency and teacher's perceptions on usefulness of learner activities towards Mathematics competencies.

4.2.1 Questionnaire Return Rate

The questionnaire return rate was 20, (100%), for the teachers. This was so since the questionnaires were administered by the researcher with assistance from a research

assistant. The questionnaire return rate for the children was also 80, (100%); this was achieved through assistance of the teachers.

4.2.2 Background Information

This section contains; gender, age, level of education, professional qualification and type of preschool.

Sex

The study sought the sex distribution of teacher and pupil. They were asked to indicate their gender; the study provided them with the following options; Male and Female. Figure 4.1 shows the distribution of teachers and pupils' gender.

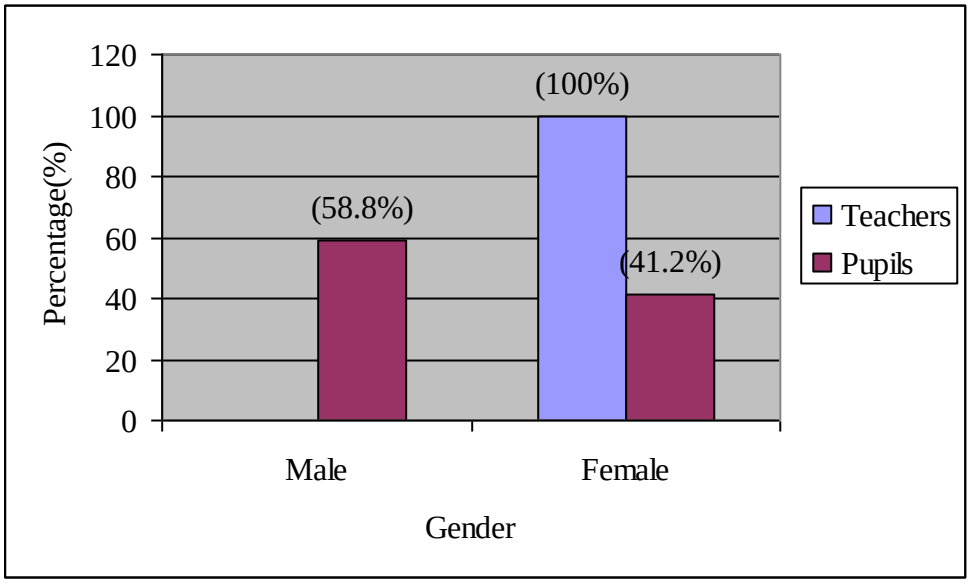


Figure 4.1: Distribution of teachers and pupils' gender

From the results in the table above, all the teachers interviewed, (100%) were female teachers. On the other hand, more than half, (58.8%) of the pupils who took part in the study were male pupils. The remaining percentage of them, (41.2%) was female.

The children representation is normalized since from census girls are supposed to

be more than boys. Pre-schools are mostly taught by female teachers as a norm since children are likely to correspond well with their mothers than fathers.

Age

The study sought to examine the age distribution of teachers. This was categorized into, 20- 29, 30-39, 40-49 and 50 and above. Figure 4.2 shows the distribution of the teachers by age.

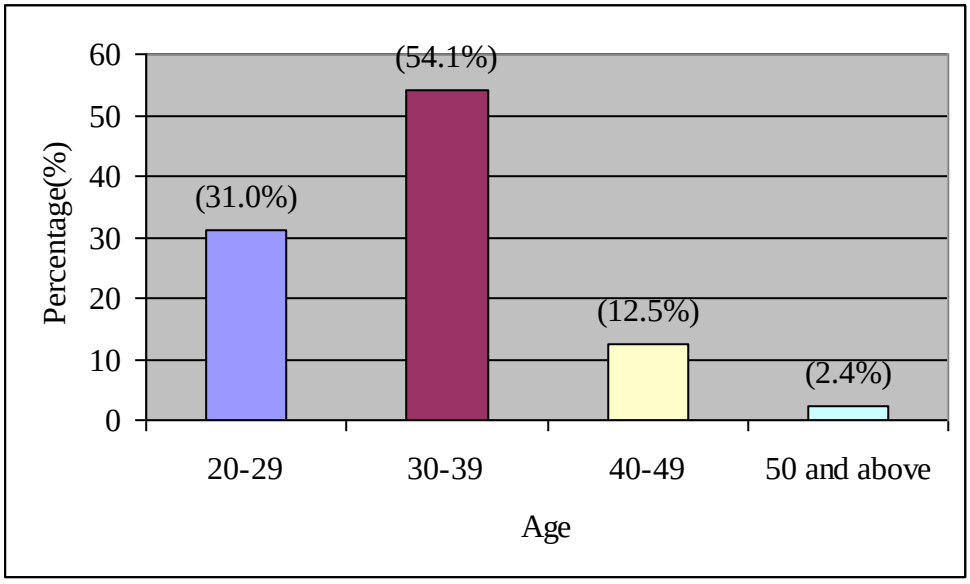


Figure 4.2:Teachers Distribution by Age

Majority of the teachers (54.1%) were aged between 30- 39, while slightly less than a third of them, (31.0%) were 20-29 years old. The remaining 14.9% were either 40-49 or were 50 years and above. This shows the pre-school children are normally taught by youthful teachers since the biggest population of the teachers is between 30-39 years.

Level of Education

The respondents were asked to indicate their level of education;. The table below shows the distribution of the teachers by level of education.

Level of Education	Frequency	Percentage
Diploma	5	25
Certificate	11	55
Untrained	4	20
Total	**20**	**100**

The results shows that majority of the teachers were certificate holder as shown by 55% of the respondents. .this was followed by 25% who were diploma holders while 20% were untrained teachers.

Length of Service

Teachers were also asked to indicate the length of service in the schools. This was categorized into 5 years and below, 6-10 years and 11-15 years, 16-20 years and 20 years and above. Figure 4.5 shows the distribution of the teachers by length of service

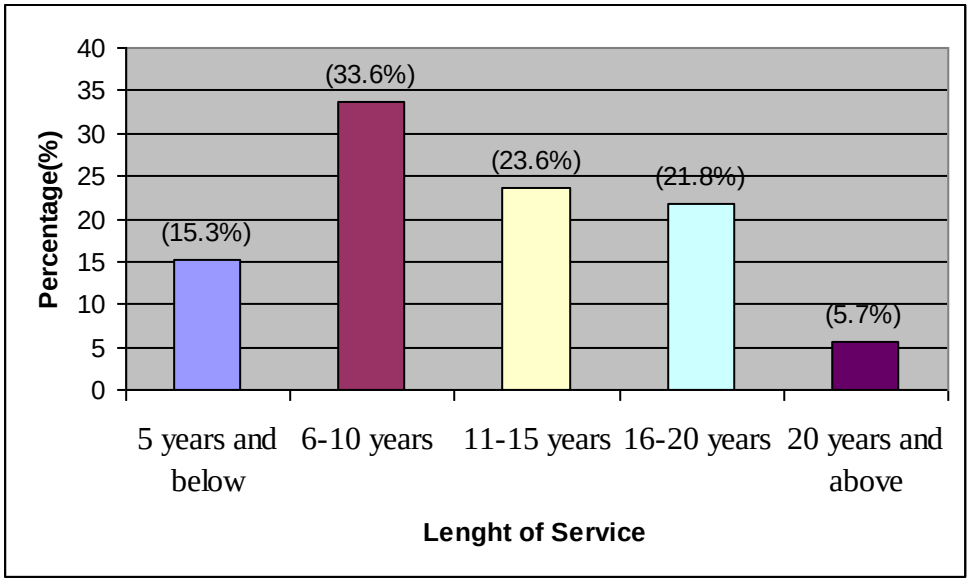


Figure 4.3: **Distribution of the teachers by length of service**

15.3% of the teachers had worked for less than 5 years. Slightly more than a third of them, (33.6%) had a working experience of 6-10 years. Slightly less than a quarter of them (23.6%) and (21.8%) had either worked between 11-15 and 16-20 years. Only 5.7% of teachers who took part in the study had worked for more than 20 years.

4. 3 Influence of Learner Classroom Activities on Mathematics Competency among Preschool Children

This study sought to find out the Influence of Learner Classroom Activities on Mathematics Competency among Preschool Children. To realize this objective, there are a number of elements that were captured. These included: classroom activities used towards developing mathematics competency, the relationship between type of activity and children's competency in mathematics, the relationship between the duration of classroom activity and mathematics competency and teachers' perceptions on usefulness of learner activities towards mathematics competency.

4.3.1 Classroom Activities Used Towards Developing Mathematics Competency

The study sought to establish the method used in teaching mathematic in the sampled schools. Table below shows responses on the method used in teaching mathematic in the sampled schools.

Description	Mean	Std Dev
Child centered	4.3212	0.8768
Thematic	4.6753	0.8675
Exploration	4.097	0.7685

Table 4.1: Responses on the method used in teaching mathematic in the sampled schools

The study found that the respondents strongly agreed that thematics was used for teaching mathematics with a mean of 4.6753. They agreed that child centered ways were used with a mean of 4.3212 and they also agreed that exploration was used for teaching mathematics with a mean of 4.097.

Table 4.2: Effectiveness of mathematics activities teaching

Effectiveness of mathematics activities teaching		
Statement	Frequency (F)	Percentage (%)
Very Effective	4	20.0
Effective	10	50.0
Not Effective	5	25.0
Poor	1	5.0
Total	20	100.0

Slightly less than a quarter, (20.0%) of the preschools teachers found their methodology very effective. Half, (50.0%) of the preschools teachers found their methodology effective. six preschools teachers planned mathematics activities according to teaching materials. A quarter, (25.0%) of the preschools teachers found their methodology not effective.

The respondents were further asked to indicate how they planned the mathematics activities of the day. Table 4.2 shows the distribution of whether teachers Plan of mathematics activities of the day.

Table 4.3: Distribution of whether teachers Plan of mathematics activities of the day

Distribution of whether teachers Plan of mathematics activities of the day		
Statement	**Mean**	**Standard deviation**
According to theme	4.4029	0.6653
According to sub-theme	3.8658	0.8688
Teaching materials	4.0517	0.7541

The respondents agreed that they plan mathematics activities of the day according to theme with a mean of 4.4029. They continued to agree that they plan mathematics activities of the day using teaching materials with a mean of 4.0517 and they agreed that they plan according to sub-theme with a mean of 3.8658.

The study sought to know the importance of using concrete materials in mathematics activity. Table 4.3 shows the distribution of responses on the Importance of using concrete materials in every mathematics activity.

Table 4.4: Importance of using concrete materials in every mathematics activity

Importance of using concrete materials in every mathematics activity		
Statement	**Mean**	**Standard deviation**
Encourages discussion	4.3154	0.6857
Helps teacher know the appropriate next step	4.1357	0.6648
Pupil ownership of their work	3.8544	0.7548
Gives teacher picture of pupil level	4.2651	0.3271

The results from the table 4.4 shows that the respondents agreed that concrete materials do help in encouraging discussion with a mean of 4.3154. They agreed that using concrete materials gives teacher picture of pupil level with a mean of 4.2651 and it helps teacher know the appropriate next step with a mean of 4.1357. They finally agreed that using concrete materials with a mean of 3.8544.

The study sought to know how other classroom activities were integrated with mathematics. Table 4.5 shows the distribution of responses on how other classroom activities were integrated with mathematics.

Table 4.5: How other classroom activities were integrated with mathematics

How other classroom activities were integrated with mathematics		
Statement	**Mean**	**Standard deviation**
Songs	4.3257	0.4567
Art drawing	3.9779	0.8655
Map making	4.2524	0.8651
Blowing bubbles	4.0625	0.3265

The respondents agreed that songs were integrated with mathematics with a mean of 4.3257. This was followed with an agreement that Map making was integrated with mathematics with a mean of 4.2524 and blowing bubbles was agreed with a mean of 4.0625 while Art drawing was agreed with a mean of 3.9779.

The study sought to know how teachers interacted with children in the classroom. Table 4.5 shows the distribution of responses on how teachers interacted with children in the classroom.

Table 4.6: How teachers interacted with children in the classroom

How teachers interacted with children in the classroom		
Statement	**Mean**	**Standard deviation**
Snacks and meals	4.3741	0.5554
Small discussion grouping	4.5873	0.4124
Art and modeling	3.3651	0.8647
Singing and reciting	3.7654	0.8764

The respondents strongly agreed that teachers interacted with children in the classroom through small discussion grouping with a mean of 4.5873. The respondents agreed that teachers interacted with children in the classroom during snacks and meals time with a mean of 4.3741 and Singing and reciting was agreed with a mean of 3.7654. the respondents moderately agreed that teachers interacted with children in the classroom through Art and modeling with a mean of 3.3651.

The study sought to know the importance of grouping children. Table 4.7 shows the distribution of responses on the importance of grouping children.

Table 4.7: Importance of grouping children

Distribution of responses on the importance of grouping children		
Statement	**Mean**	**Standard deviation**
A way of making children social	4.6233	0.8101
Enables weak children to learn from their mates	4.3215	0.3261
Encourages competition	4.1572	0.9517

The respondents strongly agreed that grouping children is a way of making children social with a mean of 4.6233. they agreed that grouping children enables weak children to learn from their mates with a mean of 4.3215 and also agreed that grouping children encourages competition with a mean of 4.1572.

The study also sought to establish challenges a teacher can face when planning for the daily classroom activities. Table 4.8 shows the distribution of responses on Challenges a teacher can face when planning for the daily classroom activities.

Table 4.8:Challenges a teacher can face when planning for the daily classroom activities

Challenges a teacher can face when planning for the daily classroom activities		
Statement	**Mean**	**Standard deviation**
Lack of enough resources	4.2658	0.5628
Lack of cooperation from the other teachers	4.0325	0.9654
Lack of enough time	3.8653	0.4325

The respondents agreed that one of the challenges they face when planning for the daily classroom activities was **l**ack of enough resources with a mean of 4.2658. This was followed by the agreement that lack of cooperation from the other teachers was a challenge with a mean of 4.0325 and another challenge was lack of enough time as agreed with a mean of 3.8653.

4.3.2 The relationship between type of activity and children's competency in mathematics

The study sought to know whether the type of activity influences children's' competency in mathematics. Figure 4.7 shows responses on whether the type of activity influences children's' competency in mathematics.

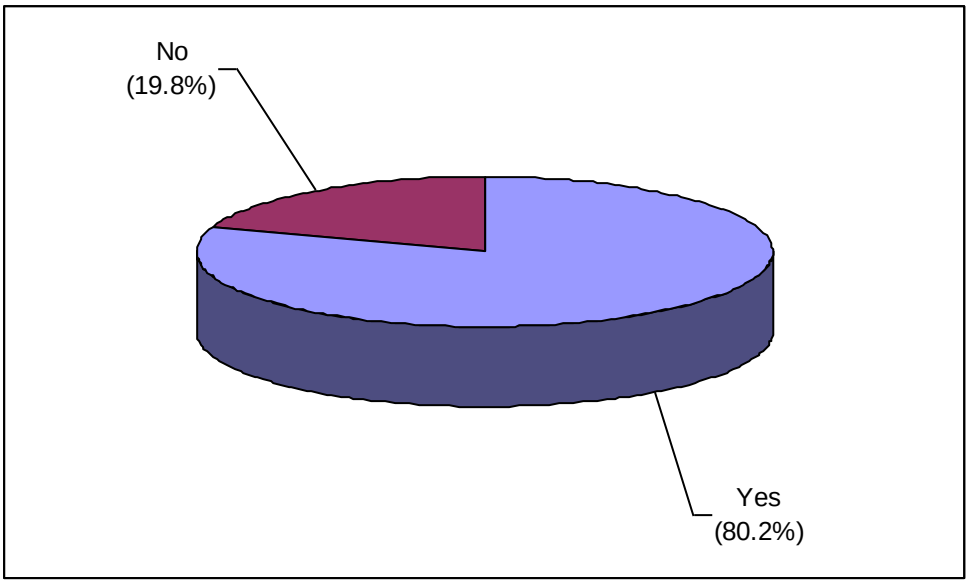


Figure 4.4: Responses on whether the type of activity influences children's' competency in mathematics

An overwhelming majority of the respondents, (80.2%) agreed that the type of activity influences children's' competency in mathematics. Only (19.8%) of them indicated otherwise.

The study sought to know how teachers were conducting peer tutoring among children. Table 4.8 shows the distribution of responses on how teachers were conducting peer tutoring among children.

Table 4.9: Conducting peer tutoring among children

How teachers were conducting peer tutoring among children		
Statement	**Mean**	**Standard deviation**
Holding open discussions	4.2187	0.7654
Doing activities together	4.5647	0.8765
Grading children	4.3421	0.5436
Cross examining children	2.3421	0.3421

The respondents strongly agreed that teachers were conducting peer tutoring among children by doing activities together with a mean of 4.5647. They agreed that they used Grading children with a mean of 4.3421 and held open discussions was agreed with a mean of 4.2187. The respondents disagreed that teachers were conducting peer tutoring among children by Cross examining children with a mean of 2.3421.

4.3.3 Relationship Between the Duration of Classroom Activity and Mathematics Competency

The study sought to know the relationship between the duration of classroom activity and mathematics competency. Table 4.9 shows the distribution of teachers' responses on the relationship between the duration in introduction and conclusion of classroom activity and mathematics competency in the classrooms.

Table 4.10:duration in introduction and conclusion of classroom activity

The relationship between the duration in introduction and conclusion of classroom activity and mathematics competency in the classrooms

	Introduction		Conclusion	
	Frequency (F)	Percentage (%)	Frequency (F)	Percentage (%)
Less than 2 minutes	5	15.0	4	10.0
2 to 5 minutes	11	65.0	11	70.0
More than 5 minutes	4	20.0	5	20.0
Total	20	100.0	20	100.0

From the results in the table above, only 15.0% and 10.0% of the respondents indicated that the duration of less than 2 minutes in introduction and conclusion influences classroom activity on mathematics competency among pre-school children. Majority of them, (65.0%) and 70.0% indicated that the duration of 2 to 5 minutes in introduction and conclusion influences classroom activity on mathematics competency among pre-school children respectively. Only 20.0% of them were in support that the duration of more than 5 minutes influences classroom activity in mathematics competency. This indicates that most teachers were within the stipulated timing.

The respondents were further asked to indicate the relationship between the duration in Lesson step one and two of classroom activity and mathematics competency in the classrooms. Table 4.10 shows Distribution of teachers' responses on the relationship between the duration in Lesson step one and two of classroom activity and mathematics competency in the classrooms.

Table 4.11:Lesson step one and two of classroom activity and mathematics competency in the classrooms

Relationship between the duration in Lesson step one and two of classroom activity and mathematics competency in the classrooms

	Lesson presentation step 1		Lesson presentation step 2	
	Frequency (F)	Percentage (%)	Frequency (F)	Percentage (%)
Less than 10 minutes	4	10.0	6	10.0
10 to 15 minutes	9	49.8	9	49.8
More than 16 minutes	7	40.2	7	40.2
Total	20	100.0	20	100.0

Only 10.0% of the respondents indicated that the duration of less than 10 minutes in lesson presentation step 1 and Lesson presentation step 2 influences classroom activity on mathematics competency. Slightly less than half, (50.0%) of them indicated that the duration of less than 10 to 15 minutes in lesson presentation step 1 and step 2 influences classroom activity on mathematics competency. 40.2% of them were in support that the duration of more than 16 minutes either in lesson presentation step 1 and Lesson presentation step 2 influences classroom activity in mathematics competency.

The respondents were also asked to indicate the extent to which the duration of classroom activity of mathematics activities affects preschool children's competency in mathematics. Figure 4.8 shows the distribution of responses on the extent to which the duration of classroom activity of mathematics activities affects preschool children's competency in mathematics.

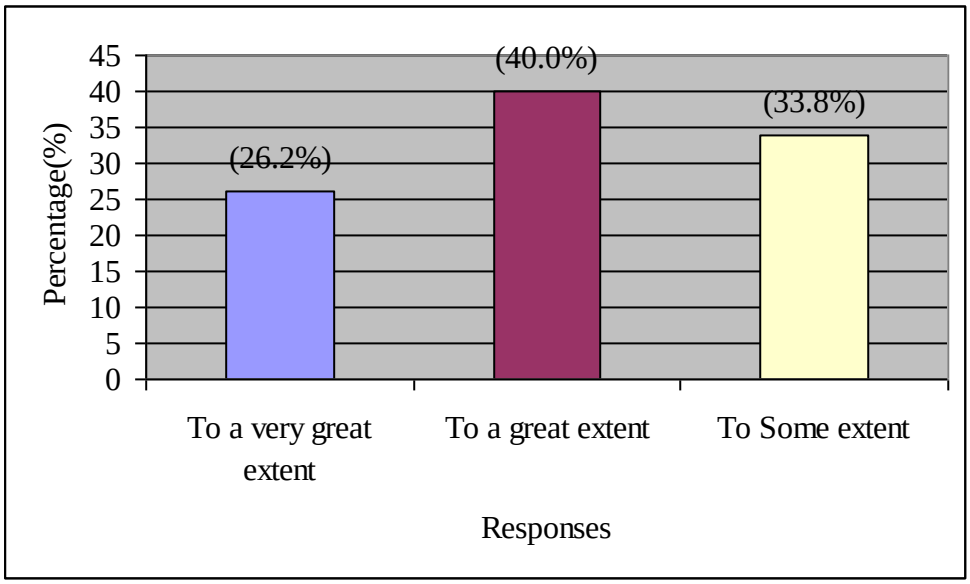


Figure 4.5: Distribution of responses on the extent to which the duration of classroom activity of mathematics activities affects preschool children's competency in mathematics

Majority of the respondents, (66.2%) who took part in the study indicated that the duration of classroom activity of mathematics activities affects preschool children's competency in mathematics either to a very great extent or to a great extent. Slightly more than a quarter of them, (33.8%) were in support that the duration of classroom activity of mathematics activities affects preschool children's competency in mathematics to some extent.

4.3.4 Teachers' Perception on the Suitability of Mathematics Activities to the Preschool Children

The study sought to know perception of teachers on the suitability of mathematics activities to the preschool children. The table 4.11 shows the distribution of the teachers by length of service

Table 4.12: Perception of teachers on the suitability of mathematics activities to the preschool children

Perception of teachers on the suitability of mathematics activities to the preschool children		
Statement	**Mean**	**Standard deviation**
Constructivists	4.4321	0.9876
Psychological	4.3657	0.6754
Logical thinking	3.4351	0.3426
Spotting patterns	2.6549	0.7659

The respondents agreed that constructivists was perceived of teachers on the suitability of mathematics activities to the preschool children with a mean of 4.4321 followed by those who agreed that psychological perceived of teachers on the suitability of mathematics activities to the preschool children with a mean of 4.3657. The respondents moderately agreed that Logical thinking was perceived of teachers on the suitability of mathematics activities to the preschool children with a mean of 3.4351. The respondents disagreed that spotting patterns was perceived of teachers on the suitability of mathematics activities to the preschool children with a mean of 2.6549.

The respondents were also asked to indicate the extent to which the Perception of teachers on the suitability of mathematics activities influences preschool children's competency in mathematics. Figure 4.9 shows the distribution of teachers' Perception on the suitability of mathematics activities on preschool children's competency in mathematics.

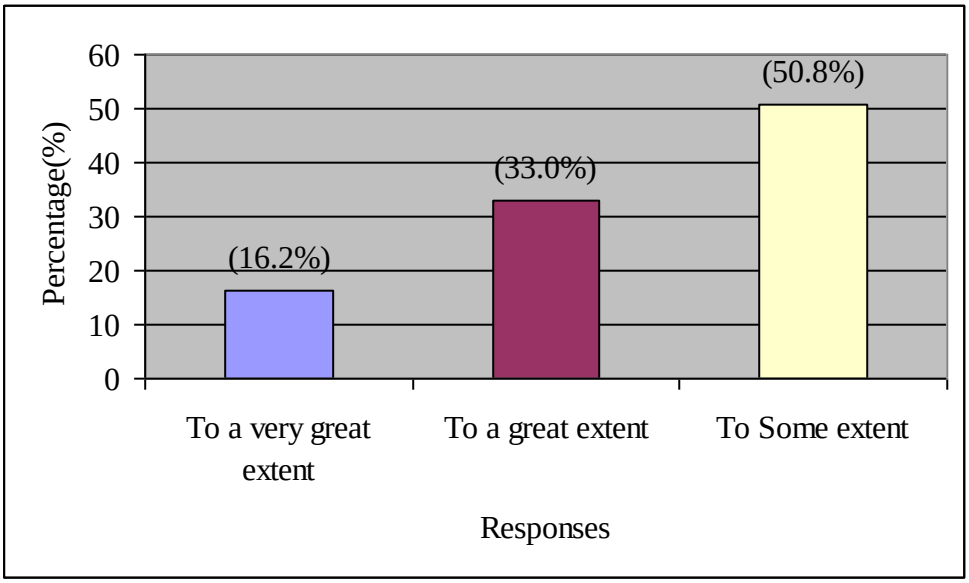


Figure 4.6: Distribution of teachers' Perception on the suitability of mathematics activities on preschool children's competency in mathematics

Majority of the respondents, (66.2%) who took part in study indicated that teachers' Perception on the suitability of mathematics activities on preschool children's competency in mathematics either to a very great or to a great extent. A third of them, (33.0%) felt that teachers' Perception on the suitability of mathematics activities on preschool children's competency in mathematics to some extent.

4.4 Regression Analysis

The purpose of this study is to find out whether learner classroom activities have influence on developing mathematics competencies among the preschool children .The research findings indicated that there was a positive relationship between the variables.

Table 4.13: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.918(a)	.843	.805	.51038	.843	1.242	4	104	.000

Predictors: (Constant), Classroom Activities, Type of activity, Duration of Classroom Activity and Teachers' Perception

Dependent Variable: Developing mathematics competencies

Analysis in table 4.9 shows that the coefficient of determination (the percentage variation in the dependent variable being explained by the changes in the independent variables) R2 equals 0.843, that is, Classroom Activities, Type of activity, Duration of Classroom Activity and Teachers' Perception only 15.7 percent unexplained. The P-value of 0.000 (Less than 0.05) implies that the model Developing mathematics competencies is significant at the 5 percent significance. From the regression model, a correlation coefficient value of 1 was established. This portends a very good linear relationship or dependence of Developing mathematics competencies

Table 4.14: Analysis of Variance ANOVA

	Sum of Squares	**Df**	**Mean Square**	**F**	**Sig.**
Regression	2431.678	6	1215.839	2.661	.0081a
Residual	19650.235	104	456.982		
Total	**22081.913**	**110**			

Source: Researcher (2014)

Predictors: (Constant); Classroom Activities, Type of activity, Duration of Classroom Activity and Teachers' Perception

Dependent Variable: Developing mathematics competencies

Analysis of Variance was used to test the significance of the regression model as pertains to significance in the differences in means of the dependent and independent variables. The ANOVA test produced an f-value of 2.661 which was significant at 0.05 significance level ($p = 0.081$). This depicts that the regression model is significant at 95% confidence level; that is, has 0.81% probability of misrepresentation.

Table 4.15: Regression Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	16.369	4.542		3.604	.001
Classroom Activities	.472	.215	-.316	-2.193	.004
Type of activity	.305	.097	.402	3.145	.002
Duration of Classroom Activity	.071	.093	.091	.760	.000
Teachers' Perception	.486	.009	0.67	0.567	0.000

Source: Researcher (2015)

The model was used to whether learner classroom activities have an influence on developing mathematics competencies

The Regression Model is as follows:

$$PERF = \beta_0+\beta_1 A + \beta_2 B + \beta_3 C+ \beta_4 D + \varepsilon$$

Positive effect was reported for developing mathematics competencies (β= .010). A positive effect was reported for all variables. The variables tested include Classroom Activities .472, Type of activity (.305) Duration of Classroom Activity (.305) and Teachers' Perception (.071).

4.4 Discussion of the Findings

This section presents the discussion of the findings. The discussion entails the key findings which are made in this study and they are interlinked with the findings obtained in other studies reviewed in the literature review section.

Teachers used several methods of teaching mathematics. The three used method were mentioned as follows; 13 (65%) of the preschools teachers used thematic method of teaching mathematics. Four preschools teachers used child centered method of teaching mathematics. Three teachers used exploration method of teaching the mathematics to the children of preschool. These methods had different efficiencies, 4 (20%) of the preschools teachers found their methodology very effective, 10 (50%) of the preschools teachers found their methodology effective. six preschools teachers planned mathematics activities according to teaching materials, 5 (25%) of the preschools teachers found their methodology not effective, Only one teacher found the method not effective.

In planning mathematics activities teachers had some challenges. These included of enough resources in the school mentioned by 9 (45%) of the preschools teachers. Six and five teachers commented that there was lack of cooperation from the other teachers and lack of enough time respectively. Use of concrete materials was mentioned as important in mathematics activities. Six (30%) of the preschools teachers indicated that manipulatives are important in encouraging discussions among children. The method was found by 7 (35%) to help the teacher know the appropriate next step in teaching the pupil. Four teachers commented that concrete materials made children own their work. Then use of concrete materials also gives the teacher the picture of pupil level in class.

Interaction is important aspect in children learning. Eight (40%), of the preschools teachers indicated that they interacted with children mostly during small discussion grouping. Snacks and meals, during art and modeling and singing were mentioned by 5 (25%), 3 (15%) and 4 (20%) respectively. This was done together with grouping. Eight (40%), of the preschools teachers indicated that use grouping children improves their social status. Seven teachers sited that grouping will help weak students learn from their mates. Five teachers said that grouping will bring about competition within students.

The study investigated the importance of considering developmental stages before giving children an activity. Nine (35%), of the preschools teachers indicated that children in preschool needed time for play, another 7 (35%) said children needed time for sleep and another 20% said children should be given time to relax not to get fatigue. Eight (40%), of the preschools teachers indicated that doing activities together is main way of tutoring. Holding discussion and grading children was mentioned by 25%. Another tutoring method was cross examining children.

The study sought to investigate perception of teachers on the suitability of mathematics activities to the preschool children. Nine (45%), of the preschools teachers indicated that constructivists perception is main. Six teachers said psychological while 4 (20%) said mathematics is logical thinking. Only one teacher termed mathematics as spotting pattern.

Building on the learning theory work of Piaget and Bruner, a solid history of research supports the regular use of manipulatives in classroom mathematics instruction. While children can remember, for short periods of time, information taught through

books and lectures, deep understanding and the ability to apply learning to new situations requires conceptual understanding that is grounded in direct experience with concrete objects. It is also important to note the critical role of the teacher in helping children connect their manipulative experiences, through a variety of representations, to essential abstract mathematics. Together, excellent teachers and regular experiences with hands-on learning can provide children with powerful learning in mathematics

Manipulatives are a powerful tool for supporting classroom assessment. The literature review by Black & Wiliam (1998) found that formative assessment practices yielded effect sizes of one-half to one full standard deviation. More importantly, "improved formative assessment helps low achievers more than other children and so reduces the range of achievement while raising achievement overall. In other words, formative assessment increases pupil learning substantially while reducing achievement gaps. There are many definitions of formative assessment. Stiggins' (2005) description suggests the critical element – teachers use classroom assessment to make changes in instruction in real time to result in real increases in learning.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter contains the summary, conclusions and recommendation on the influence of learner classroom activities on mathematics competency among preschool children in Lower Yatta Sub County, Kenya. The summary contains key findings, conclusions and recommendations are based on the research objectives and the key findings respectively.

5.2 Summary

The main purpose of this study was to investigate the influence of learner classroom activities on mathematics competency among preschool children in Lower Yatta Sub County, Kenya. This was achieved through investigating the following for specific objectives; to observe classroom activities used towards developing mathematics competency, to investigate relationship between type of activity and children's competency in mathematics, to determine relationship between the duration of classroom activity and mathematics competency and to investigate the teachers' perceptions on usefulness of learner activities towards mathematics competency.

The study employed a mixed research design. The target population of the study consisted of all final (4th) students from all the eight (8) faculties and the staff members who are posted in the library section. Simple random sampling procedure was used to select at least 10% of the target population in the sampled faculties. One hundred students were targeted but only eighty took part in the study. Questionnaires were used to collect

data from the selected sample. The collected data was analyzed using descriptive statistics, employing both quantitative and qualitative approach. Data from questionnaires was purely analyzed quantitatively and presented in frequencies and percentages.

5.3 Conclusions

From the findings of the study the are various conclusions which have been drawn. They are presented based on the research objectives.

Teachers used several methods of teaching mathematics. The three used method were mentioned as follows; use of thematic method of teaching mathematics. child centered method of teaching mathematics and exploration method of teaching the mathematics to the children of preschool. These methods had different efficiencies, 4 (20%) of the preschools teachers found their methodology very effective, 10 (50%) of the preschools teachers found their methodology effective. six preschools teachers planned mathematics activities according to teaching materials, 5 (25%) of the preschools teachers found their methodology not effective, Only one teacher found the method not effective.

In planning mathematics activities teachers had some challenges. These included of enough resources in the school mentioned by 9 (45%) of the preschools teachers. Six and five teachers commented that there was lack of cooperation from the other teachers and lack of enough time respectively. Use of concrete materials was mentioned as important in mathematics activities.

Interaction is important aspect in children learning. Eight (40%), of the preschools teachers indicated that they interacted with children mostly during small discussion

grouping. Snacks and meals, during art and modeling and singing were mentioned. This was done together with grouping.

Some of activities used by teachers to improve children performance included; grouping children and tutoring. In addition, manipulatives are a powerful tool for supporting classroom assessment. More importantly, “improved formative assessment helps low achievers more than other children and so reduces the range of achievement while raising achievement overall.

Duration of classroom mathematics activities was related to the children’ mathematics competency. The study also found that it is very important to consider developmental stages before giving children an activity.

Most of teachers’ perceptions on usefulness of learner activities towards mathematics competency were guided by constructivists and psychology. While children can remember, for short periods of time, information taught through books and lectures, deep understanding and the ability to apply learning to new situations requires conceptual understanding that is grounded in direct experience with concrete objects. It is also important to note the critical role of the teacher in helping children connect their manipulative experiences, through a variety of representations, to essential abstract mathematics. Together, excellent teachers and regular experiences with hands-on learning can provide children with powerful learning in mathematics

5.4 Recommendations

From the findings in the study the following recommendations were made:

In order to implement formative assessment well, three are particularly well-supported by manipulative-based instruction: classroom activities and learning tasks which elicit evidence of learning, activating learners as instructional resources for one another, and activating learners as owners of their own learning. In all three cases, by actively engaging children in the doing of mathematics, manipulatives provide a foundation which encourages discussion and pupil ownership of their work. This provides teachers with a vivid current picture of pupil understanding and guides teachers in determining appropriate next steps.

In order to develop every pupil's mathematical proficiency, leaders and teachers must systematically integrate the use of concrete and virtual manipulative into classroom instruction at all grade levels. This position is based on research supporting the use of manipulative in classroom instruction.

Finally, teachers should decisively involve concrete material in their classes in order to improve children' competence in mathematics. Children will improve their competence in mathematics when the teachers have high level of interaction with them.

5.5 Recommendations for Further Study

1. Influence of parents' socio- economic status of their parent on the efficiency of pre-school children

2. Factors influencing pre-school children's competency in mathematical operations

REFERENCES

Ball, D. (2008). "Content knowledge for teaching: What makes it special?" *Journal of teacher Education, 59(5),* 389 – 407

Beach, L. & Marshall (1993). "*Study guide for psychology*" New York. Holdrenehart

Bednar, A. K., Cunningham, D., Duffy T. M. & Perry J. D. (1995). *Instructional Technology: Past, present and future*. Englewood, co: Libraries Unlimited, pp 100-112

Bereiter, C. & Scardamalia, M. (1996). *Rethinking learning: The handbook of education and human development - New models of learning, teaching and schooling*. 1, 485-513.

Blocksma, M. (1989). "*Reading the numbers, a survival guide to the measurements, numbers and sizes encountered in everyday life*." New York: Penguin Books.

Bruner, J. S. (1980). "*Learning how to do things with words" Human Growth and Development* (pp. 62-84). Oxford: Clarendon Press

Butter, M. (1989) "*Knowledge utilization systems in education*" Beverly Hills, United Kingdom. Sage Publishers

Campbell, P.F. (1999). "*Fostering each child's understanding of mathematics*" New York: Teachers College Press.

Clement, D. & Sarama, J. (2009). "*Learning and teaching early math*" The learning trajectories approach. New York: Routledge

Cobb, P., & Hodge, L.L. (2002) "*A relational perspective on issues of cultural diversity and equity as they play out in the mathematics classroom*." Mathematical thinking and learning, 4, 249-284.

Dewey, J. (1902) "*The child and the curriculum" Educational psychology*, New York: Putnams. 373 pp

Duncan, G. J. et..al (2007). *"School readiness and later achievement" Developmental Psychology*, 43(6), 1428 – 1446

Engle, P. (2006). "*Comprehensive policy implications of child rights in Unicef, United Nations Committee on the Rights of the Child"*, Bernard van Leer Foundation (Eds) A guide to general comment 7: 'Implementing child rights in early childhood'

Eshiwani, G. (1985). "The Kenya Teacher in the 1990s, some reflection on training and professionalism." Kenyatta University College. Bureau of Educational Research.

Gichuba, C. Opasta & Nguchu, R. (2009). "*General methods of teaching young children and material development*", Little birds ECDE Teacher Education, Longhorn Publishers, Nairobi

Ginsburg, H. (2003). "*Young American and Chinese children's everyday mathematics activity. Mathematics Thinking and Learning*", pp. 5(4), 235 – 258

Ginsburg, H. (2008). "Knowing the mathematics in early childhood mathematics" Charlotte, NC: Information Age Publishing.

Gottfredson, L.S. (1996). "*Gottfredson's theory of circumscription and compromise.Carrer choice and development; applying contemporary approaches to practice",* (3rd ed., pp. 179-232) .San Francisco: Jossey-Bass

Greeno, T. (1984) "*Young children's counting and understanding of principles. Cognitive Psychology"*pp. 10, 94 – 143

Heddens, J.W. & Speer, W.R. (2001). "*Today's mathematics concepts and classroom*

methods" New York: John Willey & Sons.

Hein, G. (1991). "*Constructivist Learning Theory*", International Committee of Museum Educators Conference, Jerusalem, Israel, 15-22 October. <http://www.exploratorium.edu/IFI/resurces/constructivistlearning.html>

Holt, K. S. (1991). "*Child development diagnosis and assessment*". London: Elsevier Science and Technology Books.

Jacinta, M. & Regina, M. (1981). "*Primary methods Handbook*" London: Hodder and Stroughton Ltd.

Kenya Institute of Education (2000). "*Early childhood development teacher's in-service education syllabus."* Nairobi. Kenya.

KIE (2008) "*Handbook for Early childhood development syllabus*". Nairobi: KIE

KIE (2008) "*Kenya Preschool Teachers Activity Guide Series: Mathematics and Environmental Activities*". Nairobi: KIE

Klein, M. (2000). "*Teaching mathematics against the grain. Investigation for primary teachers.*" Australia: Social Science Press

Kombo, D.K. & Tromp, D.L.A. (2006). "*Proposal and Thesis writing*" Nairobi: Paulines Publications Africa.

Leedy, P.D. (1980). "*Practical research: planning and design*". New York. Macmillan Publishing Co. Inc.

Levin-Rozalis, M. (2006). "*Using projective techniques in the evaluation of groups for children of rehabilitating drug addicts*". Issues in Mental Health Nursing pp. 27(5), 519-536

Lipton, J.S. & Spelke, E.S. (2003). "*Origins of number sense*". Psychological science, 14, 396-401

Mugenda, O, M & Mugenda A.G. (2003) "*Research Methods*" Nairobi: Acts Press

Mwangi, M. "*Mathematics Activities, Little Birds ECDE Teacher Education*" Longhorn Publishers, Nairobi

Perry, B. & Dockett, S. (2002). "*Young children's access to powerful mathematical ideas*." Mahwah, NJ: Lawrence Erlbaum.

Piaget, J. (1983) "*Piaget's Theory*" in Mussen, P.H. (Ed.), "*Handbook of Child Psychology"* (4^{th}ed.). Kessen, W. (ed.), History, Theory and Methods (1: 103-128) New York: John Wiley and Sons

Ontario Ministry of Education (2003) "*Early maths strategy. The report of the Expert Panel on Early math in Ontario*", Toronto: Queen's printer for Ontario

Oso, W.Y. & Onen, D. (2009). "*A general guide to writing research proposal and report*" The Jomo Kenyatta Foundation, Nairobi

Taiwo, C.W. (1974). "*Education in the commonwealth: Number Ten Mathematics Teaching in schools*". Lagos. Commonwealth Secretariat

Twoli, N. (2007). "*Instructional methods in Education; A course book for general teaching methods.*" KIE, Nairobi Kenya

Vygotsky, L.S. (1934) "*Problems of general psychology*" New York: Plenium Press.

Walshaw, M. (2004). "A powerful theory of active engagement" For the Learning of Mathematics, 24(3), 4-10.

Wambiri, G. (2005). "*Introduction to science and mathematics in Early Childhood*." Open learning module. Nairobi: Kenyatta University

Winkins, E. (1975). “Education in practice: a handbook for teachers”. London. Evans Brothers Ltd. Young. M.E. (1996). Proceedings of a world bank conference on Early Childhood Development

APPENDICES

Appendix I: Questionnaire for the Preschool Teacher

Dear Respondents,

I am a Masters of Education student at the University of Nairobi. I am conducting a Study to examine the influence of learner classroom activities on mathematics competency among preschool children in Lower Yatta Sub County, Kenya. You have been selected to take part in this study. I would be grateful if you would assist me by responding to all items in the attached guide. Your name does not need to appear anywhere in this questionnaire, the information will be kept confidential and will be used for academic research purpose only. Your co-operation will be greatly appreciated.

Thanks in advance.

Section I: Demographic Information

(Tick in the spaces provided appropriately)

1. Sex

a) Male [ ]

b) Female [ ]

2. Age:

a) 20 – 29 years [ ]

b) 30 – 39 years [ ]

c) 40 – 49 years [ ]

d) 50 and above [ ]

3. Level of education:

a) KCPE/CPE [ ]

b) KCSE/KCE [ ]

c) UNIVERSITY [ ]

4. Professional Qualification

a) ECD Certificate [ ]

b) ECD Diploma [ ]

c) P1 Certificate [ ]

d) B.ED / ECE [ ]

5. Length of Service

a) 5 years and below [ ]

b) 6-10 years [ ]

c) 11-15 years [ ]

d) 16-20 years [ ]

e) 20 years and above [ ]

SECTION B: Classroom Activities Used Towards Developing Mathematics Competency.

6. Indicate the method you use in teaching mathematic in your school

a) Child centred [ ]

b) Thematic [ ]

c) Exploration [ ]

7. How effective are the teaching method of mathematics in your school?

a) Very Effective [ ]

b) Effective [ ]

c) Not Effective [ ]

d) Poor [ ]

8. How do you plan the mathematics activities of the day?

a) According to theme [ ]

b) According to sub-theme [ ]

c) Teaching materials [ ]

9. What do you think is the importance of using concrete materials in mathematics activity?

Encourages discussion	
Helps teacher know the appropriate next step	
Pupil ownership of their work	
Gives teacher picture of pupil level	
Any other specify_____	

10. How do other classroom activities were integrated with mathematics?

Songs	
Art drawing	
Map making	
Blowing bubbles	
Any other specify_____	

11. How do teachers interacted with children in the classroom?

Snacks and meals	
Small discussion grouping	
Art and modeling	
Singing and reciting	
Any other specify_____	

12. What is the importance of grouping children?

A way of making children social	
Enables weak children to learn from their mates	
Encourages competition	
Any other specify_____	

13. What challenges do you think a teacher can face when planning for the daily classroom activities?

Lack of enough resources	
Lack of cooperation from the other teachers	
Lack of enough time	
Any other specify_____	

14. Does the type of activity influences children's' competency in mathematics?

a) Yes [ ]

b) No [ ]

15. How do teachers conduct peer tutoring among children?

Holding open discussions	
Doing activities together	
Grading children	
Cross examining children	
Any other specify_____	

SECTION C: Relationship Between the Duration of Classroom Activity and Mathematics Competency

16. Indicate how duration of classroom activity under introduction and conclusion affects mathematics competency among children

	Introduction	Conclusion
Less than 2 minutes		
2 to 5 minutes		
More than 5 minutes		

17. What is the relationship between the duration in Lesson step one and two of classroom activity and mathematics competency in the classrooms?

Lesson step 1 **Lesson step 2**

Less than 5 minutes

5 to 10 minutes

More than 10 minutes

18. To what extent does the duration of classroom activity of mathematics activities affects preschool children's competency in mathematics?

a) To a very great extent [ ]

b) To a great extent [ ]

c) To Some extent [ ]

SECTION D: Teachers' Perception on the Suitability of Mathematics Activities to the Preschool Children

What is your perception about the suitability of mathematics activities to the preschool children?

Constructivists	
Psychological	
Logical thinking	
Spotting patterns	
Any other Specify_____	

To what extent does the perception of teachers on the suitability of mathematics activities influences preschool children's competency in mathematics?

a) To a very great extent [ ]

b) To a great extent [ ]

c) To Some extent [ ]

Appendix II: Observation Schedule for Classroom Activities

(Tick in the spaces provided appropriately)

1. Name of preschool _____
2. Type of school
   a) Public [ ]
   b) Private [ ]
3. Theme_____
4. Sub-theme _____
5. Teachers preparation

Activity	**Available**	**Not available**
a) Scheme of work		
b) Lesson plan		

SECTION A: DURATION OF ACTIVITIES AND MATHEMATICS COMPETENCY

Steps in lesson development		**Time allocated in minutes**	**Time spend during the activity**
Introduction		5 minutes	
Lesson presentation	Step 1	10 minutes	
	Step 2	10 minutes	
Conclusion		5 minutes	
TOTAL		**30 minutes**	

SECTION B: TYPE OF ACTIVITY AND MATHEMATICS COMPETENCY

(Mark √ or – or X as appropriate)

Activity used	**Steps in lesson development**				
		Lesson presentation			
	Introduction	**Step I**	**Step II**	**Conclusion**	**Total**
Enactive / Manipulatives					
Iconic / Pictures or diagrams					
Symbolic / drill or lecture					
Games / Play					
Poems / Songs					
Any other					

KEY:

√ Most used

– Moderately used

X Not used

Appendix III: A Test to Quantify Mathematics Competencies

(Tick in the spaces provided appropriately)

School: _____

Type of school: Public ☐ Private ☐

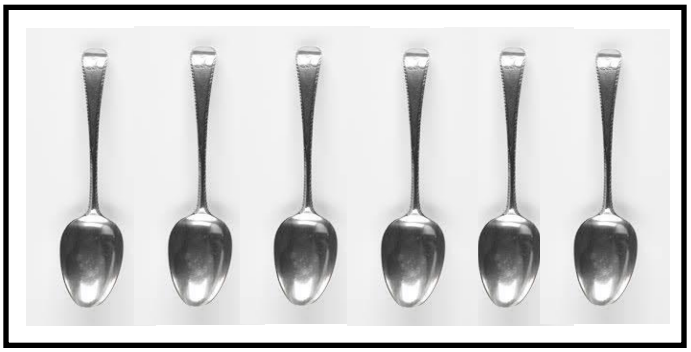
Child Name: _____

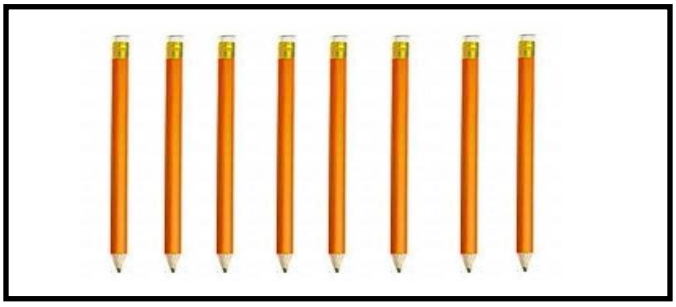
1. Match numbers with words

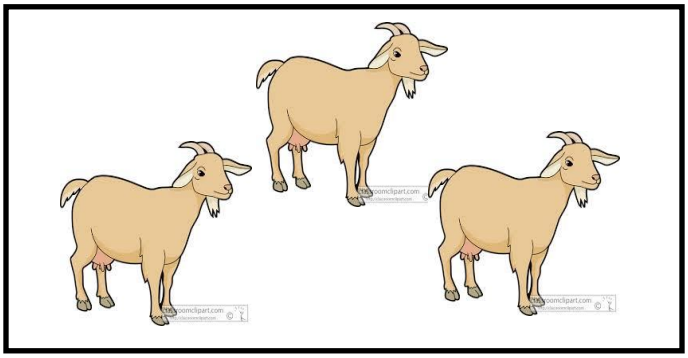
1	Three
5	Four
3	Two
2	Five
4	One

2. Number value and number symbol

(Count and match the box to its number)







8

3

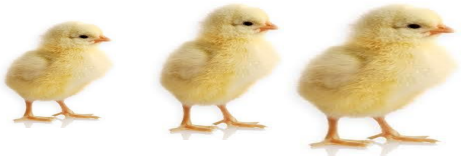
4

6

2

3. Ordering

(Tick the next one in each group)



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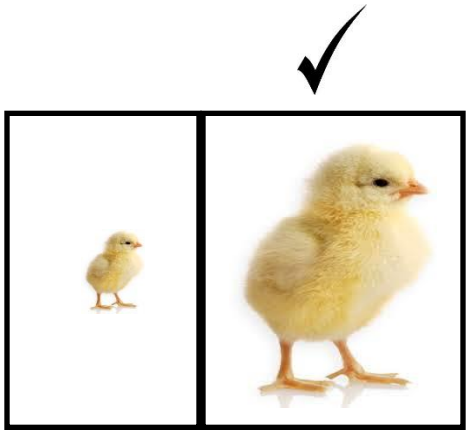

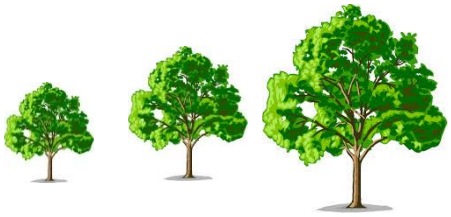

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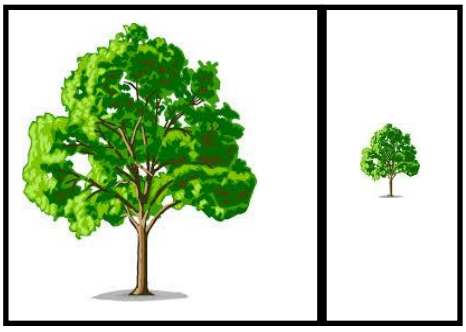

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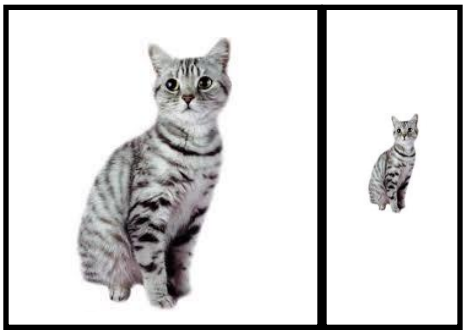

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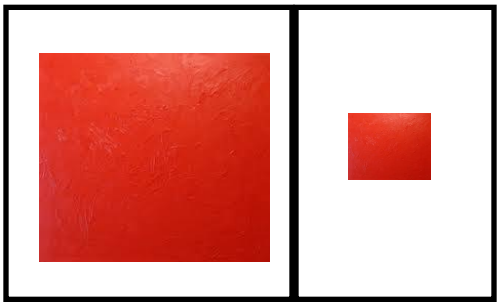
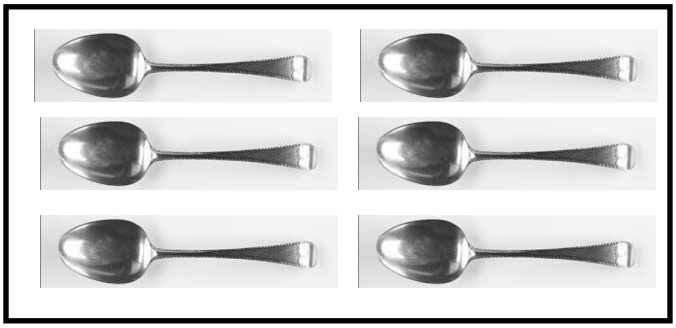
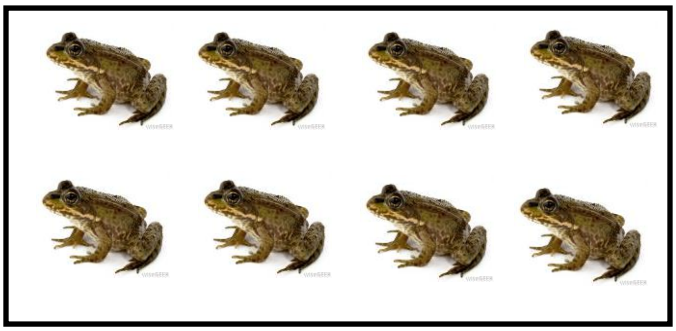


4. Counting

(Count and tick (√) the correct number)



5	✓ 6



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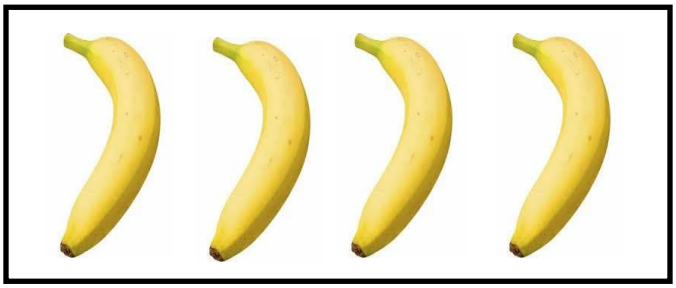
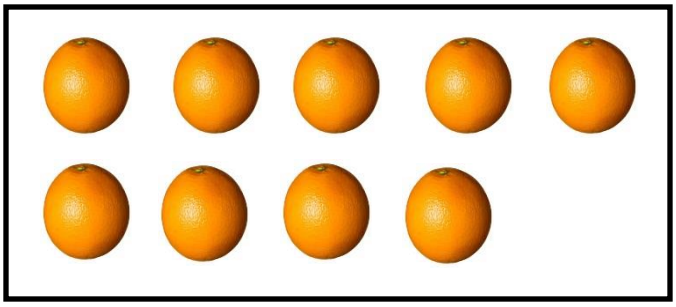
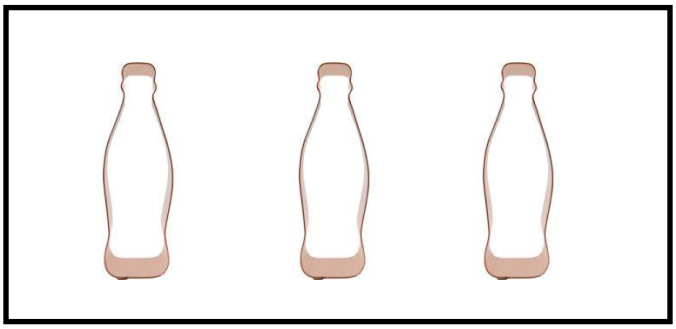


2	4



9	7

5	3



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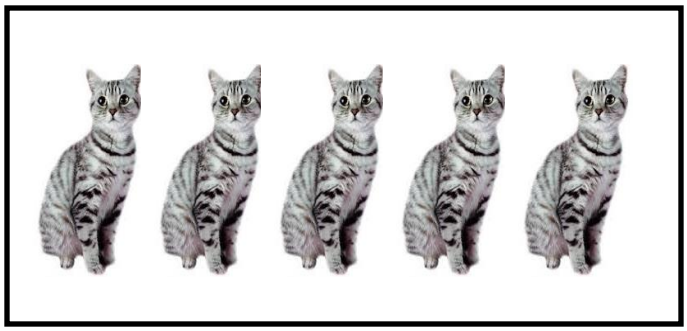
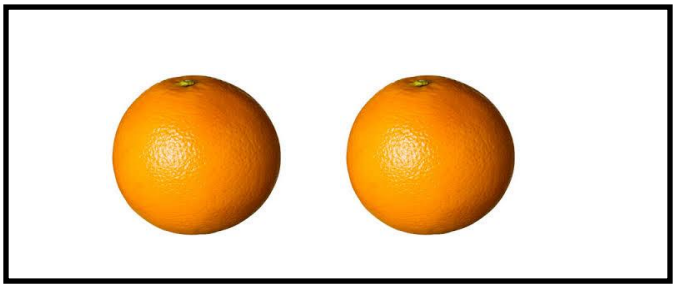
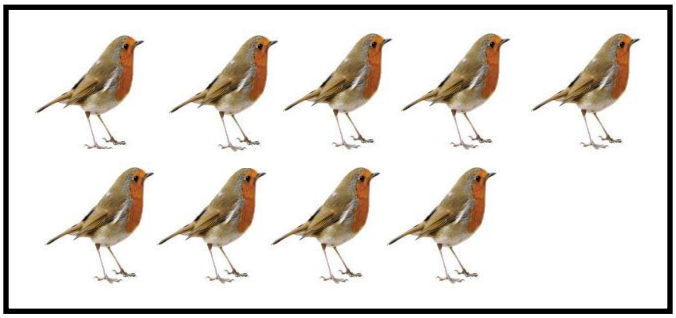
3	4	1



8	5	3



2	3	6



1	4	9

2	4	6