

EFFECT OF CLASSROOM ENVIRONMENT ON
ACADEMIC PERFORMANCE IN MATHEMATICS OF
PRESCHOOL CHILDREN IN PIONEER ZONE, UASIN
GISHU COUNTY, KENYA

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A Research Project submitted in partial fulfillment of the requirements for the award
of Masters Degree in Early Childhood to the Department of Educational
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DECLARATION

Declaration by the candidate:

This research project is my original work and has not been presented for academic purpose in any institution of higher learning.

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Signed..... Date.....

Declaration by the supervisor:

This research project has been submitted for examination with my approval as university supervisor.

Prof. Patrick Obonyo Digolo

Supervisor

Signed..... Date.....

ABSTRACT

This is a research project on the effect of classroom environment on mathematics performance of preschool children within pioneer zone, Uasin Gishu County, Eldoret.

Classroom environment influences the performance of mathematics among preschool children. It affects the children socially, physically, emotionally and mentally.

Poor performance in mathematics is contributed mainly by the government's reluctance in contributing towards the development of early childhood education in Kenya, particularly in the constructions of recommended sized classrooms and provision of inspection and quality service.

In carrying out her study the researcher used the survey design method to gather data required to perform the research project. This method is appropriate since it uses a representative sample of the targeted population since everybody in the population may not be accessed. The research findings established that pupil's text book ratio and the classroom size were the major contributors to poor performance in mathematics within pioneer zone.

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In order for the researcher to succeed in her research work, one needs sufficient time, concentration and support from those around her.

The researcher wishes to acknowledge the contributions of all those who took part in one way or the other in her research work. However, the following deserve mention for their major contributions to this research work.

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Secondly, to my immediate family members for the moral, financial and social supports during the entire project study. Particularly, my husband who spent time to type and edit this work as well as sourcing the required information from the internet.

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DEDICATION

This research study is dedicated to my dear husband and my beloved children.

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ACRONYMS & ABBREVIATIONS

ANPPCAN	African Network for the Prevention and Protection against Child Abuse and Neglect
ECD	Early Childhood Development
ECDE	Early Childhood Development and Education
IAQ	Internal Air Quality
KESSP	Kenya Education Sector Support Programme
KIE	Kenya Institute of Education
MOE	Ministry of Education
MOEST	Ministry of Education Science and Technology
NACECE	National Centre for Early Childhood Education
NGO	Non-Governmental Organization
UNICEF	United Nations International Children’s Emergency Fund
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.1 Introduction

This section presents the background to the problem, statement of the problem, purpose of the study, objectives of the study, the research questions, the significance of the study, limitations and delimitations of the study, basic assumptions and definition of key terms.

1.2 Background to the problem

According to ANPPCAN (2005) many children learn in classrooms which are ill equipped and sometimes dilapidated, some have no roofs, windows, doors, walls and even floors. Disparities exist between private and public ECDE centers in terms of standards and facilities available to preschoolers which in turn affect performance in mathematics. According to Anna K. et al (2002), learning to Guide Preschool Children's Mathematical Understanding: A Teacher's Professional Growth, creating an environment that is mathematically empowering and mediating children's experiences in this environment establish the foundation for constructing, modifying, and integrating mathematical concepts in young children.

There is a growing awareness that mathematics skills in preschool and beyond are influenced by the formal and informal mathematics skills acquired in the preschool classroom. Indeed, policy makers, researchers and educators are now arguing that preschool mathematics instructions must be recognized as a critical factor affecting young children's mathematics learning at school age (Ginsburg, Lee and Boyd, 2008).

Mathematics is considered as a core subject in Kenya's formal curriculum in all stages of learning. Most believe that even preschool children should start learning

mathematics. However, the debate remains whether children should be formally taught and expected to solve specific problems or learn the basics through play and basic instruction. In an article by Klibanoff et al (2006), it is explained that early intervention programs have a positive on children's math achievement. Therefore, all children enrolled in a preschool are befitting from attending a high quality and children program.

When I was posted to Oasis Primary school in the beginning of 2010, the preschool children were studying under torn canvas tents initially donated by UNICEF as a result of 2007-2008 post election violence that rocked most parts of Rift Valley. The preschool children were using desks meant for standard four (4) to eight (8) pupils. Teachers & children learning in the tent classrooms often complained of headaches and coughing mainly caused by dust, poor ventilation resulting in poor air circulation and heat from the sun.

The Standard newspaper of February 10, 2012 page 20 & 21 carried out a story headlined "Getting education by any means". The story showed children learning in a structure without walls and pieces of sacks acting as a roof with the children sitting on the floor. The teacher has a child strapped to her back while teaching. No wonder the news reporter reported that, "here teaching is more than a calling". This is because the learning & teaching facilities are almost nonexistent and learning environment is hostile. The school lacked textbooks to run their programmes. This public school is located in Kuinet location, Uasin Gishu County.

Another story reported by the Standard newspaper of 30th May 2012 was that of Walala Primary school in Bungoma County headlined, "School on the rocks" since some of its classes were conducted under a huge rock. The rest learn under tents & trees. Here, pupils have to carry the chairs from home to school in the morning and back after classes. This is a tall task if a preschool child is also expected to do the

same. Such an environment is not conducive for learning since the children will arrive very tired and are exposed to harsh environment conditions which hinders proper learning activities.

These schools just represent many more schools with similar problems in Kenya. In effect, the envisaged basic education by the sessional paper no.1 of 2005 and Kenya education sector support programme (KESSP) (2005-2010) means is still a long way to be realized. Sessional paper no. 1 of 2005 had envisaged mainstreaming of early childhood education into basic education by the year 2010.

According to Whitbread (1999) learners learn and perform better when their classrooms are well organized to give enough space to the learners and provide arrangement of starting points for their ideas. Interactive displays in the preschool, collection of carefully selected resources, entice the learners to explore a wide range of ideas.

According to the Ministry of Education (MOE) (2001), performance among learners can be affected by learning resources on how they are distributed and utilized by learners in terms of availability, frequency of utilization, time allowed for their use and gender sensitivity of the resources.

Raising the levels of mathematics achievement requires an understanding on the factors that shape achievement as well as understanding how the identified factors operates to promote or inhibit the achievement of learners. One of the factors to consider is a conducive classroom environment that enhances learning.

1.3 Statement of the problem

Effects of classroom environment on performance of mathematics within Pioneer Zone were noted by the researcher on her posting to the zone. Due to displacement of thousands of families during this time, classes were conducted under very difficult circumstances for both the children and the teachers. Whereas this was a temporary

situation, it is a reality that there are many other schools carrying out learning under such difficult situations which affect negatively the performance of their pupils.

The lack of conducive classroom learning environment in the majority of preschool institutions continues to hinder proper achievement of quality education for all children, particularly in mathematics. There is no better illustration of the problem than what the Daily Nation (February 12, 2011) and the Standard Newspaper (February 10, 2012) reported, showing lots of children learning basically in torn tents and in the open with a teacher teaching with a child strapped on her back.

Mathematics for young children lays a foundation of the concepts and skills on which future learning and operations are built. Mathematics help children to make sense of their world outside school as well as helping them construct a solid foundation for later success in school work (Mwangi, 2009).

Hence, the need to look deeper into the effect of learning environment through research work with the aim of coming up with recommendations for the way forward in improving learning of mathematics in preschool institutions.

1.4 Purpose of the study

The purpose of the study will be to investigate the effects of classroom environment on the academic performance in mathematics of preschoolers within Pioneer Zone of Uasin Gishu County, Kenya.

1.5 Research objectives

The objective of this study will be:

- i. To establish the effect of instructional resources on the academic performance of preschool children in mathematics.
- ii. Find out the difference in performance of children in schools with high child-text book ratio and the schools with low child-text book ratio.

- iii. Determine the difference in academic performance in mathematics in preschools with adequate and appropriate furniture (seats) and those without.
- iv. To investigate whether there is any significant difference between the performance of pupils with adequate free air circulation in their classrooms and those without.

1.6 Null hypothesis

- i. There is no relationship between the availability of the instructional materials and mathematics performance in preschools.
- ii. Pupil text book ratio is not a factor in mathematics performance of preschool children.
- iii. There is no difference in mathematics performance between schools with appropriate and adequate furniture (seats) and those without.
- iv. There is no significant difference between mathematics performance of pupils with adequate air free circulation of air and those with inadequate circulation of air.

1.7 Significance of the study

The findings derived from this study will be of importance to the following:

Preschool Teachers-it will enable the preschool teachers to understand the importance of organizing the classroom for conducive learning.

The government-the findings will enable the government to formulate policies that will address the problems pertaining to classroom environment.

Administration-the findings will enable the school administrators to appreciate the magnitude of the problem and to devise ways, both short and long term to address the problems.

Donors and sponsors-the results of the study will help the donors and sponsors to know the existence of the problem and join in addressing the problems at hand.

Future research work-the research will provide food for thought to future researchers on the subject and may lead to further research on this area.

1.8 Limitations of the study

The researcher may probably encounter the following problems.

Possible lack of cooperation from the teachers, parents and administrators to provide relevant information necessary in arriving at the right conclusions for this research study.

1.9 Delimitation of the study

The study will be confined to Pioneer Zone of Eldoret Municipality, Uasin Gishu County. The study will involve preschool teachers, preschool children and school administrators of the selected schools. The study will cover sampled private and public preschools within the zone.

The reason for the selection is because of the condition in which I found the classroom when I was posted from a school in Nairobi to one in Eldoret Municipality where preschoolers were studying in tents erected on bare ground, with no windows, sanitary facilities and basic entrance/ exit points.

1.10 Basic assumptions

This study will be carried out in light of the following basic assumptions:

The preschoolers are taught mathematics using teaching learning resources.

Interviewees will cooperate and give full and correct information requested.

The sample picked will represent the population.

All the preschoolers within the zone have favourable classroom learning environment.

1.11 Definition of key terms

The following are definitions and explanations of the key terms related to the study:

Preschool - refers to the pre-primary education programme intended to introduce young children (age 3-6 years old) to the school environment. It is the foundation for learning and that basic attitudes are laid down during this stage.

Preschoolers - are young children from ages 3-6 years who need to be shown how to control and manage their intrinsic and extrinsic behavior.

Classroom – is a room in which teaching and learning activities take place.

The classroom provides a safe space where learning takes place uninterrupted by other distractions.

Environment - is the combination of internal and external physical conditions that affect and influence the growth and development of a preschooler as they learn.

Performance – results obtained by administering oral or written tests after learning activities.

Instructional resources – these are materials that are used by the teachers to aid them in the teaching of mathematics.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter, the study focuses on literature review on the influence of classroom environment on academic performance of pre- school children in \Pioneer zone, Uasin Gishu County, Kenya. The literature review will be undertaken under the following subtitle, namely.

- i. Instructional resources and academic performance.
- ii. Mathematics in preschool.
- iii. Pupil text book ratio and performance in mathematics.
- iv. Adequate and appropriate furniture and performance in mathematics.
- v. Role of the teacher in mathematics performance
- vi. Theoretical framework.
- vii. Conceptual framework.

2.2 The instructional resources and academic performance

According to N.W Twoli et al (2007) instructional materials, teaching resources, learning aids and audio visual aids are aids that teachers use to assist learning and also increase interest of learners in the learning process. Teachers use resources to enhance learners' participation in class for effective learning.

Instructional materials have been defined by various authors. For example, Obanya (1989) viewed them as didactic materials thing which are supposed to make learning possible. Ikerionwu (Isola, 2010) referred to them as objects or devices, which help the teacher to make a lesson much clearer to the learners.

According to Oladejo, Maruff A. (PhD) et al (2011) there is a significant difference in the achievement of children taught using instructional resources, those taught

using instructional material obtained highest achievement scores. The same observation was also made by Momoli Isola (2010).

According to N.W Twoli et al (2007) for other children, learning is more effective if they look at objects, observe a process or watch people doing some work. Yet for others sounds and feeling such as those from the radio, television, movies and talks by resource persons make their learning easier.

Hall and Paulucci (1970), concluded that the use of audio visual materials will not ensure effective learner learning automatically. The teacher should learn how to select material carefully, preview and use them effectively. In addition, the materials should only be used when and where possible to realize performance in the classroom. When resources are presented to the class they only be accompanied by clear explanation or suggested study guide.

According to Hallack (1990), the availability, relevance and adequacy of educational resource items contribute to academic achievement and that unattractive school buildings, crowded classrooms, non-availability of playing ground and surrounding that have no aesthetic beauty can contribute to poor performance, Fuller (1985) discovered that children who had use or two or more books were almost three times better than those who had no textbooks in school in their performance.

Montessori (1952) stated that the learner should be provided with a rich and suitable environment in the classroom where the child would be free to move and play.

Eshwani (1983) states that difference in instructional resources in preschool seem to account for differences in achievement. Instructional materials such as books, charts, models, visual aids and play material have some bearing in school performance. Schools that found having well and enough instructional materials are also performing well academically.

Wachieye (1990) says that the use of learning resources involves the use of more than one of the human senses at the same time during learning process. As per the studies of psychologists also found that different human senses accounts for varying percentages of learning. It is estimated that taste account for 1%, touch 1.5%, smell 3.5% and sight 83%. It is believed that 20% of what is heard is retained while 50% of what is seen is retained and hence the need for visual teaching aids and active learners participation.

Further, Wachieye (1990) stated that teaching learning materials provide significant gains in formal learning by improving the learners' abilities. These include retention, remembering, thinking, reasoning, interest and imagination, better understanding and personal growth and development. When resources are used there is great opportunity for learners to move about, talk, love and interact freely under such conditions. The learner work independently and collaborating and this make learning interesting.

Learners get the opportunity to handle and manipulate objects hence increasing their understanding-this is learning by doing. They help in providing conducive environment for capturing interest as well as sustaining attention and learners' motivation.

Use of educational resources saves energy and time because most of the concepts are easily clarified and understood. They promote learning as clear images are formed when learners see, hear, touch, taste, and smell as their experiences are direct and concrete, learning through the use of senses is the most natural and easiest way of learning.

According to Bryant (1983) in Kenya, research on instructional resources affect the children's academic performance in preschools has been minimal. This could be attributed to the fact that instructional resources are not as widely used in the

preschools as in the upper classes. However, there is need to call for more research on how the usage of such a resources, as charts, abacus and beads among others impacts on school academic performance.

2.3 Mathematics in preschool

In the preschool years children use informal mathematics intuitively to explore and make sense of their world (National Association, 2008). Children compare size, shape and classify objects as they work and play, using math for activities such as balancing a block tower, sharing cookies, as well as a variety of other activities as they make sense of their world. By testing and retesting theories and formulating hypotheses, children begin to develop concepts of truths; for example: *making one end of the ramp higher will make the cars go down faster* and *three cookies are always more than two cookies*.

Truths that can be tested over and over again, yielding the same results, emerge as predictable and dependable patterns which serve as a springboard for more complex theories to be tested. As children's cognitive skills increase, they find patterns that help them to solve problems, make predictions, and generate solutions. The development and acquisition of mathematical concepts and skills in children starts at an early age. Mathematics equips the learner with knowledge and skills which assist in development logical thinking, ability to apply the knowledge acquired, analyze situations and make rational decisions.

It is therefore important for the teacher to build fundamental mathematics concepts and skills in children at an early age. This should be done in order to continue developing them further through appropriate activities and use of materials. Games, poems, rhymes, puzzles and songs are activities that are very interesting to children. The teacher has therefore to use these activities with children to develop early interest and enjoyment in mathematics. This is important for laying a firm

foundation in mathematics and for future interest in the subject. The activities should be practical with plenty of manipulative and concrete materials such as strings, counters, charts, and flashcards.

Mathematics can build on everyday exploratory activities for preschoolers (Worth, 2005). The preschool teacher should let his or her children explore their environment through play for a large portion of the day. On a daily basis in a typical play-based classroom, a large amount of time should be allowed for play so that the children can spend adequate time to learn new skills and practice existing one (Hanlin, 1999.) According to (Varol and Farran, 2006), playing with blocks, one of the central activities in preschool gives children the opportunity to classify, measure order and count.

Other preschool teachers also build on every day exploratory activities by setting up work stations for their children and letting them explore and figure out some of the mathematics problems on their own. In the preschools, during free play the children should be able to engage in certain educational activity involving instruction in order to encourage learning concepts related to mathematics. Some of these activities include art projects, block building and singing songs. The teacher observes his or her learners and intervenes when necessary. After the teacher observe their children math's related activities, "the information obtained from observation and informal interventions can lead to planning of structured experiences" (Charlesworth, 2005).

When (Charles worth, 2005) explains the best way to transfer mathematics knowledge to preschool children, not at once does she tell his children what is expected of them. She lets them play and discover things on their own only to discover prompting them by asking questions related to a specific mathematical concept.

Learning the subject of mathematics is more meaningful if it is enjoyed in both play and planned activities. Research in preschool education, explain both that play and manipulated exploration are important. (Charles worth, 2005) focused at a little more on play, explaining that children should be able to create their own problems and solve them independently. Play alone will not teach children enough mathematical concepts and skills.

It is important to prompt the children and ask relevant questions. In order for a teacher to effectively teach mathematics, he or she is expected to create a safe, stimulating environment, prompt the children throughout the school day. These structured lessons can be in the form of pre-planned activities. Mathematics is so widely used later in life that, “in order to shape their future, young children should be exposed to mathematics in their early lives” (Varol and Farran, 2006).

2.4 Pupil text book ratio.

This is the number of textbooks available per pupil during the reporting period. It is calculated thus: $(\text{total text books provided}) / (\text{number of pupils in a class})$. Text books deliver the curriculum and are the single most important instructional material that enhances learning. When text books are available, instructional time is not wasted while teachers and learners copy text on and off the blackboard (Lockheed et al, 1991). Availability of text books is critical to learning since there is a positive correlation between pupil’s performance and availability of text books, Riak (1986). Schools following the 8-4-4 curriculum are expected to choose from the approved list of books provided by the Ministry of Education. Approval is made based on the recommendations of the Kenya Institute of Education, which is a government agency charged with curriculum development in all public learning institutions under the Ministry of Education.

According to the report, “What Quality of Primary Education is Children in Urban Schools Receiving? Evidence from Nairobi by Moses Ngware et al, 2008, all the books used in 55% of the schools studied was approved by the Ministry of Education”.

The proportions of schools using all approved books ranged from 50% in community owned schools to 71% of private religious group owned schools.

Government policy on pupil-textbook ratio stipulates that lower primary (grades 1-4) should have a ratio of at most 3:1 while upper primary should have a ratio of at most 2:1 in all main subjects. The pupil-textbook ratios in Science, Mathematics and English in both lower and upper primary grades were examined in all schools. Results of the study show that while most government, private religious and private NGO owned schools had almost attained the required (minimum standards) pupil-textbook ratio both in lower and upper primary, other schools had relatively higher pupil-textbook ratios. For example, in the three subjects, the private individual-owned schools had a mean ratio of 2:5 and 7:6 in lower and upper primary, respectively, while the community owned schools had mean ratios of 5:4 and 2:3 at the same levels.

Most of the schools with pupil-text book ratios that were below the norm for lower grades were in informal settlements while those with higher ratios were in formal settlements. It appears that pupils in non-government schools in informal settlements had lower levels of access to Science, Mathematics and English textbooks in school.

While in private individual-owned schools, it is the upper grades that had ratios way above the standards, in community-owned schools, it is the lower grades that were disadvantaged. Missing out in learning experiences during the lower grades could mean that such students will be disadvantaged in terms of achievement for the rest of their schooling career. Fuller (1986) stated that greater availability of text books and

reading materials raises the quality of learning activities and educational achievements.

In a similar research carried out in India, Chile, Brazil, Malaysia and Ghana, Heyneman et al, (1981) found out that the availability of text books had a positive effect on learner's achievement and is crucial to educational performance. Beebout (1972) asserts that the availability of text books had a positive correlation on achievement amongst pupils in Malaysia.

Eshiwani, (1987) in his study in Kenya reports that schools which usually appear in the top ten in the national examination, have adequate text books. In a later study, Eshiwani describes a significant relationship between use and presence of textbooks and achievement in primary schools.

Eshiwani, (1993) in his research on the determinant of school achievement in Kajiado District, he found that pupils who had their own text books perform much better in examinations than their colleagues who did not have text books, especially in Kiswahili, Mathematics and English. He also found that the more money a school spends on text books, the higher the chances of it performing well in examination.

Therefore, textbooks are an important learning input that provides the learner with different learning experience.

2.5 Adequate and appropriate furniture.

Furniture and equipment should be appropriate for the size and age of the children.

According to NACECE (1995, 2000) the type of furniture provided in a pre- school has a great influence on the physical development of children. It can affect their posture and the extent of fatigue they are exposed to. The furniture can also influence how they play and learn.

According to, Journal of African Studies and Development Vol. 3(7), pp. 135-143, July 2011, all the ECD teachers noted that children were exposed to soil related

infections because of the unavailability of adequate and age appropriate furniture and proper resting space. One of the teachers said: “the problem is that children sit on the floor and they also sleep on the floor because the school does not have furniture and a rest room. As a result, children are exposed to diseases such as scabies, colds and pneumonia. An estimated 47% of children between 5 to 9 years old of age from developing countries are infested with the three main types of soil-transmitted worms; hookworms, round worms, and whipworm (WHO, 2007). The most common nutritional problem caused by worm infections is iron deficiency anemia. Iron deficiency is also linked to impaired cognitive functioning (Guthrie, 1989).

According to Catherine et al (2009) the tables and desks should be arranged properly to allow easy movement, group work, play and management of group behavior. The arrangements should enable children to have a clear view of each other.

For a teacher to organize the classroom, he/she should pay attention to the physical sitting arrangement (how the tables, chairs and benches have been arranged).

Further, Catherine et al (2009) stated that it is important to provide adequate and appropriate furniture. It should be borne in mind that young children are active, curious and cannot sit still for long periods. They are energetic and their bodies are growing fast. Therefore, the furniture and equipment provided should be designed in such a way that they support their healthy development, for children who are healthy perform better in school.

Studies that were conducted by the Ministry of Education indicated that schools with permanent buildings and desks performed significantly better than those schools with few or none, (Ministry of Education, 1993).

2.6 The role of the teacher in the classroom

Androga (1997) defines a preschool teacher as a teacher who is professionally competent to; stimulate and sustain healthy growth of young children, create an appropriate learning environment for the children and work closely with other teachers, parents and members of the community in planning and executing the preschool tasks as well as enhancing community development.

In the Reggio approach, the teacher is considered a co-learner and collaborator with the child and not just an instructor. Teachers are encouraged to facilitate the child's learning by planning activities and lessons based on the child's interests, asking questions to further understanding, and actively engaging in the activities alongside the child, instead of sitting back and observing the child learning. "As partner to the child, the teacher is inside the learning situation" (Hewett, 2001).

According to NACECE (1995, 2000) the teacher has an important role to play in the stimulation and learning process of a child. The teacher needs to have a deep understanding of the children, their characteristics, behavior, needs, abilities and interests so that he/she can give children proper care and assistance.

The teacher takes the place of the mother by giving the children love, attention, assistance, guidance and comfort. This is the reason why it is important for the teacher to understand his/her role well to adequately meet the needs of the children entrusted to her/him if mathematics performance is to be realized.

The preschool teacher should promote social interaction & peer to peer learning in the classroom so that children learn to work together and depend on each other. This helps address discrimination and improves performance in the classroom and promotes sharing of experiences, ideas and problems.

Sometimes gifted children can be asked by the teachers to help other children, but it is important that all children help one another and that a teacher recognizes the strength and weaknesses of every child, including children with special needs. As learners spend many of their waking hours with teachers, their experience under the guidance of the teachers will have an impact on the learners' social emotional and cognitive development (NAEYC, 1996:6).

Further the preschool teacher is expected to have adequate knowledge of the subject matter and a wide repertoire of teaching strategies (viljoen & Molefe, 2001: 124). Moreover, he or she needs to be familiar with learning theory, cognition, pedagogy, curriculum, technology, assessment and programmes in order to manage the preschool activities. His/her direct participation ranges from complete control over what is learned to minimal intervention. For instance, in preschool where there are formal teaching methods the teacher is the source of all the knowledge that the children acquire in the class.

According to Farrant (1994) a good teacher therefore, is one who as a good understanding of what his/her children used to learn and also of their capabilities for learning.

The teacher is expected to create a learning environment, which provides conditions for support and create a challenge to their learners-a positive learning environment for education and learner motivation.

He/she is able to judge how much he/she needs to intervene in each child learning activities and knows the most effective way of providing this assistance. This skill of teaching lies in knowing who, what and how to teach and also being able evaluate them.

According to Whilaken (1995) teachers are the most important factor in creating positive learning environment. When the teacher adjusts the environment to learner's

preference, the learners perform better academically and are better behaved. The child needs to be mentally and physically stimulated and helped to mix and live with others, as well as learn how to control his or her emotion. This is not an easy task and requires a highly devoted and enthusiastic teacher (Androga, 1997).

According to the ministry of education (1999), it emphasized that a preschool teacher should note that a children need to have a smooth transition from preschool to primary school. At this level a child is about 5 years and preparing for standard one, should be provided with learning opportunities that will enhance the following; concentration, classroom control and identification of subject areas, perform advanced activities to link to standard one. For example, children could be able to write simple words including their names, perform addition and subtraction problems up to 10 (MOEST, 1999). Children are bound to admire and copy their teachers. He/she should therefore, present the best image to them for instance, the teacher should be easy to approach, kind, fair, tolerant, and happy in appearance. The teacher should be a keen observer of children's characteristic and behavior. He/she must keep brief and accurate records of children interests, abilities and emotional aspects and use them for noting improvement as well as sharing the same with parents (MOEST, 1999).

This study seeks to establish whether such teachers exist in pioneer zone, and if they do, if they work in a professional way to improve performances in their respective schools.

According to Androga (1997), it noted that a preschool teacher must have a sound knowledge of planning, organization and management skills. He/she should have the ability to mobilize the necessary support and resources for her or his work. This demands good contact with the parents, members of the community, children, other teachers and education authorities.

According to Rowen (1980) if the teacher is to “make the match” between the level at which the child is operating and curriculum content she/he must be a careful observer. Keen observation and listening on the part of the teacher will enable her or him to tell whether the particular group should be given activities that are level 1, level 2 or level 3. The teacher must relate well to individual children in different ways.

According to Catherine Gichuba et al (2009), in the Reggio Emilia approach teachers routinely divide responsibilities in the class so that one can systematically observe, take notes and record conversations among the children. These observations are shared with other teachers. Parents are also involved in curriculum planning and evaluation. As a partner to the child, the teacher is inside the learning situation (Hewett, 2001).

The preschool teacher plays a major role in fostering children’s mathematical abilities. It is up to her/him to devote attention both to planned mathematical activities as well as mathematical activities which may spontaneously arise in the class and to pay attention to the mathematical development of the children (INMPC, 2008).

Being able to plan appropriate mathematical activities requires knowledge of mathematics as well as knowledge of learners and tasks. However, if we want teachers to recognize opportunities for learning mathematics and make the most of these opportunities, they need to be on the lookout for such opportunities, to be proactive. A high self-efficacy for teaching mathematics, based on actual experiences of solving mathematical problems and evaluating possible solutions, based on effectively implementing planned tasks with children and seeing the results of their work with children, can help foster the positive drive we ask of our teachers. That is our aim as teacher educators – to promote a high self-efficacy for teaching

mathematics in preschool which corresponds to a high level of knowledge for teaching mathematics in preschool.

Within the revised curriculum for preschools, emphasis is given to the role of play in encouraging learning, including the learning of mathematical concepts (Skolverket, 2011). In this paper, we explore how one teacher develops children's mathematical thinking from their play. Through respectful listening, including watching carefully what children do, the teacher is able to ask questions that simultaneously push children's mathematical curiosity and support their play.

Play is considered the foundation for preschool children's learning experiences. Play has a central role as the medium through which children are expected to learn. Play is important for the child's development and learning. Conscious use of play to promote the development and learning of each individual child should always be present in preschool activities. Play and enjoyment in learning in all its various forms stimulate the imagination, insight, communication and the ability to think symbolically, as well as the ability to co-operate and solve problems. (Skolverket, 2011)

Baroody (2000) noted during an observation of preschool children, the use of reasonably complex math during every day play. During the observations, Baroody went on to note that the experiences appeared to be cumulative, and children naturally transferred previously learned information to novel and more complex situations. The teacher's ability to observe and scaffold the learning through direct and indirect instruction during natural play situations was a key to substantial differences in the children's transfer of knowledge which is the crux of successful mathematics achievement. "A teacher affects eternity, you can never tell where his or her influence stops", Henry Adams

2.7 Free air circulation and mathematics performance in preschool

According to Mark Schroeder (2002) those involved in school planning and design see this as an opportunity to enhance academic outcomes by creating better learning environment, quiet, safe, comfortable and healthy environments are an important component of successful teaching and learning.

According to Mark Schroeder (2002) there is a growing body of work linking educational achievement and learners performances to the quality of air they breathe in classes. Poor indoor air quality (IAQ) is widespread, and its effects are too important to ignore. According to NACECE (1990) buildings should be adequately ventilated and should have enough light. A classroom with poor ventilation creates a high chance for the spread of air borne diseases such as tuberculosis according to the Ministry of Public Health and Sanitation and its sponsor, The Global Fund through campaign stickers.

The IAQ systems identified include irritated eyes, nose and throat, upper respiratory infections, nausea, dizziness, headache, and fatigue, or sleepiness have collectively been referred to as “sick building syndrome” (EPA 2000). Poor indoor air quality makes teachers and learners sick – and sick learners and teacher cannot perform as well as healthy ones (EPA 2000, Kennedy2001, Leach 1997). Improve ventilation can bring about less asthma, better school attendance, and improved academic performance.

Most notably, poor IAQ has been associated with increased learner’s absenteeism. For example, Smedje and Norback (1999) found a positive relationship between airborne bacteria and mold and asthma in children, which in turn increase absentee rates (also Rosen and Richardson 1999, EPA 2000).

Temperature and humidity affect IAQ in many ways, perhaps most significantly because their levels can promote or inhibit the presence of bacterial and mold. For example, Wyon (1991) showed that learner performance at mental tasks is affected

by changes in temperature. These findings support the idea that learners will perform mental tasks best in rooms kept at moderate humidity levels (forty to seventy percent) and moderate temperatures in the ranges of sixty – eight Harner 1974, Wyon, Anderson, and Lundquist 1979.

While we certainly seek to avoid such extreme conditions in schools, a surprising number of classrooms lack adequate ventilation and evidence is accumulating to support the common sense notion that occupants of a classroom without good ventilation can't function normally and can't learn at their full capacity.

According to Mark Schroeder (2002) the purpose of ventilating classrooms and school buildings, at minimum, is to remove or otherwise dilute contaminants that can build up inside the classrooms. Such contaminants come from people breathing, from their skin, clothes, perfumes, shampoos, deodorants, from building materials and cleaning agents, pathogens and from a host of other agents, which in sufficient concentration, are harmful.

Schools need especially good ventilation because learners breathe a greater volume of air in proportion to their body weight than adults do (Kennedy 2001, Mc Goren 1998, Moore 1998) because school have much less floor space per person than found in most office buildings (Cranford 1998). According to NACECE (1995, 2000) classrooms should have windows and adequate ventilation to allow in enough air & light.

One of the first symptoms of poor ventilation in a classroom is a build up of carbon dioxide caused by human respiration when the carbon dioxide levels reach 1000 parts per million (about three times what is normally found in the atmosphere), headaches, drowsiness and the inability to concentrate ensue. Myhrvold et al (1996) found that increased carbon dioxide levels in classrooms owing to poor ventilation decreased student performance on concentration tests and increased learner's

complaints of health problems as compared to classes with lower carbon dioxide levels.

2.8 Theoretical framework

The relevant theory to this study is Constructivism Theory of learning by Jerome Bruner (1964).

A major theme in the theoretical framework of Bruner (1964) is that learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge. The learner selects and transforms information, constructs hypotheses, and makes decisions, relying on a cognitive structure to do so. Cognitive structure (i.e., schema, mental models) provides meaning and organization to experiences and allows the individual to "go beyond the information given".

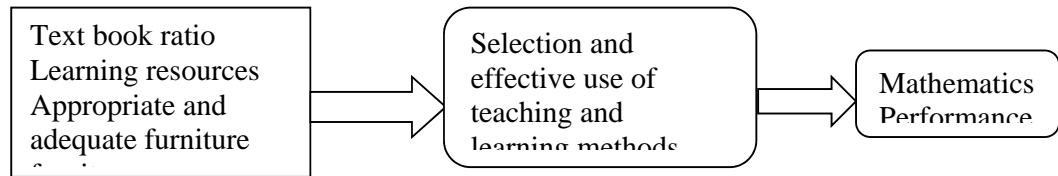
As far as instruction is concerned, the teacher should try and encourage learners to discover principles by themselves. The teacher and learners engages in an active dialog (i.e., Socratic learning). The task of the teacher is to translate information to be learned into a format appropriate to the learner's current state of understanding. Curriculum should be organized in a spiral manner so that the learner continually builds upon what they have already learned.

Bruner (1966) states that a theory of instruction should address four major aspects: (1) predisposition towards learning, (2) the ways in which a body of knowledge can be structured so that it can be most readily grasped by the learner, (3) the most effective sequences in which to present material, and (4) the nature and pacing of rewards and punishments. Good methods for structuring knowledge should result in simplifying, generating new propositions, and increasing the manipulation of information.

2.9 Conceptual Framework

The researcher has identified the following independent variables that directly affect children's performance in mathematics in preschools in Pioneer Zone of Eldoret Municipality, Uasin Gishu County. They include child text book ratio, learning resources and adequate and appropriate furniture's.

Figure 1: **Relationship between variables**



CHAPTER THREE

RESEARCH METHEDODOLOGY

3.1 Introduction

The methodology components of this research study includes research design, population, sampling procedure and sample size, instruments, validity and reliability, procedure for data collection and analysis.

3.2 Research design

Research design refers to a strategy for carrying out the study or the plan that guides the researcher during the study (Mugenda & Mugenda 1999).

The research design applied in this study is survey research method. This design enabled the researcher to understand the problem at hand in a systematic and in an objective manner. Also the research design was set in such a way that the researcher was able to collect data from a large sample. The questioning was done through interviews and telephone conversations.

3.3 Population

According to Mugenda & Mugenda (1999), population refers to an entire group of individuals, events or objects having a common observable characteristic. In other words, population is the aggregate of all that conforms to a given specification.

The study was conducted in Pioneer zone within the municipality of Eldoret. It covered both public and private preschools. The study targeted both the school teachers, preschoolers and school administrators. These targeted groups assisted in providing the required information which determines the effect of classroom environment on the preschooler's mathematics performances.

The targeted population size was as follows, public schools 11, private schools 52, preschool teachers 126, preschoolers 990 and school administrators 63.

However, since it was difficult to access the entire population in terms of time, resources and distance to be covered by the researcher, a representative sample of the targeted population was used instead.

3.4 Sampling technique

Stratified random sampling technique was applied in selecting samples from the targeted population. According to Mugenda and Mugenda 1999 this led the researcher into dividing the population into strata. The targeted population was grouped into different stratum to obtain information on the effect of classroom environment on academic performance in mathematics of preschoolers within Pioneer Zone. The technique took care of all the diversities (teachers, preschoolers and administrators) in the population and also the representativeness which allowed for generalization.

The researcher also used purposive sampling techniques. The technique was based on the earlier knowledge of the researcher in terms of research purpose and characteristics of the population. The researcher visited the preschool children, teachers and administrators in their respective schools to obtain the required information. For purposes of this study, a 30% representative sample was used as follows, public schools 4, private schools 16, preschool teachers 38, preschoolers 297 and school administrators 19.

Table 1: The table below shows the targeted population and the sample size in each category.

<u>Category</u>	<u>Target population size</u>	<u>Sample size</u>	<u>%</u>
Public schools	11	4	30%
Private schools	52	16	30%
Preschool teachers	126	38	30%
School administrators	63	19	30%

3.5 Research Instruments

According to Mugenda and Mugenda (1999) a researcher needs to develop instruments with which to use in collecting the required data. Therefore, in carrying out this study the researcher employed the following research instruments:

3.6 Observation schedule

According to Caswell (1982), observation is the most commonly used method of collecting statistical data. The researcher made use of observation by being at the scene of the behavior or the scene of action. The purpose of an observation was to obtain detailed data of the content relevant to the research problem. The main advantage of this method was that it recorded what actually happened rather than what people say would have happened or did happen (Caswell, 1982).

3.7 Interview schedule

According to Caswell (1982), an interview is a commonly used method for collecting data from the general public. However, it involves placing great reliance upon the integrity and skills of the interviewer.

Interview refers to a social interaction between a researcher and the one, two or more participants. Interviews are a process and therefore a face-to-face encounters

(Anderson (1990). According to Palton (1990), interviewing as an advantage of letting the researcher to penetrate the feelings and thinking of interviewees.

According to Bogdan & Biklen (1991), Interviewer should make use of tape recording so that when analyzing data or information the interviewer can go back to it for clarification. Open and close ended interviews were used to collect data from the administrators (head teachers) and preschool teachers.

3.8 Validity

According to Borg and Gall (1989), validity is the degree to which a test measures what is intended to measure. Therefore, validity is the accuracy, meaningfulness and the degree with which results obtained from the analysis of data actually represents the phenomena of the study. In order to determine the validity of the instruments the researcher gave three experts the instruments on different occasions. The experts scrutinized the instruments and approved them. This helped the researcher to rectify the instruments and to come up with good and reliable instruments that ensured credibility of the results.

3.9 Reliability

This is a necessary condition for validity. According to Mugenda and Mugenda (1999), reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials. Reliability of an instrument was established in the following ways: a) the researcher used test retest technique whereby the same instruments was be administered to the same participants at different times. If the responses are similar or agree, then results will be taken to be reliable. b) The researcher used inter-rater reliability. In this technique different observers observed the same scene. The observations from different observers were compared.

Further, a scientific method; Pearson's coefficient correlation(r) was used to test the degree of correlation between the variables under the study.

3.10 Procedure for data collection

Data gathering is a very important part of the research project process, according to Polonsky (2009).

Therefore, the researcher administered the research instruments as follows:

Observation-during data collection, the researcher observed and recorded the type of furniture the children used and classroom organization, the classroom ventilation, size of the classroom and classroom learning resources. The information and data obtained under this method was analyzed, collated and summarized.

Interviews-using stratified sampling technique, those sampled in the population was interviewed by the researcher to obtain relevant information and data on the issue under investigation. The information and data obtained was analyzed.

3.11 Data analysis

According to Mugenda and Mugenda (1999), data obtained from the field in a raw form is difficult to interpret. Such data must be cleaned, coded, key-punched into a computer and analyzed. It is from the results of such analysis that researchers are able to make sense of the data. The analysis of these data was both qualitative and quantitative in nature. Data was presented by use of tables. Descriptive statistics (frequencies, percentages and bar graphs) was used to present the quantitative data while qualitative data was analyzed by use of inferential statistics. In the interpretation of results the qualitative and quantitative methods was independent.

3.12 Ethical consideration

According to Kombo and Tromp (2006), researchers whose subjects are people or animals must consider the conduct of their research, and give attention to the ethical issues associated with carrying out the research. Diener and Grandall (1978) has

divided ethical issues that may arise during research work into four main areas, namely: whether there is harm to the research participants, whether there is a lack of informed consent, whether there is an invasion of privacy and whether deception is involved.

This study involves people of various categories and therefore, the researcher informed every participant of the research intent and assured them that the information provided will be treated with utmost confidentiality, privacy of individuals will be honoured and no deception was used during the research. Consent of teachers or parents was obtained first before pupils were involved in the research study.

The researcher bore at all times in mind that the research participants were not to be coerced to provide information, but were do so voluntarily.

CHAPTER FOUR

DATA ANALYSIS

4.1 Introduction

The raw data collected during the research study using several research instruments namely questionnaires, interviews, observations and literature reviews were analyzed both qualitatively and quantitatively using statistical and non statistical methods. The research analysis is presented in the form of graphs, tables, pie charts after which recommendations and conclusions are made.

The qualitative findings include observations made by the researcher during the research study on the effect of classroom environment on academic performance in mathematics of preschool children.

The quantitative findings included responses obtained from the head teachers, preschool teachers and preschool children. The head teachers were interviewed by the researcher while the teacher's ands filled in the questionnaires and preschool children answered questions put to them by their respective teachers under the supervision of the researcher.

4.2 Observations

During the research work, the researcher made several observations, namely:-

4.2.1 Classroom temperature:

Barron R.A (2001) states, "Suppose you were very hungry and very cold, could you study effectively under these conditions, probably not. Your hunger and feelings of cold would probably prevent you from focusing on the task of learning new materials, even if these were quite interesting".

During my research visits to various preschools within pioneer zone I found five preschool classrooms had no window panes/glasses to regulate classroom temperature making the classrooms very cold. This fact is compounded by the fact

that the children have to walk several kilometers to their ECDE facility. Since mathematics activities are taught early in the morning when it is still cold and chilly, children in these classes had problems in understanding the mathematical concepts being taught.

It is worth to note also that the zone experiences rains from late March to late October. The cold weather causes diseases among the children leading to absenteeism.

4.2.2 Adequacy and appropriateness of chairs and tables:

The researcher observed that whereas there was a deliberate attempt by private schools to provide appropriate and suitable chairs and tables for the preschoolers, the preschoolers in public schools were mostly using benches and desks which are not appropriate for them. This inappropriate furniture makes it difficult for the preschoolers to play and learn as in most cases the furniture occupies the entire classroom.

4.2.3 Text books:

In the course of study the researcher observed that in the majority of schools the children shared text books or there was only one text book for the teacher. In such cases the teachers wrote the work on the black board for the children to copy. In all cases, that is public and private schools, the fees received from the children is used to purchase the text books.

4.2.4 Learning corners:

Learning corners should be established in preschools to maximize children's learning and occupy their free time (Gichuba et al, 2009).

Learning corners have benefits as far as children's learning activities are concerned.

Learning corner gives children clear choices, develop the child's social responsibility, integrates a variety of activities around a theme, are interesting and provide learning opportunities for more than one developmental stage.

However, during the study the researcher observed that majority of the preschool classes lacked learning corners.

As stated above most classroom sizes are too small to allow preschool teachers to set up learning corners in their classes. However, it was also noted that other teachers do not seem to understand the importance of learning corners in their classrooms though they have adequate spaces.

4.2.5 Classroom cleanliness:

As the saying goes, "cleanliness is next to Godliness", most preschool classrooms visited were clean. One of the preschool impressed me by its cleanliness and the presence of a dustbin in the classroom.

Nevertheless, as the saying goes, "in every market there is a mad man". Indeed two of the preschools visited were very dirty, littered with papers and dust, a clear sign that the situation is worse during rainy days.

4.2.6 Classroom size:

According to Whitbread (1999) learners learn and perform better when their classrooms are well organized to give enough space to the learners and provide arrangements for starting points for their ideas. Interactive displays in the pre-school and collection of carefully selected resources entice the learners to explore a wide range of ideas.

A standard preschool classroom should have a minimum area of 8mx8m. This will accommodate a maximum of thirty (30) children.

However, in my research visits I observed that the majority of the preschools had the prescribed number of children, the classroom sizes were in most cases too small, leading to overcrowding and congestion.

Ndani (2009) states that air is survival need. Lack of adequate supply of fresh air in a classroom means limited supply of air in the body cells. Poorly ventilated and crowded rooms leads to accumulation of foul air which often makes children sick, tired and dull. This can suffocate the child and make him or her unable to carry out every day activities effectively. This also means that performance in mathematics activity is affected because there is no space for the children to carry out actual mathematical activities such as sorting and grouping of objects.

4.2.7 Attendance registers:

Preschool education lays the educational foundation for children, but missing too much school in this critical early stage in their lives can easily crack that foundation, especially among children in poverty situations.

Head teachers say that young children who miss too much school are likely to struggle academically in later years. Young children miss school for a variety of reasons, just like older students, such as illness, none payment of school fees and parental negligence because some parents do not consider preschool education to be that important, which may contribute to the staggering absentee rate for preschool programs.

Family difficulties may also make it tougher for parents to get their child to school, setting up an early pattern of absenteeism.

Most preschool teachers and head teachers testify that school fees are the major cause of absenteeism among preschoolers in the zone. This is because whenever these children are sent away due to nonpayment of school fees, they either go for

good or for a long duration of time. This affects absentees' performance in mathematics.

4.2.8 Charts:

Teaching aids helps in stimulating young children's physical, mental, social, emotional, moral and spiritual developments. When children actively engage themselves in the manipulation of materials in play activities, they use most of their senses during learning. This makes it easier for them to understand concepts that would have otherwise been difficult to understand (Gichuba et al, 2009). It's important that learning materials are displayed according to the learning areas. Display in the classroom is part of learning environment. The way materials are displayed can affect children's learning. The displays, whether on the wall or tables should be at a height where children can reach and see clearly. Concrete materials should be displayed on the tables or on the ground for easier access by the children.

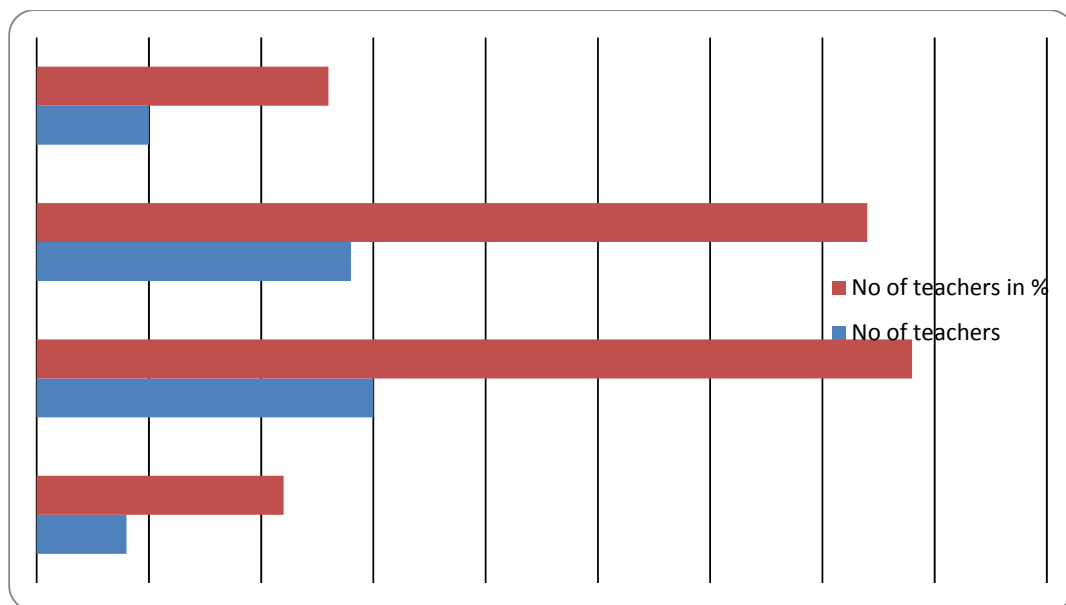
However, it was observed that the majority of these preschools lacked these essential learning charts. Those which had the illustration charts were poorly drawn. Some illustrated the numerals, while others the names of animals and a few others names of people.

Since most classrooms are overcrowded, the charts were displayed on the walls far beyond the children's reach. The researcher also noted that in most of the schools visited there were no children's work on display as expected.

4.3 Preschool teachers' and Head teachers age brackets:

From data collected and analyzed, the preschool teachers' age brackets were as follows:

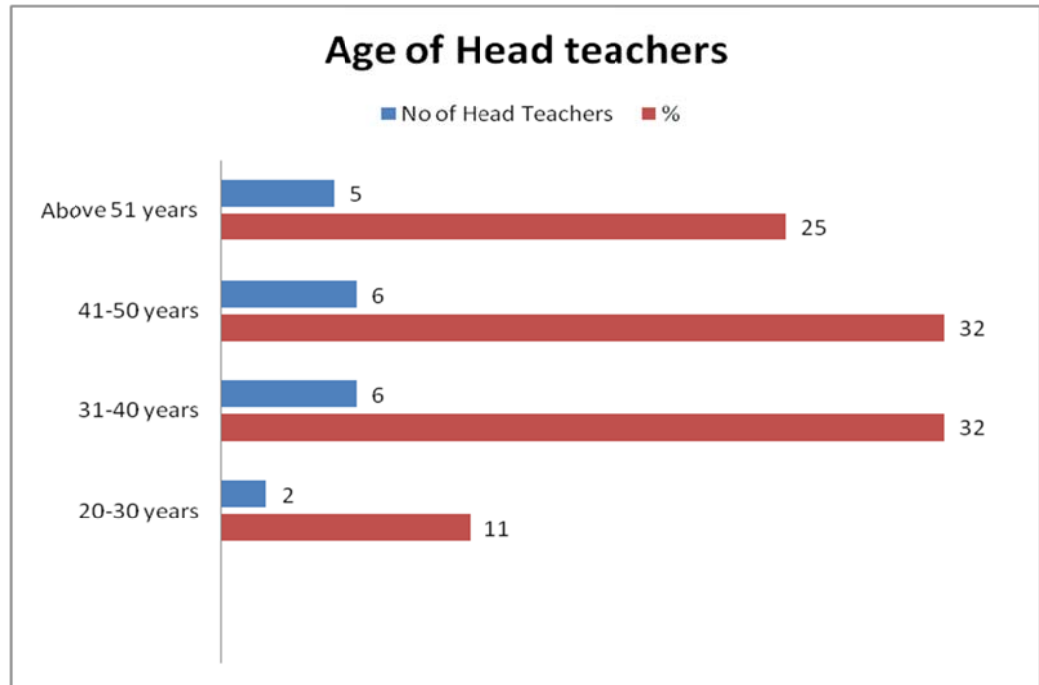
Figure 2: Preschool teachers age brackets



Therefore, 76% of the preschool teachers are in the age brackets of between 21-40 years. This means therefore that the majority of the teachers are experienced in caring and handling of young children as majority of these teachers are also parents. Most of these teachers are young and energetic to facilitate playing with the children and demanding learning activities.

Also, the analysis of the head teachers age brackets were as follows:

Figure 3: Age bracket for head teachers

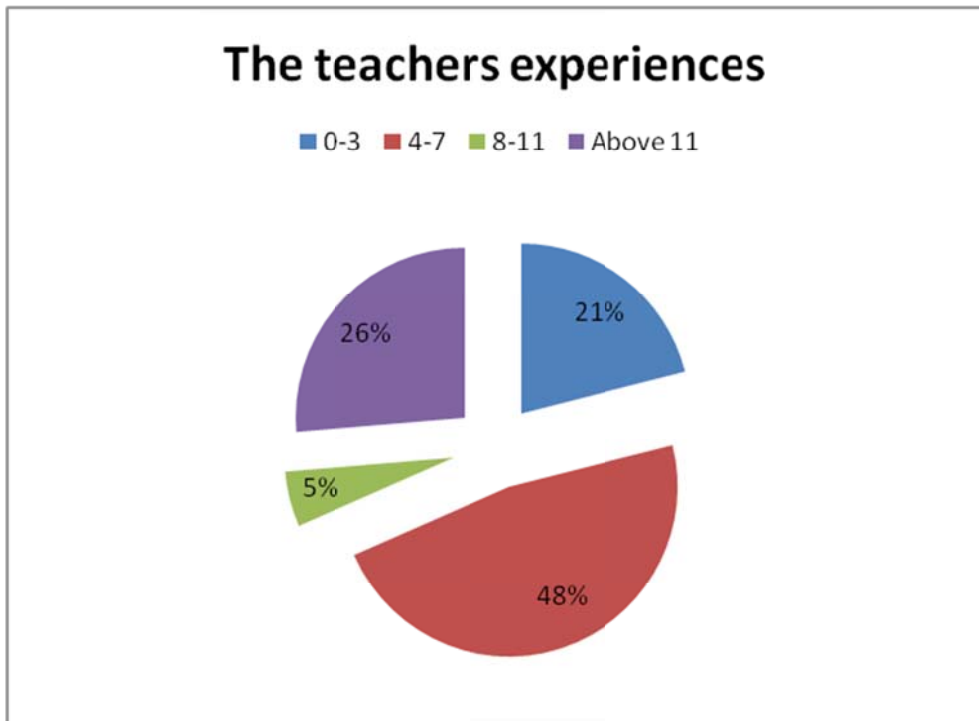


The above analysis shows that majority of head teachers are mature and have the necessary skills to guide the preschool teachers in their schools on how to effectively run and manage the preschool sections.

4.4 Teaching experiences:

The data analyzed produced the following results for preschool teachers teaching experience:

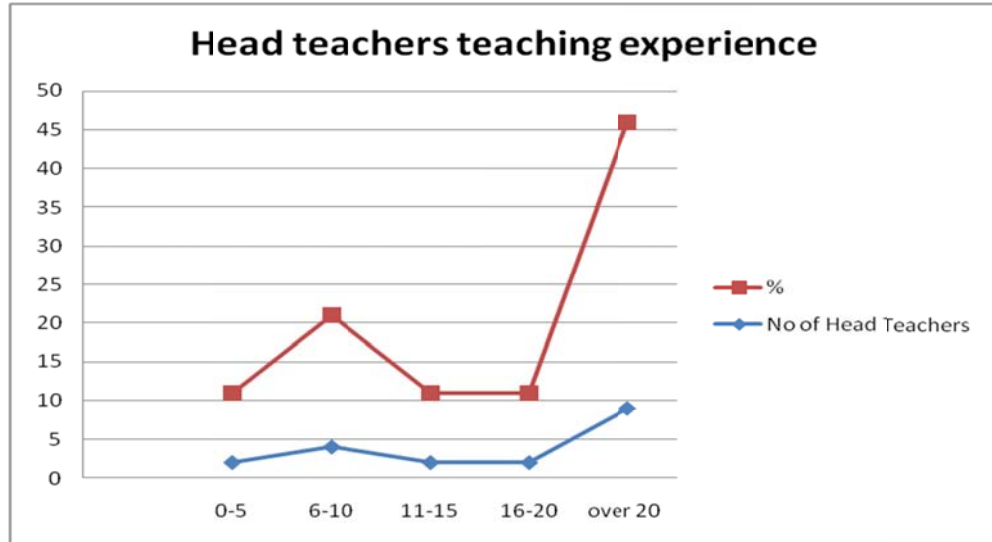
Figure 4: Preschool teacher’s experience in %



The data shows that the majority of the teachers (78%) have the required experiences for teaching preschoolers.

Further, the analysis of data in regard to head teacher’s teaching experience gave the following results:

Figure 5: Head teachers teaching experience

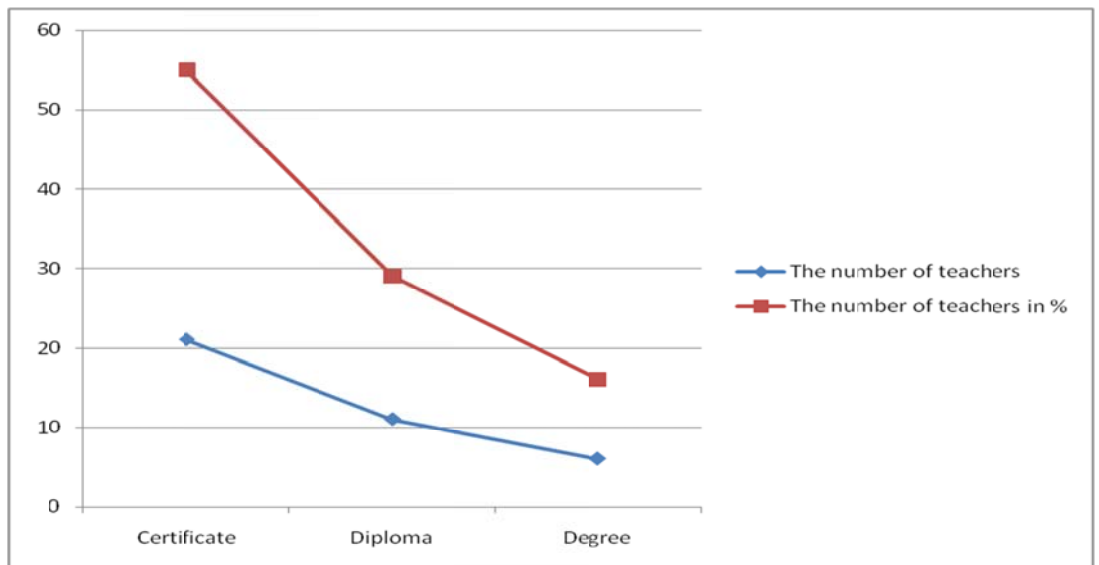


Therefore, 68% of head teachers have teaching experiences of over 11 years which is a good indication of availability of experienced administrators. Overall, preschool teachers and head teachers do have required teaching experiences.

4.5 Preschool teacher's and head teacher's qualifications:

Preschool teacher's qualifications analysis results were as follows:

Figure 6: Preschool teachers' qualifications

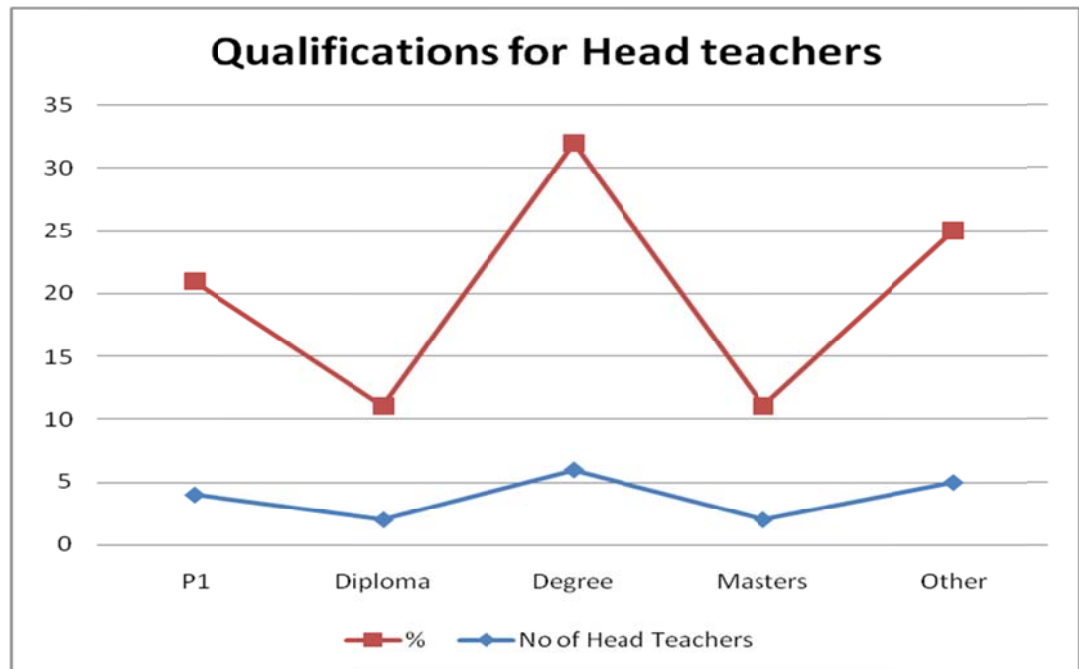


Androga (1997) defines a pre school teacher as a teacher who is professionally competent to; stimulate and sustain healthy growth of young children, create an appropriate learning environment for the children and work closely with other teachers, parents and members of the community in planning and executing the pre school tasks as well as enhancing community development.

Nacece (1995, 2000) explain that the pre school teacher should promote social interaction and peer to peer learning in the classroom so that children learn to work and depend on each other. This helps address discrimination and improves performance in the classroom and promotes sharing of experiences, ideas and problems.

The analysis of preschool teachers' qualifications indicates that 55% have an ECDE certificate, 29% have an ECDE diploma certificate and 16% have a degree. Therefore, the preschool teachers have the necessary qualifications to impart the required skills, attitudes and knowledge to preschool children.

Figure 7: Qualifications for head teachers



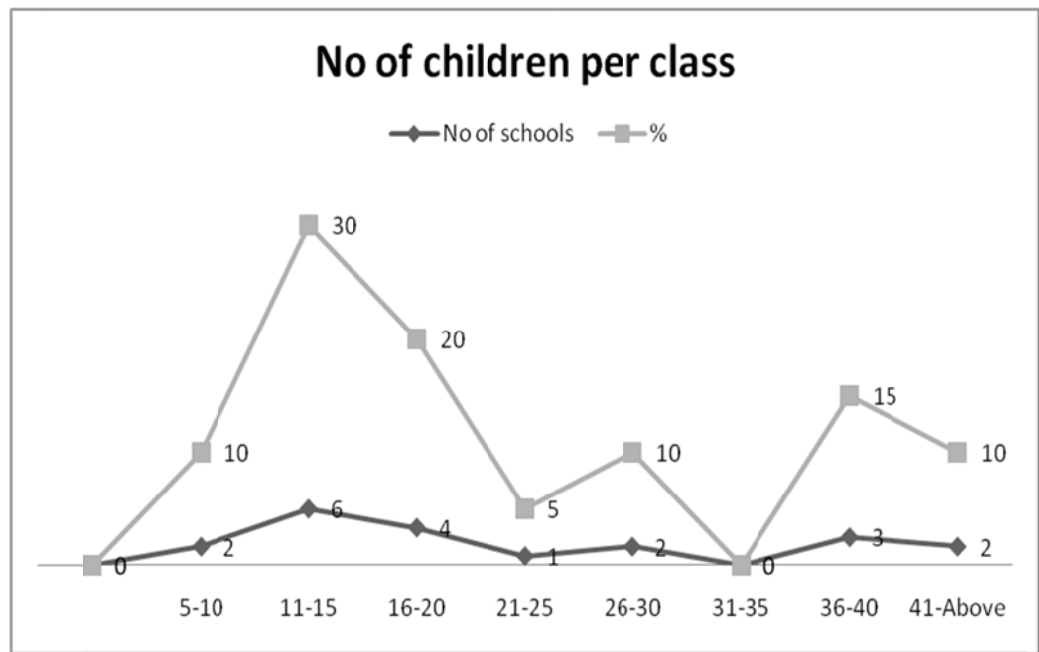
On the other hand, the head teachers had the following qualifications: those with P1 certificate were 21%, those with Diploma certificate were 11%, and those with degree were 32% and masters 11%. Other qualifications represented 25%.

Therefore, 64% of the head teachers have the necessary and relevant qualifications.

4.6 Number of children per class:

The following were the results on the sizes of preschool classes: 5-10 children 10%; 11-15 children 30%, 16-20 children 20%, 21-25 children 5%, 26-30 children 10%, 31-35 children 0% and 36-40 children 15% and above 40 children 10% as represented in the graph below:

Figure 8: Class size



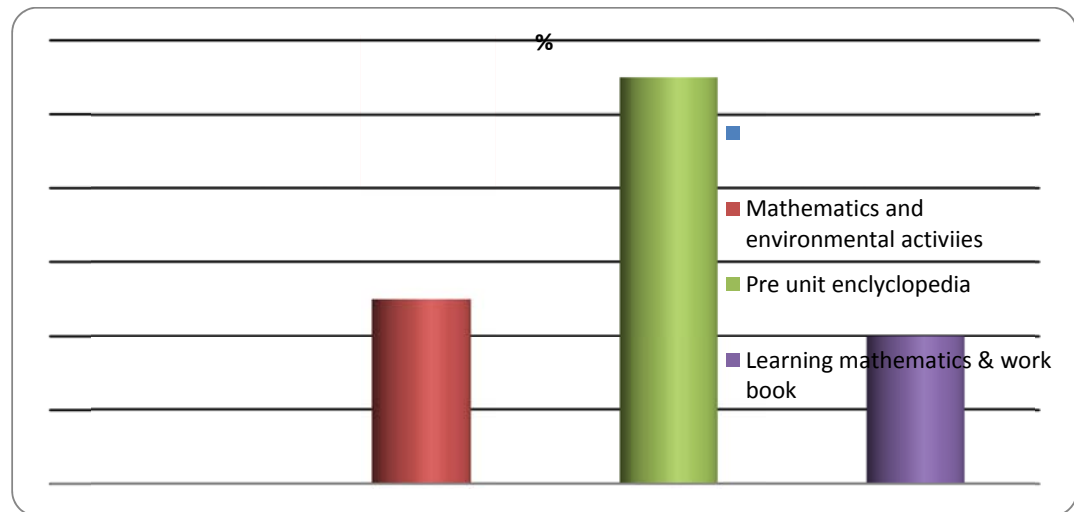
65% of the preschools have the right class size of 25 and below children per class.

The size recommended by the ministry for preschool classes is 25 children per class.

4.7 Books used to teach mathematics:

The Kenya Institute of Education (KIE) has recommended Mathematics and Environmental Activities, book three for teaching of mathematics in preschool. This recommended book contains many activities which enhances learning of mathematics concepts preschoolers. During the research visits, the researcher collected information confirming that majority of the preschool teachers (55%) use Pre-unit Encyclopedia to teach preschool mathematics, while 25% used the recommended book and the remainder 20% used Learning Mathematics and Workbook.

Figure 9: Text books used to teach mathematics



4.8 Pupils Mathematics text book ratio:

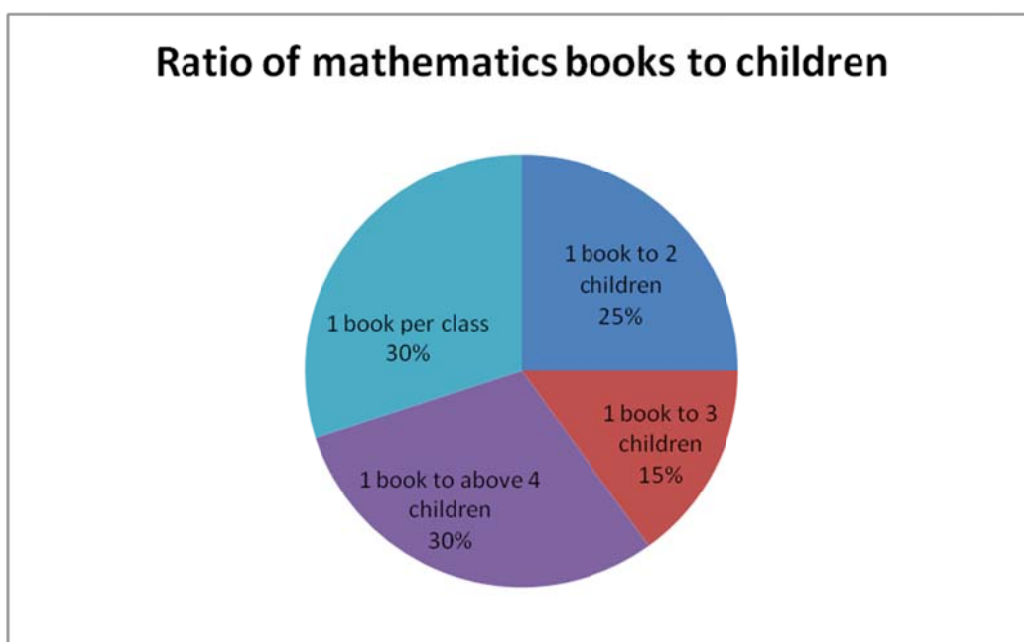
Text books deliver the curriculum and are the single most important instructional materials that enhance learning. When text books are available, instructional time is not wasted while teachers and learners copy text on and off the black board (Lockheed et al,1991). Availability of text books is critical to learning since there is a positive correlation between pupils performance and availability of text book (Riak,1986).

Eshiwani (1993) in his research on the determinant of school achievement in Kajiado District, he found that pupils who had their own text books perform much better in examination than their colleagues who did not have text books, especially

in Kiswahili, Mathematics and English. He also found that the more money a school spends on text books, the higher the chances of it performing well in examination.

The data collected and analyzed in this area was as follows: 2 pupils to 1 text book 25%, 3 pupils to 1 text book 15%, 4 pupils to 1 text book 0% and above 4 pupils to 1 text book 30% and others (1 book per class) 30% as represented by pie chart below.

Figure 10: Ratio of mathematics books to children



The above analysis shows that 60% of preschool children either share books or use one book per class. This therefore may be contributing to the recorded poor performance in mathematics in the zone.

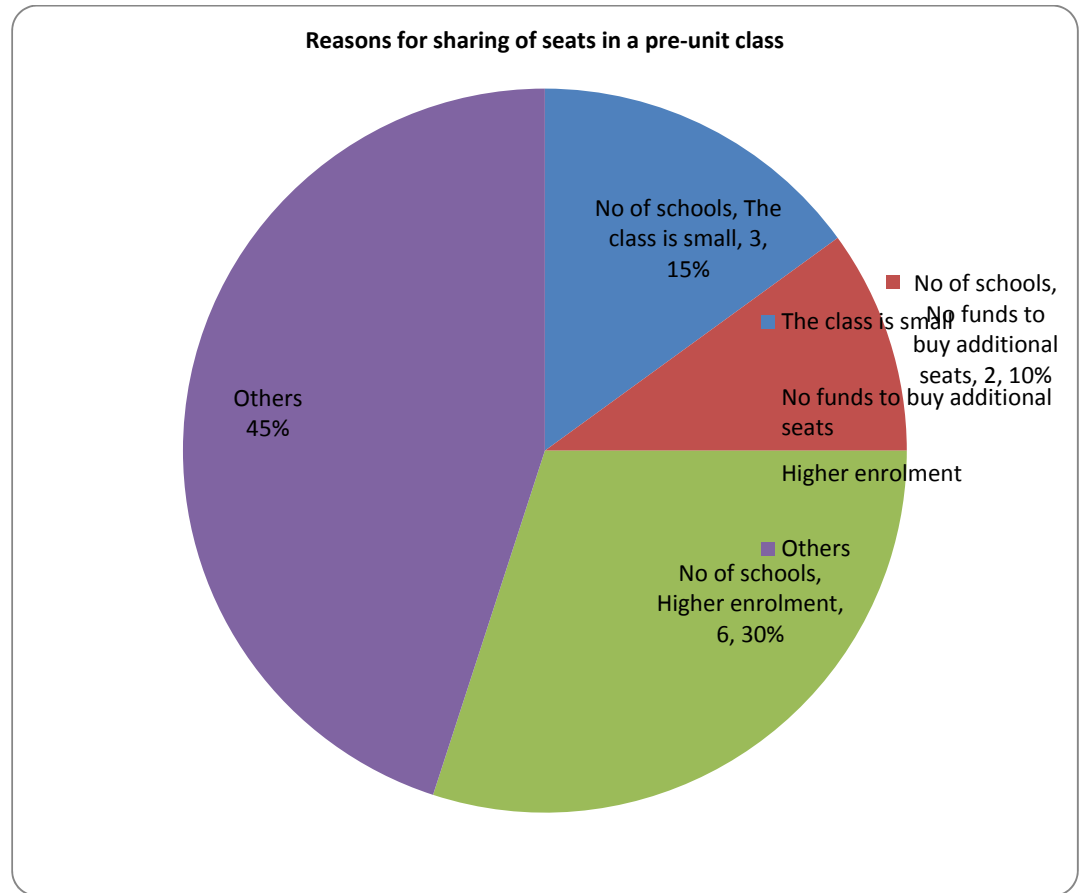
4.9 Reasons for sharing of seats:

Data obtained and analyzed on the reasons as to why pre unit children share seats showed that children do not share seats in 30% of the schools, in 10% of the schools children share seats because of breakages and 30% due to high enrolment rate and 15% as a result of small class sizes.

Sharing of seats by pres-unit children limits their movement in participating in learning mathematics activities.

The diagram below shows the percentages on the results obtained regarding to sharing of seats in pre-unit classrooms.

Figure 11: Sharing of seats in pre-unit classrooms



4.10 Children’s mathematics performance

Mathematics performance test was given out in four selected schools, those with favourable classroom environment and those with unfavourable classroom environment conditions. The results are analyzed below.

Table 2: Analysis of performance test results in mathematics

	<u>Schools with Favourable classroom environment</u>			<u>Schools with Unfavourable classroom environment</u>		
	P	Mw	Total	M	S	Total
Names of the 4 selected schools						
Total Scores	2,658	1,231	3,889	1395	526	1,921
Number of pupils per school	27	14	41	30	10	40
Mean Score	98	88	94.85	46.5	52.6	48.03

The above mathematics results obtained from a performance test administered to four selected preschool children indicates that preschools with favourable classroom environment have better performance in mathematics when compared to preschools with unfavourable classroom environment. Preschools with favourable classroom environments obtained a mean score of 94.85 while those of preschools with unfavourable conditions had a mean score of 48.03. From the results above, classroom environment determines the children's performance in mathematics. These unfavourable conditions include small classroom size that makes it impossible to have learning corners necessary to conduct learning activities, inappropriate desks and chairs has a great influence of the physical development of the children. It can affect their posture and the extent of fatigue they are exposed to. Inappropriate furniture affects how they play and learn.

The preschools with good performance in mathematics are privately run while the majority of the preschools with poor mathematics performance are public schools.

This state of affairs contributes to the widening gap between the poor and the rich, since the rich will afford to pay the preschool fees in private schools.

In order to redress this problem the government should fund pre primary education, employment of qualified pre primary teachers and providing the necessary teaching and learning resources.

4.11 Curriculum assessment

Data collected and collated by the researcher shows that most school heads uses pupil's performance in exam and other official methods in assessing the use and implementation of approved curriculum in their respective pre unit schools.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the study

The purpose of the study was to investigate the effect of classroom environment on academic performance in mathematics of preschool children in Pioneer zone, Uasin Gishu County. Four research objectives were formulated to guide the study. Objective one sought to establish the effect of instructional resources on the academic performance of school children in mathematics. Secondly, to find out the difference in mathematics performance of children in schools with high child text book ratio and the schools with low child text book ratio, thirdly, to determine the difference in academic performance in mathematics in preschools with adequate and appropriate furniture (seats) and those without and finally, to investigate whether there is any significant difference between the performance in mathematics of pupils with adequate free air circulation in their classroom and those without.

The study was descriptive in nature and used survey research design. The design was chosen to help the researcher understand the problem at hand in a systematic and in an objective manner. The study targeted 11 public preschools, 52 private preschools, 126 preschool teachers and 63 school administrators (head teachers). Due to the difficulty in accessibility of the entire population, a representative sample was selected through stratified random sampling technique as follows; 4 public preschools, 16 private preschools, 38 preschool teachers and 19 school administrators (head teachers). Data was collected through observation schedule and interview schedules. The collected data was coded, cleaned and analyzed using descriptions, frequencies, percentages and by use of tables.

5.2 Conclusions

Over 70% of the preschool teachers are in the age bracket of 21-40 years. This means that the teachers are in their prime years and are very active and an asset to the preschool education, particularly in regard to mathematics performance.

On the other hand, 64% of the head teachers are in the age bracket 30-50 years of age. This implies that there are enough mature administrators in charge of preschool education within the zone.

As the saying goes, an old broom sweeps better. Both preschool teachers and head teachers have experience of over 5 years making them experienced to handle effectively preschool pupils and administration issues.

Both the heads and preschool teachers have undergone relevant training in administering and handling preschool education in their respective schools.

The recommended class size is 25 pupils per class. 65% of the preschools sampled had 25 pupils per class and below, making it easy for the preschool teachers to effectively teach mathematics.

Absenteeism is majorly caused by non payment of schools fees by the preschool parents or guardians. Not all parents afford the payment of school fees.

Another cause for absenteeism on the other hand is illnesses as a result of exposure to changing weather conditions and parental negligence.

The findings indicate that more than 4 children share a mathematics text book. At their tender ages, sharing a book is a very challenging exercise. The same applies where a preschool teacher as to write work on the chalk board for the children to copy. These scenarios lead to poor performance in mathematics.

During the research visits the researcher noted with concern that the majority of preschool classrooms are smaller than the recommended classroom size of 8mx8m.

Due to this, learning corners are unavailable in most of the schools in the zone.

5.3 Recommendations

Whereas the findings established that the teachers and head teachers have enough experiences, the government should regularly conduct in service training on new methods and techniques of teaching mathematics to realize good performances and keep the teachers updated. Preschool is the foundation of education and as such the government should invest more resources in it.

In view of the conclusion above on class sizes, the government should strive to achieve the recommended class sizes in all preschool schools, both private and public by coming up with preschool policies backed by legislation.

In order to address the issue of preschooler's absenteeism, the government should provide free and compulsory early childhood education to all public preschools in Kenya and as for absenteeism due to illness the government should develop a routine medical check up in every public school.

One of the main problems arising from the research study is the pupils-text book ratio. The government should provide text books to public preschools and should ensure that all private schools do provide mathematics and other text books to each child since there is a positive correlation between pupils performance and availability of text books. This can be done through the establishment of inspectorate for preschools that incorporates QASO in each district of the Republic of Kenya.

The government should enforce the recommended standard size of constructing pre-unit classrooms throughout the country using county governments. The government should acquire land for building preschool classrooms. The QASO education

officers should periodically inspect the pre unit classroom to ensure that they are operating on the right size of a classroom

5.4 Recommendations for further study

There are several factors related to class room environment that contribute to poor performance in mathematics in the zone and require further research work.

Therefore, further research work would include:

Further research work on the effect of classroom environment on academic performance of all subjects in preschools should be carried out.

Further research should also be carried out in regard to the extent to which the government should be involved in the running and management of preschool education in Kenya.

There is need to carry out research on the importance of learning corners in preschool classrooms.

Also research could be carried out on the methods and techniques of teaching mathematics in preschools to improve on the preschooler's performance.

Finally, further research work should be carried out to establish the minimum training required for preschool teachers as there are no standards currently.

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APPENDICES
APPENDIX 1

Performance test

1. Fill in the missing numbers

(a) 1 _____ 3 _____ 5 _____ 7 _____ 9 _____
_____ 23 _____ 25 _____ 27 _____

(b) 19 _____ 21

2. Draw balls

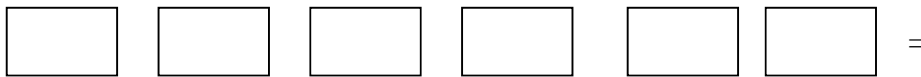
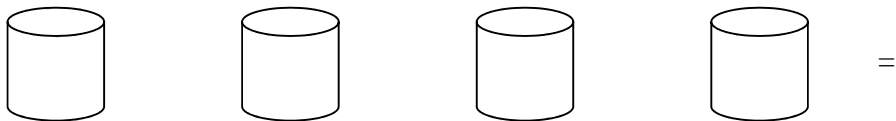
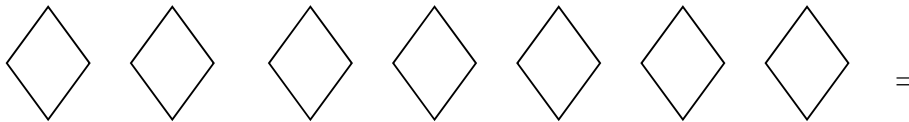
Example: 4 = 0 0 0 0

8 =

11 =

9 =

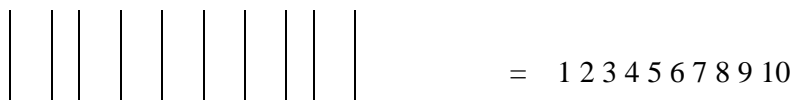
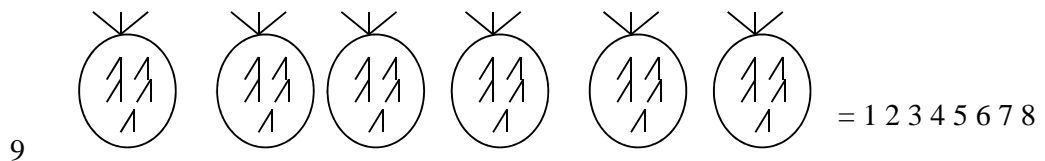
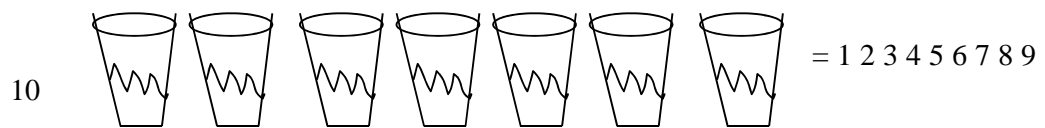
3. Count and write the number



4. Count and circle the correct number

K K K K K = 1 2 3 4 5 6 7 8 9 10

M M M = 1 2 3 4 5 6 7 8 9 10



5. Work out the following sums

$$\square + 4 = 8$$

$$\square + 2 = 5$$

$$6 + \square = 10$$

$$3 + \square = 3$$

$$\begin{array}{r} 3 \\ + 1 \\ \hline 2 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ + 5 \\ \hline \end{array}$$

6. Take away (-)



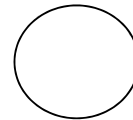
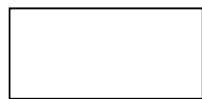
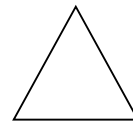
$$5 - 5 =$$

$$12 - 6 =$$

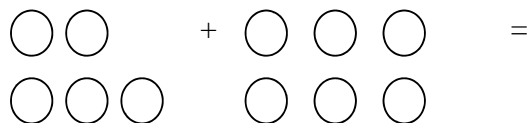
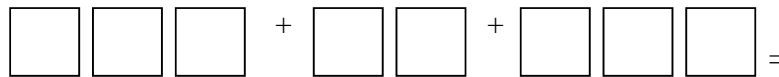
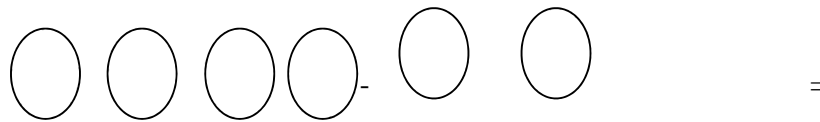
$$n n n n n - n =$$

$$9 - 5 =$$

7. Name the shapes



8. Work out the followings:



APPENDIX 2: OBSERVATION SCHEDULE

This is a checklist in which behaviours to be observed are recorded by the researcher in the order in which they are to be observed:

School Name:

#	THINGS TO BE OBSERVED	FINDING
1	Adequacy of class room lighting	
2	Real objects	
3	Charts on the wall	
4	Children interactions	
5	Learning corners	
6	Number of children per class	
7	Classroom cleanliness	
8	Adequacy & appropriateness of chairs and tables	
9	Classroom temperature	

APPENDIX 3: INTERVIEW FOR HEAD TEACHERS

(Instructions: Please respond to the following questions orally):

SECTION A: BIODATA

i. What is your gender?

Male () Female ()

ii. What is your teaching experience?

0-5 years () 6-10 years ()

11-15 years () 16-20 years ()

Above 21 years ()

iii. How old are you?

20-30 years () 41-50 years ()

31-40 years () above 51 years ()

iv. Indicate your highest educational qualification?

P1 () Diploma ()

Degree () Masters ()

Other (specify):

SECTION B:

i. How many children do you have in your pre unit class(s)?

ii. Does your pre unit class have relevant teaching materials?

Yes () No ()

iii. Which of the following teaching/learning materials are available in your pre unit class?

a) Teacher's text books ()

b) Charts ()

c) Pupil's textbooks ()

d) Real objects ()

e) Others (specify)

iv. How many pre school teachers do you have in your centre?

v. How do you assess curriculum implementation in your pre school?

vi. Is the furniture for your pre unit class adequate and appropriately designed for them? Yes () No ()

Thank you for your cooperation

APPENDIX 4: INTERVIEW FOR TEACHERS

(Instructions: I kindly request you to respond to the following questions)

SECTION A: BIODATA

i. Your gender?

Male () Female ()

ii. How old are you?

Below 20 years () 31-40 years ()

21-30 years () Above 41 years ()

iii. Your teaching experience?

0-3 years ()

4-7 years ()

8-11 years ()

Above 11 years ()

iv. Your highest academic qualification?

Certificate () Degree ()

Diploma () Masters ()

Others (Specify).....

SECTION B:

1. How many children do you have in your pre-unit class? _____

2. Why do children share seats in your?

A. The class is small.

B. No funds to buy additional seats.

C. High enrolment.

D. Other (Specify): _____

3. Which books do you use to teach Mathematics in your pre-unit class?

4. Do your children share text books?

Yes ()

No ()

If yes, what is the ratio of text books to children?

1book per 2 children ()

1book per 3 children ()

1book to more than 4 ()

Other (Specify) _____

5. How do you obtain classroom charts?

1. Made by teachers

2. Bought

3. Donation

4. Other (Specify) _____

Thank you for your cooperation