PLAY DETERMINANTS INFLUENCING ACQUISITION OF NUMERACY SKILLS AMONG EARLY CHILDHOOD LEARNERS IN ECDE CENTRES IN KATHIANI SUB-COUNTY, MACHAKOS COUNTY

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DECLARATION

This project report is my original work and has not been submitted in any other university for examination or for any other award.

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DEDICATION

To the teachers of Early Childhood Development Education for their commitment to the wellbeing of children.

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ABSTRACT

This study sought to underscore the influence of play determinants in the teaching of Mathematics, particularly acquisition of numeracy skills among children in pre-school. The study was done in Kathiani zone which is in Kathiani Sub-County, Machakos County. Its purpose was to assess the influence of play determinants on acquisition of numeracy skills in Early Childhood Development and Education (ECDE) centres. In this regard, while focusing on pre-school institutions in Kathiani Sub-County the objectives of the study were threefold; to establish forms of play and how they influence acquisition of numeracy skills, to establish the criteria of material selection and how they influence acquisition of numeracy skills, and to establish teacher training and experience and how they influence pre-school learner's acquisition of numeracy skills among children in pre-school institutions in Kathiani Sub-County. The study utilized qualitative research design. The dependent variable for the study was the acquisition of numeracy skills among children in pre-school institutions in Kathiani Sub-County, while independent variable is influence of play determinants. The target population comprised all pre-school children and pre-school teachers and headteachers in Kathiani Sub-County. The research instruments were piloted in two public schools and one private pre-school institution that were not included in the study sample, but within the target population. The data collected were edited and coded according to themes that emanated from the research objectives and questions. Questionnaire, interview schedules and observation schedules were used for data collection. Qualitative data were derived from open-ended responses received during interviews. The quantitative data were analyzed and presented using descriptive statistics such as frequency distribution, tables and percentages, and also in narrative form. Qualitative data were presented in narrative form. Majority (52.6%) of ECDE teachers agreed that they rarely consider quality when selecting play material. (63.2%) selecting play materials based on content enabled facilitation of acquisition of numeracy. Appropriateness is key when selecting play materials (52.6%) and (47.4%) of ECDE teachers indicated that selecting play materials based on sophistication has made it difficult for ECDE teachers to enhance acquisition of numeracy skills in ECDE centres in Kathiani Sub-County. The study further established that (39%) of ECDE teachers were not decided whether different forms of play enhanced acquisition of numeracy skills in ECDE Kathiani Sub-County. On training and experience of ECDE teachers, the study established 57.6% of ECDE teachers agreed that level of training influences delivery and acquisition of numeracy skills, (73.2%) teachers' mastery of content influences learners' acquisition of numeracy. Thus, the study recommended that ECDE teachers should be made to understand the importance of play in enhancing acquisition of numeracy skills in ECDE centres. ECDE teachers should undertake further proficiency training on planning, organizing and delivering of content in ECDE teaching and learning. It is expected that the findings of this study will contribute to the efforts towards early interventions to improve numeracy learning outcomes among learners in Kenya. The study is significant to the Ministry of Education, Kenya Institute of Curriculum Development, publishers and developers of early childhood education materials and teachers as well as owners and sponsors of ECDE institutions.

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ABBREVIATIONS AND ACRONYMS

DICECE	District Centre for Early Childhood Education
ECDE	Early Childhood Development Education
KIE	Kenya Institute of Education
MoE	Ministry of Education
NACECE	National Centre for Early Childhood Education
NACOSTI	National Commission for Science Technology and Innovation
PRIMR	Primary Mathematics and Reading
RTI	Research Triangle International
USAID	United States Agency for International Development

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Play-based learning is described as a context for learning through which children organize and make sense of their social world as they actively engage with people and objects. Representation of young children's play allows them to explore, identify, negotiate, take risks and create meaning. The intellectual and cognitive benefits of playing have been well-documented. Children who engage in quality play experience are more likely to have well-developed numerical memory skills, and are able to regulate their behaviour, leading to enhanced school adjustment (Tina, 2005).

The children's play is challenged by several forces including child labour and exploitation practices, war and neighbourhood violence, and the limited resources available to children living in poverty. However, even those children who are lucky enough to have abundant available resources and who live in relative peace may not be receiving the full benefits of play. Many of these children are being raised in an increasingly rushed and pressured style that may limit the protective and numerical benefits they would gain from play (Syomwene, 2013).

According to Reys (1999), Early Childhood Education incorporates activities or experiences that are intended to affect developmental changes in children before entry into primary school. Tina emphasizes that play is important for the early stages of brain development and playing with child can help build relationships for later life. Play helps to develop important skills for learning, life and work. This has the importance that,

encouraging play is one of the key approaches that educational institutions could use to positively influence the teaching-learning process to enhance numeracy learning outcomes. The importance of play as a component in the teaching-learning process of pre-school children has been underscored by educational thinkers of ancient times among them Plato and Aristotle. These educational thinkers argued that play was important in enhancing the memory and creative capacities of children. Johann Pestalozzi (1746-1827) emphasizes that play as a method of instruction develops the principle of self-activity in children while acquiring knowledge in the first stages.

Froebel (1782-1852) as reported in Sifuna and Otiende, (1995) pointed out that play was the mode through which the child achieved an equilibrium through harmonious development and remained committed to play as a mode of instruction for young children and a curriculum representative of the larger society. Froebel observed that play leads children step by step to an orderly sense of reality and planned occupation to train the hand, eye and mind which is basic in numeracy skill acquisition.

In underscoring the importance of Early Childhood Development Education (ECDE), the Kenya Government through the Ministry of Education presented a sessional paper number one (1) 2005. This project presents a policy framework for education training and research to develop a comprehensive ECDE policy paying attention to gender, vulnerable and disadvantaged children. This serves as evidence to the great concern that government has on the importance of education in the early years of the Kenyan child. The policy framework provides that early childhood education programme includes any types of educational programme that serves in early or formative years and is designed to improve

later school performance. A growing nation needs healthy and active people who can perform day-to-day duties at various positions. One way of preparing such people is by having well-organized play and physical activities from pre-school years where foundation is laid. During pre-school year's basic skills such as jumping, climbing, catching, dancing, singing, swimming, running and hoping can be developed (KIE, 2008).

According to Lain and Ganne (2014), there is need for pre-school teachers to understand the importance of play in order to provide appropriate methods for introducing numeracy activities. Also, the pre-school teachers should be aware of the needs of children and their different characteristics. This is because; the early childhood programme provides learning though playing which is very important and special part of childhood whereby children develop numeracy skills like sharing, counting, capacity in filling and empting games among others. Play also helps children to develop problem solving skills like simple addition, matching and pairing number value, recognition of symbols and shapes of numbers and development of the child's eye- hand coordination. Play is seen as one of the miracles of childhood by means of which children discover things essential to their wellbeing. It is part of child's life and also as a necessary condition for development. It provides the child with a variety of essential experiences, sensory exploration, emotional and social experiences as well as experiences of mastery or achievement (Jean, 2006).

According to Gale (2005), the teacher should apply approaches that are child-centred, motivating and sustains interest of all children. They should be provided with opportunities that stimulate them to play with sounds, rhythm, language, materials, space

and ways to express their creative ideas so as to advance in physical and intellectual competence. This is because children development of numeracy skills is affected by the nature of their early educational experiences; numeracy is essential skills for all children to develop. Without these experiences modern life becomes almost impossible. Yet, there is often disagreement about how teachers should approach this learning, and when aspects of it should be introduced to children. When people think of numeracy, often think of school rather than prior-to-school settings, and of formal teaching methods based on rote learning and memorization. From this perspective, it can sometimes be hard for us as early childhood educators to see how numeracy is relevant to our work in the early years of a child's life. The temptation can be to leave numeracy for schools to worry about while parents and caregiver's direct efforts elsewhere. The foundations of numeracy are laid well before formal schooling starts: Positive attitudes and competencies in numeracy are essential for children's successful learning. The foundations for these competencies are built in early childhood. Curriculum implementers have a responsibility to incorporate numeracy into pre-school programmes, but to do so in a way that is in keeping with the principles and practices of sound early childhood practice. In this study, the researcher considered how play can be incorporated in the teaching and learning to improve numeracy skills among pre-school children into a play-based programme and why this is so important.

According to Kioko (2010), the over emphasis on the value of passing examinations; many schools in Kathiani Sub-County have neglected play in efforts to teach children. Pre-school teachers do not consider play as important in child numeracy learning, children are provided with little time and opportunities to play and also there are no

enough play materials for the children in the learning centres. In the Sub-County, the children are expected to get high grades in examinations and therefore, remain in class being taught with little time for play or participate actively in learning activities. This has led to rote learning whereby the children do not understand number value, number symbols and number recognition concepts in numeracy and learning in general. It is, therefore, the endeavor of this project to underscore play as a cornerstone instructional component in the acquisition of numeracy skills among pre-school children.

1.2 Statement of the Problem

Reseach by Uwezo (2016) (a Non-Governmental Organization in Kenya), point out the problem of poor learning outcomes, including numeracy skills in early grade learning among children in Kenya. The findings indicate that many children of primary school age, including those enrolled beyond standard three, are not able to pass learning outcome tests. On individual tests, only one in three children enrolled in standard three can pass them. This rises to a little over 60% (or less than two in three children) in Standard four. Even in standard seven, one in ten children cannot pass both English and Numeracy tests at standard two level. Several initiatives have been made to address this seeming problem. A programme aimed to improve English, Kiswahili and Mathematics was implemented in Malindi between 2007 and 2009.

A larger programme on the Primary Mathematics and Reading (PRIMR) Initiative was implemented by the Ministry of Education (MoE) with support from USAID and RTI International from 2011 to 2014. Despite the measures of intervention taken to raise learning outcomes in public primary schools in Kathiani Sub-County, the problems of

poor numeracy skills levels remain persistent. It is noted that efforts to improve learning outcomes seem to focus on lower primary and above while leaving out pre-school children. This study holds that intervention measures towards raising learning outcomes need to start from the early formative stages, that is, from pre-school to the rest of the educational levels, thus there is need to focus on the acquisition of numeracy skills among pre-school children.

1.3 Purpose of the Study

The purpose of the study was to assess the influence of play determinants in acquisition of numeracy skills among early childhood learners in ECDE centres in Kathiani Sub-County, Machakos County.

1.4 Objectives of the Study

The study was guided by the following objectives:

1. To establish forms of play and how they influence acquisition of numeracy skills among children in pre-school institutions in Kathiani Sub-County.
2. To establish the criteria of material selection and how they influence acquisition of numeracy skills among children in pre-school institutions in Kathiani Sub-County.
3. To establish teacher training and experience and how they influence pre-school learner's acquisition of numeracy skills among children in pre-school institutions in Kathiani Sub-County.

1.5 Research Questions

1. To what extent does the form of play influence acquisition of numeracy skills among children in pre-school institutions in Kathiani Sub-County?
2. How do the criteria of material selection influence acquisition of numeracy skills among children in pre-school institutions in Kathiani Sub-County?
3. To what extent does teacher training and experience influence pre-school learner's acquisition of numeracy skills among children in pre-school institutions in Kathiani Sub-County?

1.6 Significance of the Study

It is expected that the findings of this study may contribute to the efforts towards early interventions to improve learning outcomes among learners in Kenya. The government through the Ministry of Education may be made to understand the need of supporting ECDE programmes in Kenya to improve the standards of ECDE education. Kenya Institute of Curriculum Development, publishers and developers of early childhood education materials and teachers as well as owners and sponsors of ECDE institutions may understand the importance of improving play activities and play learning facilities to cater for maximum acquisition of numeracy skills and heuristic learning in early learning experiences per ECDE guidelines (2006). This study is critical in supporting dispositions that poor numeracy skills stimulation during early childhood years may be reflected in the poor academic achievement of learners in mathematics subjects in primary and secondary levels and that performance in mathematics at higher levels may be determined by the quality of numeracy in early childhood.

Children may be provided with informal education geared towards developing the child mental capabilities and physical growth. It makes possible for the child to enjoy living and learning through play. It may enable the children to build good habits for an effective living as individuals and as members of a community. Play may also help children to; explore and develop personal talents and skills, develop their large and small motor skills and strengthen their body muscles, control and coordinate different body parts, develop accuracy and estimation skills and relaxation and enjoying themselves.

1.7 Limitation of the Study

Due to diverse personal characteristics, data gathering may have affected some respondents from exhaustively responding to all items. So, the respondents were sensitized about the importance of filling and answering the interview schedule and questionnaire appropriately.

1.8 Delimitations

The study was delimited to all children in pre-school institutions in Kathiani Sub-County regardless of gender, religion or socio-economic status. ECDE teachers have varying capacities due to differences in experience and training arising from the number of years taught. Therefore, the findings of the study were generalized based on the variation. The study was conducted in public and private pre-schools as well as the social settings factors from one school to the other. However, these findings may be applied in pre-schools within similar social settings.

1.9 Assumptions of the Study

The study assumed that play can be used to bring about positive learning outcomes. By implications, this could be used to improve acquisition of numeracy skills among pre-school children. Also, it assumed that respondents who were available during the data collection process, were cooperative and provided truthful and accurate information.

1.10 Theoretical Framework

The study adopted Karen Stephen's theorization of play in Education. According to Anderson (1998), play can be described as a role play or pretend play which involves creativity, such as: making props to use or finding objects to be used as props. Play can also be creative, when the person involved constructs building blocks, uses paint or uses different materials to build an object. Creativity is not about the end product but the process of the play scenario. Imagination is also used during play when the person involved creates images in his/her mind to do with personal feelings, thoughts and ideas. The person then uses these images in their play. Play is active, intrinsic, episodic, symbolic, child-initiated, process oriented and rule-governed. There are critical differences between play and work.

Play is mostly a self-chosen activity by the child, rather directed by a parent or teacher; it is a process rather than a predicted outcome or product. Work, on the other hand, has a definite intent and a prescribed outcome. For an activity to be considered play, the experience must include a measure of inner control, ability to bend or invent reality, and a strong internally based motivation for playing. If parents and educators try to label experiences as play, but in reality have specific requirements for the activity, then it

becomes work not play. For example, it is really impossible to play with flash cards whose purpose is to have a child memorize something on each card. This is not playing and children quickly differentiate between pure play and work being disguised as play (Kabiru, 1993).

Play is not wasted time, but rather time spent building new numeracy skills and knowledge from previous experience. There are various ways in which researchers may choose to look at the differences between work and play. Play is the primary mode for interacting with the world. It is children's "work". Play can also be described as a means through which children get an opportunity to practise the necessary life skill through use of their senses. Through play, they stretch their abilities and expand their understanding of concepts. They spend hours poking, prodding and manipulating objectives (Anderson, 1998).

1.11 Conceptual Framework

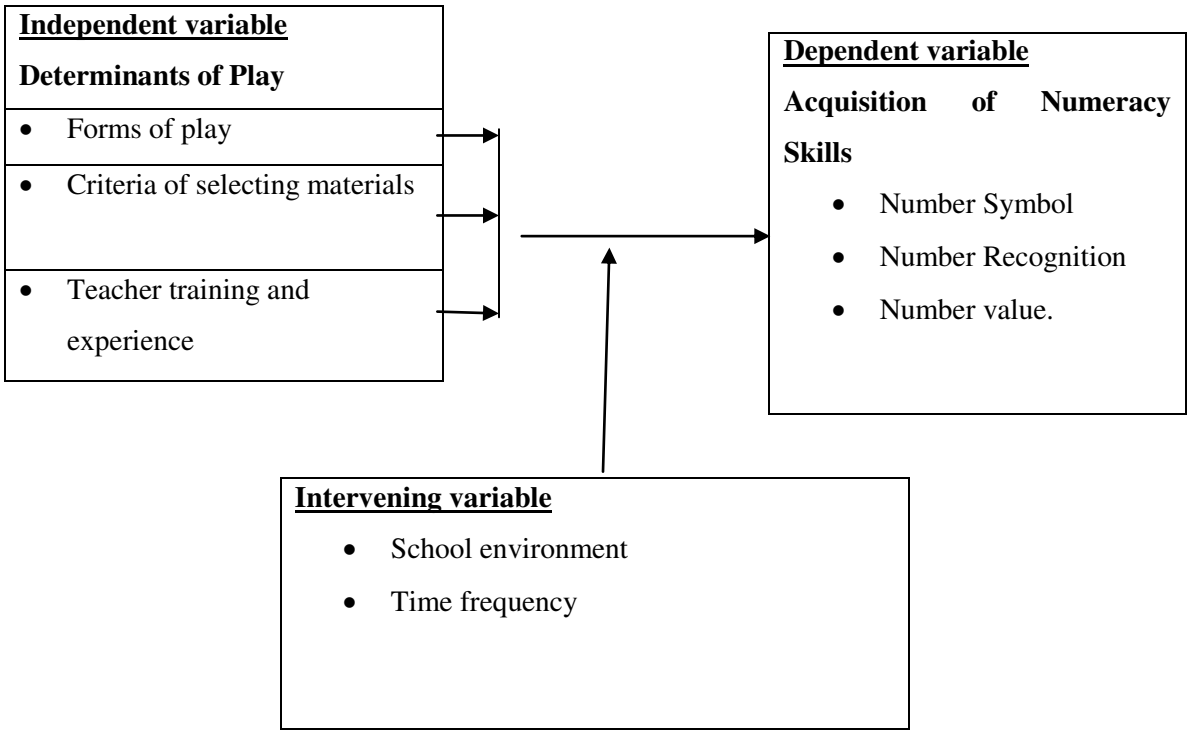

Figure 1: Conceptual Framework

Source: Researcher, 2018

The independent variable of the study is influence of play which has three indicators; the forms of play, criteria of selecting material and teacher training and experience. The dependent variable of the study is acquisition of numeracy skills. The numeracy skills taught in preschool include number symbol, number recognition and number value. The intervening variables are the factor which will not be put into consideration in the study. The researcher highlighted them as follows; school environment and time frequency.

1.12 Operational Definition of Terms

Acquisition : Refers to learning and retaining new numeracy skills among the pre-school children.

Early childhood learners: Refer to children aged between three to eight years who attend pre-school centres for learning.

Forms of play **:** refer to the types of play that a child will take part in, depending on his/her age, mood, and social setting.

Numeracy skills : Refer to the ability to use mathematics or the application of mathematics in other areas of the ECDE curriculum. Numeracy skills are needed in order to function fully in modern life. Being numerated means being able to reason with numbers and other mathematical concepts and to apply these in a range of contexts and to solve a variety of problems.

Play **:** Refers to means by which children develop their physical, intellectual, emotional, social, and moral capacities. It also provides a state of mind that in children is uniquely suited for high-level reasoning, insightful problem solving, and all sorts of creative endeavors.

Selection criteria **:** Refer to ways and factors through which the teacher select play materials. This is based on quality, suitability, appropriateness and sophistication.

Teachers' training **:** Refers to any professional process of acquiring skills and knowledge on how to use play materials in teaching and learning. These was measured based on level of education or training, mastery of content, experience and levels of exposure.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviewed the information from internet, books, magazines, newspaper and other scholar's reports which are related to the study on the effect of play on learning numeracy skills.

2.2 Philosophies of Play

Play is a concept used in psychology of education to describe how a child can learn to make sense of the world around him/her. Many writers, educators, philosophers and psychologists have tried to discuss play in different fashions. According to KIE (1994), play is the most natural form of acting and thinking characteristic for children. It may seem as though children play for the sake of playing and because it is fun. Children acquire a level of deep satisfaction through play. However, they also learn and make sense of the world around them through different forms of play. Moreover, it gives them opportunities to participate, and increase creativity and motivation. Play may also be seen as one of the miracles of childhood by means of which children discover things essential to their wellbeing. The book explains play as part of a child's life and also as a necessary condition for growth and development. It provides the child with a variety of essential experiences, sensory exploration, emotional and social experiences as well as experiences of mastery or achievement. Piaget defined play as the way a child learns about his/ her environment. It is interactive in nature that facilities constructional knowledge. It is an activity which is concerned with the whole of his being, not with just one small part of

him. Denying him right to play is to deny right to live and grow. Play is a means of learning about and making sense of the world (Eva, 2011).

2.3. Play and the Acquisition of Numeracy Skills

Learning about numeracy is a pre-schooler's first step toward becoming a budding young mathematician. Numeracy learning in pre-school is all about number counting, number writing, number symbol, number recognition or identification and number value. If a child doesn't ace these seemingly simple skills in a timely manner, he/she may have problems with development mathematic in later life.

Numeracy skills mean having the ability to problem-solve, reason and analyze information. It is the second key step for all pre-schoolers, beyond language literacy. It is the ability to use numbers to help solve real-word problems. In developing early number skills, it requires a "good intuition about numbers and their relationships. It develops gradually as a result of exploring numbers, visualizing them in a variety of contexts, and relating them in ways that are not limited by anything (Debra, 1982).

Basic numeracy skills utilized in a pre-school classroom sets the foundation for learning more advanced math skills. Early exposure to mathematics and number activities promotes child's comfort with these skills. Also, additional opportunities to practise these skills increases child's confidence when working with math and number skills which leads to individual believe that he/she is "good at math." If a child does not become comfortable with numeracy skills at a young age, he/she may lack confidence in his/her abilities and may become hesitant as more advanced mathematic skills are introduced.

When this happens, the child may default to believing he/she is “bad at math” and he/she risk beginning a self-failure in mathematics (Tina, 2005).

The use of play as an educational component has been underscored by several scholars. Sandie (2013) points out that modern psychological theories and theorists describes the current trends put into "play" in today's educational settings and emphasizes the English saying that "All work and no play make Jack a dull boy." While this ancient proverb may seem trite or cliché to modern scholars, it still holds true when discussing children and play. Greek Philosophers Plato and Aristotle discussed the role of play in education, but specific play theories were not developed until centuries later. Sandie highlighted that, Sigmund Freud posed a psychoanalytic play theory that was defined in his book" Beyond the Pleasure Principle." In this work, Freud described play as a child's mechanism for repeatedly working out a previously experienced traumatic event in an effort to correct or master the event to his satisfaction.

According to Joel (2010), Bruner suggested that one of the main functions of child's play was to rehearse actions to various real-life scenarios in a safe, risk-free environment so that when confronted with a difficult situation, it would not be so stressful. Joel highlighted further that, John Dewey a prominent theorist in the early 1900s saw play as a sub-conscious activity that helps an individual develop both mentally and socially. It should be separate from work as play helps a child to grow into a working world. As children become adults, they no longer "play" but seek amusement from their occupation. This childhood activity of play prepares them to become healthy working adults.

According to Anderson (1998), Maria Montessori, an Italian educationist during the early 1900s, postulated that "play is the child's work." According to the Montessori Method, which is still employed today in private schools, children would be best served spending their play time learning or imagining. Montessori play is sensory, using a hands-on approach to everyday tools like sand tables. The child sets her own pace, and the teacher is collaborative in helping the child play to learn. According to Karen (2007) Jean Piaget is most noted for introducing the stages of child development. These stages directly relate to play, as he stated that intellectual growth occurs as children go through the stages of assimilation, or manipulating the outside world to meet one's own needs play acting and accommodation, or readjusting one's own views to meet the needs of the outside environment or work.

In a study by Karen (2007) further indicated that to foster the child's numeracy development, many pre-school teachers may be tempted to provide flash cards as an initial learning tool. This is not the best method for teaching young children numeracy skills with understanding. Many pre-schoolers may be able to identify numbers 1-9, but they don't understand what they mean. It's important for pre-school teachers to understand the difference between conceptual learning and skill development. Instead of flashcards, they should look for teachable moments, count things that are familiar to the child as they play or helps you with simple chores like counting socks, toy cars, or other toys will maintain her attention and have more meaning for her. Play is learning for three to six-year olds. Follow their interests and create environments that encourage creativity and exploration for maximum numeracy skills development.

A study conducted in India, Kang'ara (2017) revealed that significant number of teachers has the view that the most effective manner to instruct is by taking the role of the dictator in the classroom. In this capacity as dictators, they treat their learners as sponges and hardly impart to the learner's information hence expect it to soak in and be understood. In a study by Karen (2007), further indicated that such teacher's believe that once information is presented, it is the learners' responsibility to understand the concept. This indicates that learning, in the view of these teachers, means reading, memorizing, and repeating any information. A study by Brannan (2005) refers to this as the banking concept which implies that education becomes an act of information depositing, where learners are the depositories and the teacher is the depositor. Besides communicating, the teacher issues communiqués and makes deposits which the learners receive through memorization and repetition. Unless the information sinks in, it will not be comprehended.

In support of these assertions, Kang'ara (2017) in a study conducted in Kiambu West asserted that the banking concept of education does not attract learners to be involved in critical thinking but instead, it encourages the learners to be passive and receive facts as they are delivered without debating or questioning. However, learners will get the concepts material only if they are focused, involved and interested in the information. This is the time when learners are at their peak point of absorption that they will eventually be eager to learn. Pre-school teachers who employ appropriate and different instructional strategies such as discussion, groupwork or demonstration in the classroom achieve a more learner-centred classroom where pre-school learners are more actively involved in building upon existing knowledge. Such classrooms use time more

efficiently; information is communicated consistently and clearly and is reinforced with varying strategies of instruction. In Australia, for example, effective use of literacy materials has seen an increase of 2.9% in ECDE learner autonomy and improved language development skills.

2.4 Forms of Play Used and the Acquisition of Numeracy Skills

Play is a combination of exploration, discovery, physical activities, artistic experiences and self-expression. It can happen in organized or free form, in a group setting or independently. Essa (2011) indicated that, play is the most effective and natural method through which children learn and experience the world around them. Play can be categorized in its social (six stages) or its cogitative (four stages) characteristics. Mildred categorized children's social play into five types which are considered valid today. Other researchers view play in different perspectives. For instance, Sara Smilansky proposed categories based on children increasing cognitive abilities and measured by how children use play materials similarly came up with four types. Paten's categories of social play include the solitary play whereby the child plays alone. Children at all ages engage in this type of play, although older children's solitary play is more complex.

The Onlooker Play which is quite common among children of two-year-old, a child stands nearby watching others at play without joining in. The Parallel Play Children use similar materials or toys in similar ways but do no interact with each other. Another category of play is associative play which is increasingly evident as pre-scholars get older, children interact and even share some of their materials, but they are not engaged in a common activity. The last category of play according to Partin is cooperative play

which is typical of the older pre-schoolers, it is the most social from of play and involves children playing together in a shared activity (Debra, 1982).

Brannan (2005) highlighted that, Smilansky's Categories of Cognitive Play include the Functional Play which is characterized by infants and toddlers' repetitive motor play used to explore how are and what objects can be done with them. Smilansky urged further in dramatic play the children use play objects to substitute for something imaginary. He added that Games with rules involving acceptable pre-arranged rules in a play and this stage is more typical of older children. He also included Constructive Play which involves creating something with the play objects e.g. Harumi uses blocks to construct a tower.

Focusing on the different forms of play according to Kyriacou (2001), it is a simple yet comprehensive categorization which also captures technological advancements and values of today. Moreover, these forms of play are easy to integrate into the daily schedule of children within the classroom. Digital play is the combination of digital technology with daily activities of enjoyment and recreation. Studies have shown it to provide rich content together with high levels of engagement, creativity and motivation. Moreover, this form of digital play allows a whole new level of enjoyment, interaction, collaboration and unique learning experience.

Regardless of a child's physical limitations it has the capacity to simulate highly realistic immersive and pleasurable experiences. Thus, among different forms of play, digital play ranks particularly high in its ability to grant children to connect create and share with others from around the world. Furthermore, while promoting digital literacy and

information technology skills are necessary to succeed in the present world, digital play also enhances critical thinking, academic performances and a variety of other skills (Essa, 2011).

Wilson (2002) noted that, an active play can be referred to as activities or plays which maintain physical movement at heart. It could be carried out indoors or outdoors in the form of organized games or more relaxed activities which have no restrictions or not directed by grown up. It has been researched and established that children need to be physically active for a minimum of two hours per day. Active play strengthens and promotes skills necessary for learning such as practice, persistence, improved attention span, stress management and motor skills and competence. Moreover, when carried out in a competitive spirit, it enables children to experience the joy and winning spirit, frustration of losing and working together as a team. Furthermore, it also helps children develop a positive self-image, competence, self-esteem and an awareness of their own body. Among the different forms of play, active play in particular promotes creativity, discovery and physical wellbeing (Gay, 2002).

KIE (1994) indicated that, creative play depending on the age blanket of the child could involve imagination, pretending to innovation and exploration and make believe. It is how children explore the world of imagination using all the different senses and creativity. Traditionally, creative play revolved around either an artistic talent such as painting, drawing, dancing, singing or drama. In addition, it involved constructive play such as designing, building or engineering something.

Children nowadays are also able to incorporate digital technology to create digital content, items, objects, and tools, elevating creative play to a whole new level. Wilson (2002) suggested that the most contemporary and comprehensive definition which captures and explains the essence of creative play should be activities which promote artistic expression and experiences. Engaging in creative play allows pre-school learners to discover and pursue their interests. It also enables them to build their unique talents, as well as fine and gross motor skills. Further, creative play inspires innovation, scientific discovery and thinking outside the box. It is also likely to enhance the likelihood of a child creating an inventor or an innovator.

Social play involves activities through which children interact and engage with other people naturally. This could include interactions with other children during their free play, teachers in learning and social situations and parents at home. The engagement could be organized such as collaborating on a classroom learning at school or as casual as interacting on the playground. On the other hand, social play could also be for enjoyment or competition whereby children play to win. Wilson (2002) believed that traditionally social play consisted of interactions which children do one on one. However, today it is also possible to do so virtually through online gaming, social media and other interactive digital technologies through use of internet connection. This particular type of play helps children develop personal skills, communication, collaboration and interpersonal skills together with empathy. Moreover, it also promotes cultural competence as well as it enhances social and emotional skills further.

According to KIE (1997), free play refers to type of activities with no specific structure or rules or even guidelines to be followed. While the players have complete liberty to come up with or how and what to play, the motivation behind free play is simply 'for the sake of playing and enjoying themselves'. Often as children grow older, free play is replaced with more structured forms of activities such as competitive games or organized hobbies such as piano playing, field games and other fun games. However, the freedom of choice or autonomy related to free play boosts intrinsic motivation, making it an ideal learning tool. Thus, particularly younger children can develop their creativity, imagination, innovation and abstract thinking by engaging in free play. Moreover, it also fuels their curiosity and prompts them to discover and try new ideas. Furthermore, free play also promotes critical thinking and problem solving among the players. In today's world, children also incorporate digital technology into free play whereby they engage in digital games or surfing the internet for casual amusement and enjoyment.

To obtain a comprehensive and optimal education in ECDE centres, we ought to employ different strategies to utilize variety of forms play including creative play, digital play, social play active play and free play. Therefore, to support the overall numeracy learning of children, it is important to adopt a variety of play based teaching and learning in pre-school institutions (NACECE 2001).

2.5 Criteria of Selecting Play Resources for Effective Acquisition of Numeracy Skills

Reys (1999) suggested that, the teaching and learning materials should be selected and accessed in ways which ensure they are directly related to a pre-school or school curriculum policy and programme, based on the department's framework of standards

and accountability. Providing opportunities and material for children to classify, sort and group objects using various criteria like; colour, shape, size, texture or use, help children to symbolize and use differed imitation and enhance their mental abilities. Learners actively construct their knowledge depending on the type of resources used; they see, hear or do in relation to what they know. Learners should be exposed to different types of resources so that they can construct their knowledge better.

According to Margaret (2009), there is a low level of instructional resources available in public schools and stated that our public schools are starved of both teaching and learning resources. He articulates that effective teaching cannot take place within. All teachers should understand that; all play activities integrated in ECDE curriculum need involvement or participation of teachers but the kind of teachers involvement or participation might be either active or passive.

A study by NACECE (2001) stresses that teachers in pre-schools are expected to play with children, teach them alphabet and numerals and make them be aware of their cultural patterns through play, storytelling or music activities. They should also take care of their good grooming and hygiene. The study further says that teachers are expected to encourage children to work in groups, to discuss and solve problems. They should introduce them to Mathematics, Language, Science and Social Studies play activities are games. In the selection of instructional materials there should be criteria used such that there should be appropriateness of the materials to instructional objectives; freedom of the content from bias, degree of the quality variety of the materials, quality of the format, print, sound or photography, availability of the materials to clarify objectives of and how

to operate the materials, how reasonable the time, effort and expenses are for both the learners and the teachers.

It further noted that most institutions have poor facilities, which continue to affect the quality of education offered to pre-school learners in Kenya. Therefore, it is valid to say that the efforts by parents, community, and individual schools to mobilize resources through fundraising have not raised enough funds for the provision of adequate educational facilities in our Country. The NACECE (2001) further indicated that where teachers may even work in separate schools or different parts of the building. Educators are being forced to step outside of their traditional roles and learn to work together by the current movement toward inclusion of all students with disabilities in the general education environment. The rationale of inclusion lies in how educators respond to individual differences. Inclusion calls for divergence in terms of the strategies used in teaching while standards-based reform calls for convergence in terms of learning outcomes.

Sandlie (2013) highlighted that, Children learn best through first-hand experience hence there should a wide variety of materials provided in ECDE so that they may engage in various activities. Being exposed to various materials and activities helps them to learn and to remember what they learn and thus enjoy their learning. The teacher has an obligation to organize, collect and make materials. Many pre-school activities will involve taking children outside the classroom so that they can observe things under different conditions without interfering with them. It is best for the teacher to start using materials that are familiar with the children and introduce unfamiliar ones later. Such use

of materials will help children develop confidence in the use of materials. There should be a chance for every child to participate and contribute towards learning. Provide a variety of materials to children to play with as the teacher guides them to solve problems. Teachers should enhance the acquisition and development of new values.

According to Rai and Richardson (2003), the activities and materials should be relevant to culture and age of the child. Teaching and learning aids are intended to provide children with real life experiences. They give children opportunity to use their full senses (touch, sight, smell, hear and feel) to enhance learning which helps in conceptualization of otherwise abstract ideas and helps understanding mastery and retention of the ideas or concepts. Learning aids need to be used as often as possible and should be relevant for the lesson. Rai and Richardson (2003) added that, equipment/ materials must be carefully evaluated to ensure their appropriateness for young children. Some important questions to ask when selecting equipment/ materials include; does the piece of equipment/ material support the programme's philosophy? Equipment/ materials should promote children's self-esteem and independence encourages positive social interaction and support children's development. Second, are the equipment/ materials appropriately sized for children? For a class of two-year- olds, chairs should be smaller and tables lower than for the older pre-scholars. In addition, it is important to question about the safety of the equipment/ materials.

Kyriacou (2001) indicated that it is important to ensure that safety standards are met and the item will withstand term usage. It must continue to be safe for the expected lifetime of the equipment/ material/ manufacturers of the outdoor play structures often provided a

safety warranty for such equipment. Durability is another concern about equipment/ materials for play in pre-schools. Early childhood equipment/ materials should be built to withstand hard use by large numbers of children over a period of years. Varnished or plastic surface will protect tabletops and shelved. The outdoor equipment should be finished to resist weathering, rusting and chipping. It is usually more expensive in the long run to purchase less expensive equipment/ materials that are not intended for group use and will have to be replaced sooner. Kyriacou (2001) added that, teachers should ask themselves whether the equipment/ materials are aesthetically pleasing. Consider whether a new piece of equipment/ materials will fit harmoniously with the existing furnishing. As we match our sitting rooms, the same way we should consider new equipment/ materials in the context of the entire classroom. Many early childhood items are available and made of attractive wood and others come in brightly coloured plastics. Lastly, is the equipment easy to clean and maintain? Classroom items should be relatively easy to sanitize and keep clean.

According to KIE (1997), materials should be made in such a way that, they can be easily handled and maneuvered by small children. Materials should not be too small as to choke children since at this stage or age they like putting everything in their mouths. Karen (2007) emphasized that "Good choices of play materials promote learning while poor creates safety hazards and increases behaviour problem. The following should be considered: Toys and materials should be appropriate for children's ages and abilities, provided a variety of materials. Children need variety and novelty to keep their interest. They become bored when provided with same materials every day. Rotate items regularly, maintaining a balanced between familiar items and new ones. Include materials

that children can look at, listen to, smell and sometimes taste, and such materials enable children to use all their senses for learning. Materials should also be accepted in different cultures. Children's books, puppets, dolls and posters can reflect many ethnic groups. Activities using foods, customs and music of multiple cultures make learning interesting and exacting. Provide enough materials so that children can comfortably share. Having too few materials frustrate children and sets the stages to fight and the young children, the more important is it to have duplicate toys.

2.6 Influence of Teacher Training and Experience on Pre-school Learner's Acquisition of Numeracy Skills

According to Margaret (2009), emphasis on the importance of training ECDE teachers as he observed that most ECDE centres in Kenya emphases academic and give little or no time for learners to interact with instructional materials. He further observed that in Kenya pre-school children are subjected to academic work due to pressure from parents who would like to see their children read and write within weeks upon joining pre-school. The ECDE curriculum developed by KIE has the provision for learners to interact with instructional materials but this is overlooked by parents and private school managers who insist that the pre-school children have to be taught numeric, literacy and have the ability to read and write this fact is compounded by the fact that the primary school head-teachers subject the ECDE children with oral and written interview for them to be admitted to standard one hence give no room for learners to interact with instructional resources.

According to Gay (2003), a qualified teacher has the ability to organize the knowledge of the world in a rationale way independent of the learning for Dewey knowledge consists of learning about the real world out there. The trained teachers have to endeavor first and to understand that world organize it in the most rational way possible and present it to the learner. This view may still engage the teacher in providing the learner with activities with hands-on learning with opportunities to experiment and manipulate the objects of the world but the intention is always to make it clear to the learner the structure of the world independent of the learner.

According to Ogogo (2013), a qualified teacher is expected to create the environment as well as put forth resources he/she feels are most beneficial to the child to learn how to count and classify in classroom. They further observed that the objective of teacher training programmes is to prepare and develop teachers with values, skills and knowledge required to teach competently in the pre-schools. Besides, teacher preparation programmes need to desired attributes of beginning teachers and develop broad components of skills and knowledge with the underlying core values as the basis of the curriculum. These values, skills and knowledge articulate the desired skills and knowledge components for beginning teachers.

Kabiru and Njenga (2007) suggested that a qualified teacher can be very good at retrieving resources that other people see as rubbish or have no value to use with children. For Vygotsky, there is a wide range of instructional resources and equipment available for number work activities of which may be available in most settings. A lot of materials can be salvaged from home, school and the immediate environment of the pre-

scholars. This suggestion of Vygotsky is supported by that a qualified teacher has the ability to transform the immediate local materials available and bring them to the classroom for learners to interact in mathematical activity areas.

Githinji and Kanga (2011) indicated that, a qualified teacher is aware and keen of factors to consider when selecting number work instructional materials like: cost, trained teachers need to know that children do not need expensive resource in order to learn number work, but materials collected from the immediate environment of the learner. The pre-school teachers should let the learners explore their environment through play for a large portion of the day and on daily basis in the typical-play based classroom, a trained teacher can allow learners enough time to interact with instructional resources, the children can spend adequate time to learn new skills and practice existing ones. Tina (2005) suggests that other pre-school teachers also build on everyday explanatory activities by setting up number work statues for their children letting them explore and figure out some of the number work problems on their own.

According to Kabiru (2009), the trained teacher explains the best way to transfer knowledge to pre-school children she/he sets them to interact with instructional resources and discover things on their own, only to prompting them by asking questions relevant to a specific concept. He further suggested that it is important to prompt the learner and ask relevant questions. For trained teacher to teach effectively, he/she is expected to create a safe, stimulating environment to prompt the learners appropriately and plan worthy tasks.

According to Vygotsky (1978), much important learning by the child occurs through social interaction with a skillful tutor/teacher as the tutor may model behaviours or provide verbal instruction for the child. Vygotsky refers to this as collaborative dialogue; the child seeks to understand the actions or instructions provided by the tutor then internalize the information using it to guide or regulate their own performances. Ogogo (2013) believes that anything that can be learned by direct experience can also be learned from observation. Bandura also believes that models are most effective if they are seen as having respect, competence high status or power. Thus, in most cases teachers can be highly influential models. Through careful planning of instructional materials to be presented, teachers can do more than teach routine information they can model skills, problem solving strategies, moral codes, performance standards, general rules principles and creativity (Debra, 1982).

According to Kabiru (2009), children of three to five years during their early learning would be important for the qualified teacher to provide the children to experience in an enriched environment which consists a wide variety of sights, sounds textures, shapes, objects among others. The more complex the environment, the more there is to be represented on the neurological level. The more that is represented on the neural level, the more the child can think about. Kabiru and Njenga (2007) suggested that there is need to train teachers as they deal with young children so that they can create an educational environment with great variety of instructional resources for number work. They asserted that teaching is one of the duties that require both qualifications and experience for better delivery. Recruitment of competent teachers to improve teacher student ratio is a necessary measure in improving the performance of learners.

Githinji and Kanga (2011) further suggested that the government of Kenya should give adequate attention to training of teachers to enhance performance of learners. Qualified teacher is human resource whatever facilities are available, whichever kinds of learners are given to teach the importance and vital role of the qualified teacher cannot be over emphasized. Assuming that necessary facilities are adequately provided for the environment is conducive to learning, the curriculum satisfies and the learners themselves have interest in learning, learning cannot take place without the presence of the qualified teacher when handling and organizing instrumental resources for number work in classroom. The teachers represent a large proportion of the input of an educational system.

According to Margaret and Njenga (2007), the problem of teacher supply is not one of simple numbers. It is first and foremost a problem of quality and of getting the right quality. It is a truism that teachers are the human beings of any educational system that upon their number their quality and devotion depends the success of any number work performance in learners. It is also vital to have sufficient and adequate human resources in terms of teacher quality for teaching of all subjects in the school curriculum. Without qualified pre-school teachers, the implementation of the goals of education can never be achieved hence no achievement in number work from low levels of education to higher levels of education.

2.7 Summary of Literature Review

The main goal of this study was to improve learning of numeracy skills through play in pre-school centres. Play is a means by which children discover things essential to their

wellbeing. It is part of child's life and also it's necessary condition for learning, growth and development. Play provides variety of essential experiences, sensory exploration, emotional and social experience as well as experiences of mastery or achievement. Poor learning through play can be as a result of lack of awareness or ignorance of caregivers or pre-school teachers. Poor forms of play, poor criteria of selecting equipment and play materials and lack of training and experience of pre-school teachers are also other causes of poor acquisition of numeracy skills in pre-school children in Kathiani Sub-County.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter explains the methods that were used to carry out this study. It focuses on research design, location of the study, target population, sampling techniques, sample size, research instruments, piloting, data collection methods, data analysis, logistical and ethical considerations.

3.1 Research Design

The study utilized descriptive survey research design since it attempts to describe the characteristics of the variables of the study (Mugenda & Mugenda, 2003). The research design was applied to gather data from a wide range of respondents from pre-primary centres and entails use of questionnaires, observation checklist and interview schedules. However, equal emphasis was based on the findings of methodologies. It applied mixed methods approach, that is, quantitative and qualitative methods.

3.2 Research Variables

According to Mugenda and Mugenda (2003), a variable is a measurable characteristic that assumes different values among the subjects and, therefore, a logical way of expressing a particular attribute in a subject. The dependent variable for the study was the acquisition of numeracy skills while independent variables were influences of play. The indicators of play were forms of play, criteria of selecting learning materials and teacher training and experience.

3.3 Location of the Study

The study was carried out in pre-school institutions in Kathiani Sub-County, Machakos County. The location of the study was selected to address the outcry by parents concerning the poor performance in numeracy by children from the area. The study sought to establish if the problem culminates from the Early Childhood Development Education era and it was also to sustain the curiosity of the researcher to choose Kathiani Sub-County as the area of study. The county has a total population of 155,230 children falling within the age group of 3 to 5 (pre-school). This consists of 78,478 males and 76,752 females. The County has an enrolment rate of 43.1 per cent and 41.1 per cent for boys and girls in ECD. The transition rate is 45 per cent. There is need for strategies to ensure that enrolment and transition rates improve to more than 70 per cent. The transitions rate is low which may be as a result of poor performance (Machakos County Integrated Plan, 2015).

3.4 Target Population

The target population for the study comprised children and teachers in Kathiani Sub-County; Machakos County. The targeted population for this research was 1875 subjects consisting of 190 early childhood teachers, 95 headteachers, and 1590 pre-school children. Mugenda and Mugenda (1999) define population as a group of people with similar observable features.

Table 3.1: Target Population

Categories	Target Population	Proportion
Pre-school headteachers	95	**100%**
Pre-school Teachers	190	**100%**
Pre-school Children	1590	**100%**
Total	**1875**	**100%**

Source: Researcher (2018)

3.6 Sampling Techniques and Sample Size

The study utilized purposive sampling technique to sample Headteachers. The pre-school teachers and pre-school children were sampled using simple random sampling. The researcher selected to use this sampling so as to objectively get respondents without bias. This is because review of literature shows that due to over emphasis on the value of passing examinations; many schools in Kathiani Sub County have neglected play in efforts to teach children.

3.6.1 Sample Size

The study sample was drawn from 95 schools in Kathiani Sub-County. A ten per cent of the target population was selected. According to Mugenda and Mugenda (2003), suggestion of drawing a 10-30% sample from the target population, the researcher selected 10 headteachers, 19 pre-school teachers and 159 pre-school children from the zones accounting for 10% representation of the target population making a total of 188 respondents.

Table 3.2: Distribution of Sample Size

Categories	Target Population	Sample Size	Sampling technique
Pre-school headteachers	95	10	Purpose sampling
Pre-school Teachers	190	19	Random sampling
Pre-school Children	1590	159	Random sampling
Total	**1875**	**188**	

Source: Researcher (2018)

3.7 Research Instruments

The study research instruments included questionnaires which obtained information from the pre-school teachers, interview schedules which were administered to headteachers and observation checklist for pre-school children. These tools were used to gather information about the specific set themes of research objectives. The instruments for this study were developed along the set objectives with each objective forming a sub-topic with relevant questions.

3.6.1 Questionnaire for ECDE Teachers

The researcher applied a self-designed questionnaire to collect data from ECDE teachers since according to Morse (2000), a questionnaire is a research instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents and is often designed for statistical analysis of the responses. The questionnaire was divided into two parts. The first part consisted of information on respondents' demographic profiles, while the second part contained questions on the research objectives to get the facts of how play used learning situations in the ECDE centres. The respondents were also assured of confidentiality.

3.7.3 Interview Schedules for Headteachers

The study used structured interviews to gather information from headteachers. Structured interviews were important for this study since they enabled the researcher to ask probing and supplementary questions and develop a good rapport with the respondents and a goal-directed attempt by the interviewer to obtain reliable and valid measures in the form of verbal responses from one or more interviewees.

3.7.4 Observation Checklist for ECDE Learners

This involved observing the extent to which ECDE learners interacted and whether teachers use different types of forms of play activities.

3.8 Piloting of Research Instruments

Purpose of the piloting was to ensure that the instruments were to the standard of the desired research. The research instruments were piloted in two (2) public and one (1) pre-school institutions that were not included in the study sample, but within the target population. According to Kothari (2005), a pilot sample should constitute 10.0% of the sampled questionnaires. The purpose of piloting was also to check on suitability and the clarity of the questions on the instruments designed, relevance of the information that was being sought and the language that was used and to test the validity, reliability, credibility and dependability of the instrument.

3.8.1 Validity

To test validity, items were analyzed to check for content validity where the researcher with the help of experts in early childhood education went through each item and the

responses given to establish whether the items would generate the required information. Test items that were not adequate in terms of generating the required information were dropped and others suggested that were appropriate in generating the information. This was consistent with the assertions of Creswell et al., (2009) that researchers evaluate content validity by going to a panel of experts and have them identify whether the questions are valid. According to Creswell et al., (2009), validity means that the individual's scores from an instrument make sense, are meaningful and enable the researcher to draw good conclusions from the sample being studied to the population. Thus, opinions of the experts assisted to establish content validity.

3.9 Reliability

Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials (Orodho, 2004). The study used test-retest method to ensure reliability. This method of assessing reliability of data involves administering the same instrument to the same group twice (Mugenda & Mugenda, 2003). The study used test-retest approach in which the developed questionnaire was administered to a few identical subjects who wouldn't participate in the actual study, but not from the same pre-school institutions in Kathiani Sub-County. The researcher examined the research instruments for appropriateness of items so as to identify any ambiguous and unclear items. Results from the pilot study were used to compute reliability index, $r = 0.7$, using Cronbach Alpha Method which indicates high internal reliability.

3.10 Data Collection Technique

The first step in data collection was to seek audience with the respondents and brief them about the study. Questionnaires were administered by the researcher with the help of one research assistant.

3.11 Data Analysis

The data collected was edited and coded according to themes that emanated from the research objectives and questions. Qualitative data were derived from open-ended responses received during interviews. The coded data were analyzed using both qualitative and quantitative techniques. The quantitative data were analyzed and presented using descriptive statistics such as frequency distribution, tables and percentages and also in narrative form. Qualitative data were presented in narrative form.

3.12 Logistic and Ethical Considerations

The researcher sought clearance from The School of Postgraduate Studies of Machakos University before proceeding for a permit from NACOSTI and the Ministry of Education to be able to collect data from the pre-school institutions in Kathiani Sub-County. The researcher explained to the respondents the purpose of the study and requested their willingness to participate in it. The subjects were assured of the confidentiality of the information provided.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter presents the findings of the study. For clarity and chronology, it is arranged according to the three research questions that the study sought to answer. In the first section, however, biodata information about the respondents is presented, because it might be pertinent in interpreting the data that they provided. The study sought to address the following objectives:

1. To establish forms of play and how they influence acquisition of numeracy skills among children in pre-school institutions in Kathiani Sub-County.
2. To establish the criteria of material selection and how they influence acquisition of numeracy skills among children in pre-school institutions in Kathiani Sub-County.
3. To establish teacher training and experience and how they influences pre-school learner's acquisition of numeracy skills among children in pre-school institutions in Kathiani Sub-County.

4.2 Response Rate

The researcher administered 19 questionnaires to ECDE teachers and all were successfully filled and returned. At the same time, 9 headteachers were interviewed whereas the researcher also conducted observation schedules for 155 ECDE learners. These gave a response rate as indicated in Table 4.1 below.

Table 4.1: Response Rate

Respondent Categories	Sampled Respondents	Those who Turned Up	Response Rate
Headteachers	10	9	90%
ECDE Teachers	19	19	100%
ECDE Learners	159	155	97.5%
Total	**188**	**183**	**97.3%**

From Table 4.1, headteachers, ECDE teachers and ECDE learners registered a response rate of 97.3%. This affirms the assertions of Creswell et al., (2009), that a response rate above 75.0% is sufficient and acceptable levels to enable generalization of the results to the target population.

4.3 Respondents' Demographic Information

The research instruments solicited biodata information of the respondents. These included; gender and level of education.

4.3.1 Gender of the Respondents

Information about the distribution of the respondents by gender was collected and the information is indicated in Figure 4.1.

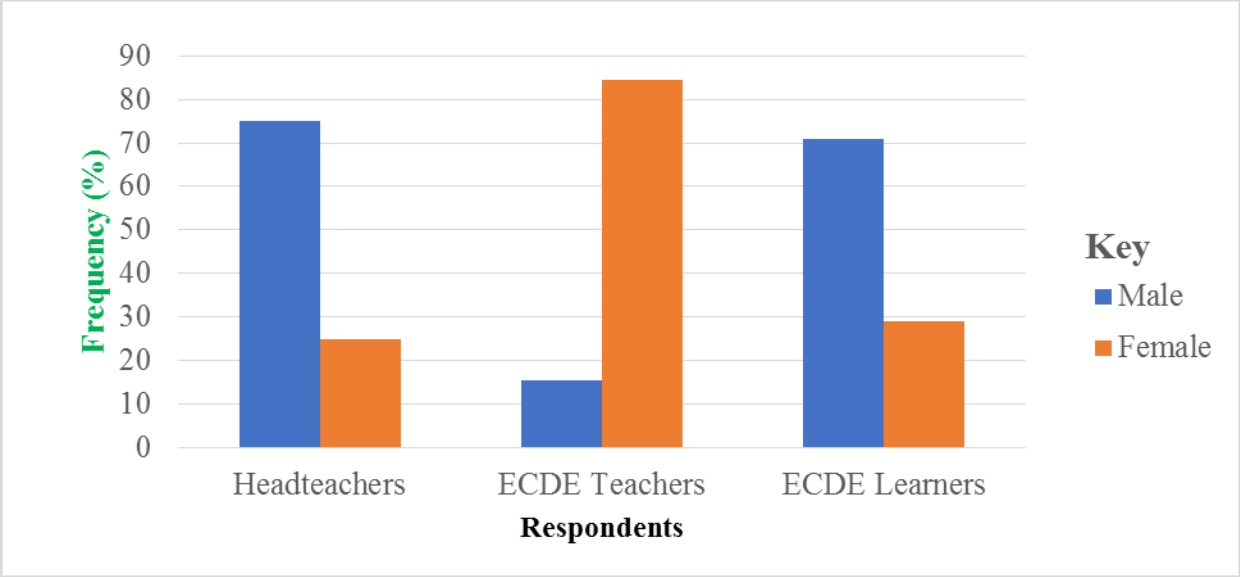

Figure 4.1: The Respondents by Gender Distribution

Figure 4.1 indicates that three-quarters (75.0%) of the headteachers were male with female headteachers constituting a quarter (25.0%). In the same vein, a record majority (84.5%) of the ECDE teachers were female with 15.5% being male. Majority (70.9%) of the ECDE learners were male whereas their female counterparts constituted 29.1%. These data reveal that there were more female ECDE teachers in levels of the study. This calls for all stakeholders to advocate more on the importance of gender balance in ECDE programmes. The question of use of play materials in acquisition of numeracy skills in classroom interactions in ECDE concerns both male and female headteachers, ECDE teachers and ECDE learners alike.

4.2.2 Headteachers and ECDE Teachers' Level of Education

The research instruments also elicited information on headteachers and ECDE teachers' level of education since this variable could influence their ability to supply credible information about the research objectives. The information is indicated in Figure 4.2;

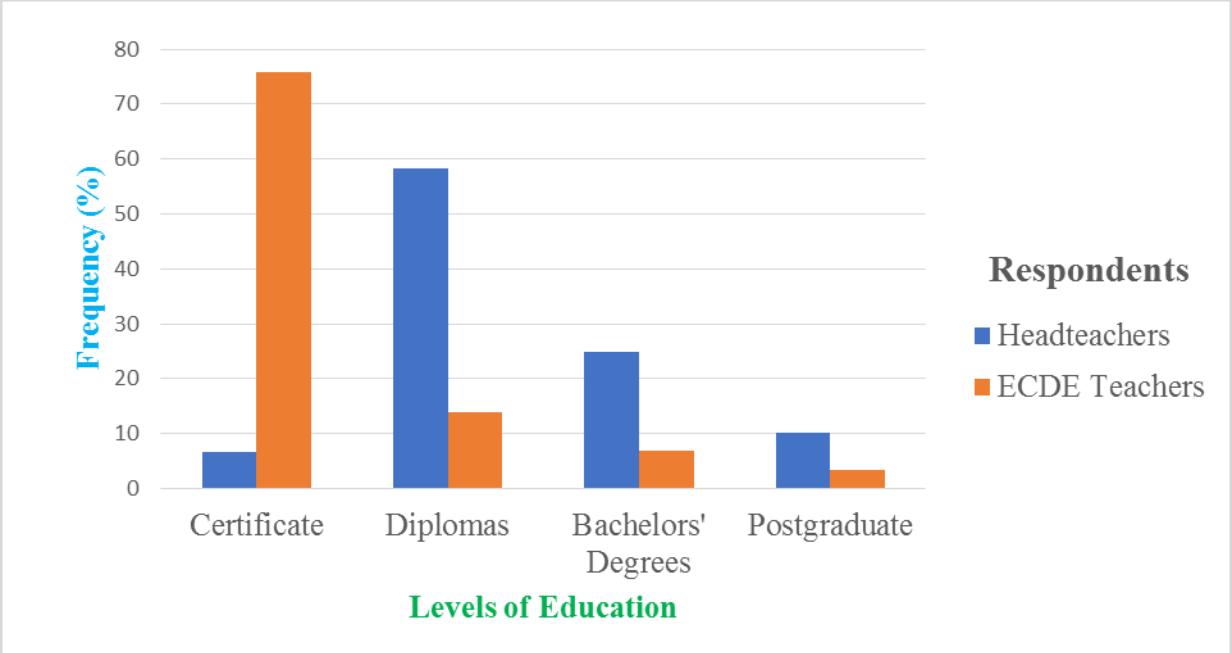

Figure 4.2: Respondents' Level of Education

Figure 4.2 indicates that slightly more than half (58.3%) of the headteachers had Diplomas, a quarter (25.0%) had Bachelors' Degrees, 10.1% had postgraduate qualifications whereas 6.6% had certificate qualifications. At the same time, slightly more than three-quarters (75.9%) of the ECDE teachers certificate qualifications, 13.8% had Diplomas, 6.9% had Bachelors' Degrees whereas 3.4% had postgraduate qualifications. This information reveals that the respondents in the study locale met the minimum qualification to be competent to answer the research questions about the influence of instructional media on classroom interactions in ECDE centres.

4.4 Forms of Play and Acquisition of Numeracy Skills among Children in ECDE Centre.

As per objective one, the study sought to establish forms of play and how they influence acquisition of numeracy skills among children in pre-school institutions in Kathiani Sub-

County. Data were collected from Headteachers, ECDE teachers and learners, organized and summarized and results are indicated in table 5 and as discussed in thematic analysis of qualitative findings on how the forms of play and acquisition of numeracy skills among children.

Table 4.2 below reveals that 5.3% of ECDE teachers indicated they strongly agreed that throwing and catching helps in learning numeracy. Twenty one point one percent of ECDE teachers agreed on the statement while the majorities 42.1% of ECDE teachers were undecided. Twenty six point three per cent of the studied ECDE teachers disagreed with the statement and 5.0% strongly disagreed throwing and catching helps in learning numeracy skills.

Table 4.2: Percentage of ECDE Teachers' views on Forms of Play and Acquisition of numeracy skills among Children in ECDE Centres

Skills	S. A %	A %	U %	D %	S. D %
Throwing and catching helps in learning numeracy skills	5.3	21.1	42.1	26.3	5.0
Hoping and skipping helps children learn numeracy skills	10.5	26.3	36.8	10.5	15.8
Matching and pairing enhances numeracy kills	5.5	10.5	47.4	31.6	5.0
Modeling numbers helps preschool learners to acquire numeracy skills	5.3	26.3	36.8	21.1	10.5
Racing games helps learners to learn numeracy skills	5.5	26.6	36.3	21.1	10.5
Drawing and colouring numbers helps children to enhance numeracy skills	10.5	21.1	31.6	21.1	15.8
Singing songs about numbers enhances acquisition of numeracy skills	10.5	31.6	42	15.8	0
Grouping objects activity helps children to acquire numeracy skills	5.3	26.3	36.8	21.1	10.5

The ECDE teacher's response on whether hoping and skipping help children to learn numeracy, only 10.5% of the ECDE teachers strongly agreed and 26.3% agreed. Those who were undecided were 36.8%, 15.8% disagreed hopping and skipping help in acquisition of numeracy and 10.5% strongly disagreed. Only 5.5% of ECDE teachers indicated that matching and pairing enhances numeracy skills and 10.5% of them agreed. Fourty seven point four per cent of the studied ECDE teachers were undecided, while 31.6% disagreed that matching and pairing enhanced numeracy and 5% strongly disagreed. Teachers who strongly agreed with modelling helps pre-school learners to

acquire numeracy skills were 5.3%, 26.3% agreed. Majority of the teachers at the rate of 36.8% were undecided whether modeling numbers helps pre-school learners to acquire numeracy skills. Twenty one point one per cent of the teachers disagreed and 10.5% of them strongly disagreed with the statement. The study established that the highest percentage 26.3% of pre-school teachers were undecided whether racing games helps learners to acquire numeracy skills. Twenty six point six per cent of them agreed and 5.5% strongly agreed; 21.1% disagreed and only 10.5% strongly agreed.

The study further established only 10.5% of ECDE teachers strongly agreed whether drawing and colouring helps children to enhance numeracy skills, 21.1% of the teachers agreed, 31.6% were undecided 21.1% disagreed and 15.8% strongly disagreed. The study revealed that majority (42%) of the sampled ECDE teachers were undecided whether singing songs about number enhances acquisition of numeracy, 31.6% of them agreed and 10.5% strongly agreed. On the contrary, 15.8% of ECDE teachers disagreed with singing songs about number enhances acquisition of numeracy skills. The study further indicated that 5.3% of the sampled teachers strongly agreed that grouping objects activities helps children to acquire numeracy skills, 26.3% of them agreed whereby majority 36.8% indicated they were undecided. Contrary 21.1% of the teachers disagreed and 10.5% of them were for the opinion of strongly disagree. Pre-school teachers should ensure they expose learners to different play activities with variety of play materials; this arouses curiosity of the children to interact with the play materials which enhance learning of numeracy skills in a very natural way.

These views agree with the views expressed by Essa (2011) that play provides the child with a variety of essential experiences, sensory exploration, emotional and social experiences as well as experiences of mastery or achievement. The main functions of child's play are to rehearse actions to various real-life scenarios in a safe, risk-free environment so that when confronted with a difficult situation.

These views corroborate the views expressed by Wilson (2002) that to obtain a comprehensive and optimal education in ECDE centres, we ought to employ different strategies to utilize variety of play forms including creative play, digital play, social play active play and free play. Therefore, to support the overall numeracy learning of children, it is also important to adopt a variety of play-based teaching and learning in pre-school institutions. Play in brain development is very effective, has intellectual and cognitive benefits for the brain and it in fact shapes the structural development of the brain. It is through play whereby children develop important learning and life skills such as exploring, identifying, creativity, and imagination. Introducing different forms of play into the daily learning of children not only promotes their numeracy skills but it also facilitates the most effective multi-sensory learning experience.

4.4.1 Thematic Analysis of Qualitative Findings on the Forms of Play and Acquisition of Numeracy Skills among Children

To get more in-depth information on the forms of play and acquisition of numeracy the headteachers were interviewed. The headteachers were asked to explain about how often ECDE teachers in their school used different types of play. The interviewees responded in favour of the view that most ECDE teachers rarely used play in teaching and learning

in ECDE centres. The researcher also observed that there were very few relevant instructional activities in most ECDE centres. One headteacher noted,

> *"ECDE teachers in my school rarely engage learners in activity lessons because play normally takes a lot of time for learners to acquire single concept or skill*."

These views corroborate the views expressed by Wilson (2002) that acquisition of numeracy skills and concepts calls for an imaginative approach by the teacher who needs to constantly be on alert for new ideas and techniques to make lesson presentation achieve effective outcome with different instructional activities. On the same question about explaining how often ECDE teachers in their school used different types of play another headteacher revealed that:

> *"The ECDE teachers rarely use different types of play especially during teaching and learning process due to the pressure given by parents who perceive play in school as wastage of time of their children and their money."*

These views indicate that there is need for the stakeholders to advocate for the importance of play in learning to both teachers and the parents. The intellectual and cognitive benefits of playing have been well documented.

Children who engage in quality play experiences are more likely to have well-developed numerical memory skills, and are able to regulate their behaviour, leading to enhanced school adjustment. This agrees with Tina (2005), who emphasizes that play is important for the early stages of brain development and playing with children can help build relationships for later life. Play helps to develop important skills for learning, life and work. This has the importance that, encouraging play is one of the key approaches that

educational institutions could use to positively influence the teaching-learning process to enhance numeracy learning outcomes. The importance of play as a component in the teaching-learning process of pre-school children has been underscored by educational thinkers of ancient times among them Plato and Aristotle. These educational thinkers argued that play is important in enhancing the memory and creative capacities of children.

The teachers were also asked to explain to what extent the type of play done by ECDE children in their influence acquisition of numeracy skills among children. These views thus point to the fact that use of instructional activities such as cognitive and social play helps learners improve in numeracy skills that would make learners discover facts glued firmly to the memory. The interviewees further noted,

> *"Use of variety of instructional activities in ECDE teaching and learning arouses children's attention, sustains their interest and makes leaning to be fun*."

Further, these views attest to the fact that ECDE learners become motivated and stay focused. Thus, variety of activities is also important so that all children can be involved and no child is left idle during the lesson, and for them to use all their senses in learning hence develop concepts and skills. Another headteacher responded that *though in my school we have limited space for play, I know play is vital in leaning for young children. It helps learners in acquisition of new concepts and skills and also helps learners to retain them for longer.* These views thus point to the fact that use of play activities develops learners' skills and concepts.

The view is consistent with the views expressed by Jean (2006) that play helps children to develop problem-solving skills like simple addition, matching and pairing number value, recognition of symbols and shapes of numbers and development of the child's eye-hand coordination. Play is seen as one of the miracles of childhood by means of which children discover things essential to their well- being. It is part of child's life and also as a necessary condition for development.

4.4 Criteria for Selecting Play Materials and Acquisition of Numeracy Skills Among Children in ECDE Centre.

As per objective two, the study sought to establish the criteria of material selection and how they influence acquisition of numeracy skills among children in pre-school institutions in Kathiani Sub-County. Data were collected from Headteachers, ECDE teachers and learners, organized and summarized and results are indicated in table 4.3 and as discussed in thematic analysis of qualitative findings on the criteria for selecting play materials and acquisition of numeracy skills among children.

Table 4.3: Percentage of ECDE Teachers' Views on Criteria for Selecting Play Materials and Acquisition of Numeracy Skills

Test items	S. A %	A %	U %	D %	S. D %
ECDE teachers rarely consider quality when selecting play materials and it affects acquisition of numeracy skills in ECDE learners	10.5	42.1	36.8	10.5	0.0
Selecting play materials based on content has enabled ECDE teachers to facilitate acquisition of numeracy skills among children in pre-school institutions.	15.8	47.4	31.6	5.3	0.0
Appropriateness is key when selecting play materials for effective acquisition of numeracy skills in ECDE centres	10.5	42.1	42.1	5.3	0.0
Selecting play materials based on sophistication has made it difficult for ECDE teachers to enhance acquisition of numeracy skills in ECDE centres	5.3	36.8	47.4	5.3	5.3

The research found that 10.5% of ECDE teachers strongly agreed that they rarely consider quality when selecting play materials while (42.1%) agreed they rarely consider quality when selecting play materials as shown in table 4.3 above. (31.6%) indicated they are undecided about the selection of play materials, 5.3% of the ECDE teachers indicated they disagreed with the statement that they rarely consider quality when selecting play materials. None of the ECDE teachers strongly disagreed with the statement. In the same vein, 15.8% of the ECDE teachers strongly agreed selecting play materials based on content to enable the teacher to facilitate acquisition of numeracy skills, 47.4% of ECDE teachers agreed on the same statement, 31.6% indicated that they were undecided whether selection of play materials enabled ECDE teachers to facilitate acquisition of numeracy skills, 5.3% disagreed with the statement and none of the ECDE teachers strongly disagreed.

On appropriateness as key when selecting play materials for effective acquisition of numeracy, only 10.5% of the ECDE teachers strongly agreed, 42.1% agreed and 42.1% of the ECDE teachers were undecided. 3.3% of ECDE teachers disagreed and none of the ECDE teachers strongly disagreed with the statement that, appropriateness is key when selecting play materials for effective acquisition of numeracy. Five point three per cent of the ECDE teachers strongly agreed that selecting play materials based on sophistication has made it difficult for ECDE teachers to enhance acquisition of numeracy skills. Thirty six point eight per cent agreed the highest number 47.4% of ECDE teachers were undecided only 5.3% disagreed and other 5.3% strongly disagreed. Provision of quality, appropriate and teaching and materials which are content-based can improve acquisition of numeracy in pre-school centres in Kathiani Sub-County. This is evident by the highest number of pre-school teachers who agreed that there is need to follow criteria when selecting play materials for teaching and learning numeracy. The availability of appropriate teaching and learning materials for numeracy skills such as books, charts, flashcards, counters and many more aid the pre-school teachers in explaining numeracy skills to the pre-school learners. It is through play activities that ECDE learners get the chance to acquire variety of numeracy skills which exposes them to concepts that are crucial for future mathematics learning. Notably, children acquire more knowledge by adding new information into their existing frame of reference about the world.

As it was revealed in quantitative findings, these views further corroborate the views expressed by) Kabiru (1993) that teaching and learning materials should be selected and accessed in ways which ensure they are directly related to a pre-school or school's curriculum policy and programmeme, based on the department's framework of standards

and accountability. It is best for the teacher to start using materials that are familiar with the children and introduce unfamiliar ones later. Such use of materials will help children develop confidence in the use of materials. Kabiru further noted that most institutions have poor facilities, which continue to affect the quality of education offered to pre-school learners in Kenya. Therefore, it is valid to say that the efforts by parents, community, and individual schools to mobilize resources through fundraising have not raised enough funds for the provision of adequate educational facilities in the County.

These views further corroborate the views expressed Rai and Richardson (2003). Learners actively construct their knowledge depending on the type of resources used; they see, hear or do in relation to what they know. Learners should be exposed to different types of resources so that they can construct their knowledge better. On the selection of instructional materials, there should be criteria used such that there should be appropriateness of the materials to instructional objectives; freedom of the content from bias, degree of the quality variety of the materials, quality, availability of the materials to clarify objectives of and how to operate the materials, how reasonable the time, effort and expenses are for both the learners and the teachers.

4.4.1 Thematic Analysis of Qualitative Findings on Criteria for Selecting Play Materials and Acquisition of Numeracy Skills among Children in ECDE Centre.

To get more information about criteria for selecting play materials, the headteachers were interviewed. The headteachers were asked to explain about the dynamics which ECDE teachers in their school often consider when selecting play materials for teaching numeracy skills. The headteachers who were interviewed echoed similar sentiments. The

interviewees noted that quality, cost effectiveness, availability, appropriateness individual differences, ability of learners and sophistication are rarely considered when selecting media for classroom instruction in ECDE centres. One headteacher remarked,

> *"The criteria used in selecting play materials which are supplied in pre-schools are never suitable and relevant for skills taught in ECDE centres to a point they are just kept in stores gathering dust. Some are even too complex to be used in teaching. This has hampered effective learning interaction between ECDE teachers and their learners*."

Just like in quantitative findings, these views further corroborate the views expressed by Debra (1982) that in the selection of instructional materials, there should be a criterion used such that there should be appropriateness of the materials to instructional objectives, degree of the quality variety of the materials, availability of the materials to clarify objectives of and how to operate the materials, how reasonable the time, effort and expenses are for both the learners and the teachers. On the same question, another headteacher responded that:

> *"The ECDE teachers in my school consider variety of factors depending with the situation at a particular time. Children are unique and this brings about individual differences in learners, thus the ECDE teacher at that particular point puts in to consideration the individual difference as factor. Ability of the learner, brought about by level of the learner, special needs of children and interest of the learners."*

Pre-school learners with special needs require special attention from teachers. Such learners include; learners with disability, exceptional or gifted learners. The uniqueness of every pre-school learner should be and different abilities should be considered when selecting play materials for learning activities.

The views further corroborate the views expressed by NACECE (2001) which indicated that where teachers may even work in separate schools or different parts of the building, educators are being forced to step outside of their traditional roles and learn to work together by the current movement toward inclusion of all students with disabilities in the general education environment. The rationale of inclusion lies in how educators respond to individual differences. Inclusion calls for divergence in terms of the strategies used in teaching while standards-based reform calls for convergence in terms of learning outcomes.

The teachers were also asked to explain how selection criteria for play materials influence acquisition of numeracy skills among children in their ECDE centrer. One headteachers further observed,

> *"Teaching and learning materials should be selected and accessed in ways which ensure they are directly related to a pre-school's or school's curriculum policy and programme and that learners actively construct their knowledge depending on the type of resources used; they see, hear or do in relation to what they know*."

These views further indicate that ECDE learners should be exposed to different types of play materials so that they can construct their knowledge better. Besides, ECDE learners actively construct their knowledge depending on the type of resources used; they see, hear or do in relation to what they know. Based on the same question, another headteacher revealed that;

> *"Selection criteria help learners to create interest in learning, it makes learning to be real, and also gives the learner opportunity to interact with the environment and learn it".*

The findings further corroborate the views expressed by KIE (1997) asserted that lack of preparation or selecting appropriate teaching and learning materials for a lesson may translate into feelings of inadequacy once teachers enter classroom environments where learners' needs are diverse. Just like in quantitative findings, these views further corroborate the views expressed by Lain and Ganne, (2014) that there is need for pre-school teachers to understand the importance of play in order to provide appropriate methods for introducing numeracy activities. Also the pre-school teachers should be aware of the needs of children and their different characteristics. This is because; the early childhood programme provides learning though playing which is very important and special part of childhood whereby children develop numeracy skills like sharing, counting, capacity in filling and empting games among others.

4.5 Teachers' Training and Experience Acquisition of Numeracy Skills among Children in ECDE Centre

As per objective three, the study sought to establish teacher training and experience and how they influence pre-school learner's acquisition of numeracy skills among children in pre-school institutions in Kathiani Sub-County. Data was collected from Headteachers, ECDE teachers and learners, organized and summarized and results are indicated in table 4.4 and as discussed in thematic analysis of qualitative findings on teachers training and experience and acquisition of numeracy skills among children.

Table 4.4: Percentages of ECDE Teachers' Views on Teachers' Training and Experience Acquisition of Numeracy Skills

Test items	S. A %	A %	U %	D %	S. D %
ECDE teachers' level of training influences delivery and acquisition of numeracy content in ECDE centres.	15.5	42.1	36.8	5.5	0.0
ECDE teachers' mastery of content influences learners acquisition of numeracy skills in ECDE centres.	15.8	57.4	21.6	5.3	0.0
ECDE teachers' experience in teaching influences learners interest acquisition of numeracy in ECDE Centres.	10.5	62.1	22.1	5.3	0.0
ECDE teachers' training exposes the teacher to understand strategies to enhance numeracy skills in ECDE centres.	5.3	66.8	17.4	8.3	2.3

The results in table 4.4 indicated that majority (42.1%) of the sampled ECDE teachers were for the opinion that they agree with the ECDE teachers' level of training influences delivery and acquisition of numeracy skills. Moreover, 15.5% strongly agreed. Contrary 5.5% of the teacher disagreed. The teacher's responses on whether the ECDE teacher's mastery of content influences learners acquisition of numeracy skills in ECDE centres were the majority who agreed; 57.4% and 15.8% of them strongly agreed; 21.6% were undecided and 5.3% of the sampled ECDE teachers disagreed with the statement. The study also established that fair majority 62.1% of the sampled ECDE teachers revealed they agree that ECDE teachers training exposes the teachers to understand strategies to enhance numeracy skills in ECDE centres. Ten point five per cent of them strongly agreed. At the same time 22.1% of the studied ECDE teachers were undecided while only

5.3% disagreed. At the same time the sampled ECDE teachers indicated that they agree (66.8%) ECDE teachers training exposes the teachers to understand strategies to enhance numeracy skills in ECDE centres. 5.3% of them strongly agreed with the statement. Seventeen point four per cent were undecided; 8.3% indicated they disagree and 2.3% strongly disagreed. It is important to note that, without qualified pre-school teachers, the implementation of the goals of education can never be achieved hence no achievement in number work from low levels of education to higher levels of education.

As it established in quantitative findings, these views further corroborate the views expressed by Gay (2003) that a qualified teacher has the ability to organize the knowledge of the world in a rationale way independent of the learning for Dewey knowledge consists of learning about the real world out there. The trained teachers have to endeavor first and to understand that world organize it in the most rational way possible and present it to the learner. This view may still engage the teacher in providing the learner with activities with hands-on learning with opportunities to experiment and manipulate the objects of the world but the intention is always to make it clear to the learner the structure of the world independent of the learner. Margaret and Anne (2007) suggested that there is need to train teachers as they deal with young children so that they can create an educational environment with great variety of instructional resources for number work. They asserted that teaching is one of the duties that require both qualifications and experience for better delivery. Recruitment of competent teachers to improve teacher-student ratio is a necessary measure in improving the performance of learners.

The government of Kenya through Ministry of Education should give adequate attention to training of teachers to enhance performance of learners. Qualified teacher is human resources whatever facilities are available, whichever kinds of learners are given to teach the importance and vital role of the qualified teacher cannot be over emphasized. Assuming that necessary facilities are adequately provided for the environment is conducive to learning, the curriculum satisfies and the learners themselves have interest in learning, learning cannot take place without the presence of the qualified teacher when handling and organizing instrumental resources for number work in classroom. The teachers represent a large proportion of the input of ECDE educational system.

4.5.1 Thematic Analysis of Qualitative Findings on Teachers' Training and Experience Acquisition of Numeracy Skills Among Children in ECDE Centre

Qualitative data was collected from the headteachers using interviews schedule to get more information about how teachers' training and experience influence acquisition of numeracy skills among children in their ECDE centre. The headteachers were asked to give view about how teachers training and experience influence acquisition of numeracy skills among children in their ECDE centre. The headteachers responded in favor of the view that ECDE teachers' level of training on how to use instructional activities enhances classroom interactions in ECDE centres. One headteacher noted*:*

> *"ECDE teachers who manifest mastery and exposure on use of instructional activities have exhibited positive cases of classroom interactions with their learners. Their classroom interaction with learners is inspiring, motivating and stimulating to learners*."

These views further lend credence to the viewpoints held by Jean (2006) that the importance of training ECDE teachers gives little or no time for learners to interact in learning activities. Another headteacher noted that

> *"Trained and experienced teachers have knowledge in selecting appropriate teaching and learning resources, appropriate learning activities, selecting teaching strategies, monitoring and evaluating learners. They also have knowledge to deal with individual differences in learners."*

Just like in quantitative findings, these views affirm the fact that a qualified teacher has the ability to organize the knowledge of the world in a rationale way independent of the learning since knowledge consists of learning about the real world out there.

It is evident that a trained teacher has to endeavor first and to understand that world organize it in the most rational way possible and present it to the learner. That is, a qualified teacher is expected to create this environment as well as put forth learning activities he/she feels are most beneficial to the child to learn how to count and classify in classroom. These views further affirm the fact that through effective training and education on use of learning activities or play to be presented effectively, ECDE teachers can do more than teaching routine information and model skills, problem solving strategies, moral codes, performance standards, general rules and principles and creativity.

The headteachers were also asked to explain the challenges they face in recruiting trained and experienced teachers in their schools. One headteacher indicated that:

> *Lack of government support, lack of finances, lack of knowledge about importance if early years' education for children and poor attitude towards ECDE teaching are among the challenges they face.*

As it is indicated in quantitative findings, the government of Kenya through Ministry of Education should give adequate attention to training of teachers, ensure provision of adequate facilities, advocate for the importance of early years and implementing pre-school teachers terms of service to enhance good performance of ECDE learners. Another teacher noted that:

> *Gender balance for teachers is an issue because very few male trains to become ECDE teachers, he cited lack of proper training and experience because many ECDE teachers train up to certificate level, he also cited lack of policy and clear guidance by the government.*

The interviewees and discussants also responded in favour of calls for government to fast track the formulation and implementation of ECDE policy and guidelines to ensure quality education in ECDE programmes in Kenya. The school stakeholders should also ensure that the teachers employed in their pre-schools have the required training and experience to handle the pre-school learners. These teachers should also be motivated to go overboard, in enhancing the learning and performance of the learners. The Ministry of Education, Science and Technology should enforce the use of play as a critical component of pedagogy in ECDE centres.

4.6 Observation Checklist for ECDE Learners and Acquisition of Numeracy Skill in ECDE Centre

The study sought to establish percentage of ECDE learners' performance in observation checklist on acquisition of number symbol, number recognition and number value skills among children in your ECDE centre. Data were observed from ECDE learners, organized and summarized as in tables 4.5 below.

Table 4.5: Percentage of ECDE Learners' Performance in Observation Checklist on Acquisition of Number Symbols Skill.

Level of Performance	Number Symbols				
	Modelling	**Mounding**	**Sticking**	**Drawing**	**Tracing**
	%	*%*	*%*	*%*	*%*
Excellent	0.6	1.3	0.6	1.3	0.6
Very Good	3.2	2.5	3.1	2.6	1.2
Good	17.3	17.1	16.3	19.9	6.8
Fair	30.5	30.9	23.1	17.5	29.1
Poor	38.1	39.4	46.3	48.6	47.6
Very Poor	8.3	6.3	7.5	8.3	11.4
Unable	1.9	2.5	3.1	1.9	3.3

Table 4.5: indicates that majority of pre-school learners performed poorly (38.1%) and fairly (30.5%) in modelling. Only 17.3% managed to perform good, 3.2% very good and 0.6% of learners performed excellently; 8.3% performed very poorly and 1.9% were unable to perform the activity.

Further, the table indicates that mounting was performed poorly (39.4%), 30.9% fairly and 17.1% of learners managed to perform good. Those who performed very good were 2.5% and 1.3% managed to perform excellently. 39.4% of the learners performed poorly, 6.3% of the learners performed very poorly and 2.5% of them were unable. The learners who managed to perform above average in sticking were 16.3% good, 3.1% very good and 0.6% excellently. Majority performed below average at rate of 23.1% performing fairly, 46.3% performing poorly, 7.5% performed very poorly and 3.1% were unable to

perform the play activity. The learners' performance in drawing was also below average. Only 19.9% of the learners managed to perform good, 2.6% managed very good and 1.3% were unable.

The higher number of learners managed 48.6% poor, 17.5% fair8.3% very poor and 1.9% were unable. Tracing activity was the most poorly performed amongst all the activities that were observed. More than 90% of learners performed fair and below. Twenty nine point one per cent of the performance in tracing was fair, 47.6% was poor, 11.4%was very poor and 3.3% were unable to trace numbers. Only 6.8% managed to do good and 0.6 excellent. The findings established that the number symbol performance is generally dismal in almost across all activities. Unless measures of intervention are taken to raise numeracy skills outcomes in pre-schools in Kathiani Sub-County, the problems of poor performance levels will remain persistent.

These views further lend credence to the viewpoints held by Githinji and Kanga (2011) that a qualified teacher is expected to create the environment as well as put forth resources he/she feels are most beneficial to the child to learn how to count and classify in classroom. They further indicated that the objective of teacher training programmes is to prepare and develop teachers with values, skills and knowledge required to teach competently in the pre-schools. Besides, teacher preparation programmes need to desired attributes of beginning teachers and develop broad components of skills and knowledge with the underlying core values as the basis of the curriculum. These values, skills and knowledge articulate the desired skills and knowledge components for beginning teachers.

Table 4.6: Percentage of ECDE Learners' Performance in Observation Checklist on Acquisition of Number Recognition Skill

Level of Performance	Number Recognition				
	Counting	Colouring	Modeling	Naming	Identifying
	%	%	%	%	%
Excellent	1.6	1.4	0.0	1.3	0.6
Very Good	2.2	4.3	2.1	3.6	2.2
Good	17.3	17.1	16.3	15.9	12.8
Fair	20.5	25.9	30.7	20.5	27.1
Poor	48.1	46.3	49.3	48.6	49.6
Very Poor	7.3	2.5	7.5	8.5	6.4
Unable	2.9	2.5	4.1	1.7	1.3

Table 4.6: indicate that majority of pre-school learners performed poorly (48.1%) and fairly (20.5%) in counting activity. Only 17.3% managed to perform good, 2.2% very good and 1.6% of learners performed excellently. 7.3% performed very poorly and 2.9% were unable to perform the activity. Further the table indicates that colouring was performed poorly (46.3%), 25.9% fairly and 17.1% of learners managed to perform 'good'. Those who performed very good were 4.3% and 1.4% managed to perform excellently. Fourty six point three per cent of the learners performed poorly, 2.5% of the learners performed very poorly and 2.5% of them were unable. The learners who managed to perform above average in modeling were 16.3% good, 2.1% very good and 1% excellent. Majority performed below average at rate of 30.7% performing fairly, 49.3% performing poorly, 6.5% performed very poorly and 4.1% were unable to perform

the play activity. The learners' performance in naming was also below average. Only 15.9% of the learners managed to perform good, 3.6% managed very good and 1.3% managed to perform excellently. The higher number of learners managed 48.6% poor, 20.5% fair 8.5% very poor and 1.7% were unable.

Majority of pre-school learners performed poorly (49.6%) and fairly (27.1%) in identifying activity. Only 12.8 % managed to perform good, 2.2% very good and 0.6% of learners performed excellently. 6.4 %performed very poorly and 1.3 % were unable to perform the activity. The findings indicated that pre-school learners in Kathiani Sub-County performed poorly in number recognition activities which help to enhance acquisition of numeracy skills. It is crucial for the pre-school teachers to follow the curriculum, introduce use of appropriate activities as they are indicated in the ECDE syllabus hand book to prepare schemes of work and lesson plans to enhance acquisition of numeracy skills. It is also important to remark after every lesson and follow up for the activities which are poorly performed.

These findings corroborate the assertions of Sandlie (2013) emphasized the importance of training ECDE teachers as he observed that most of ECDE centres in Kenya emphasize academic and give little or no time for learners to get actively involved in teaching and learning activities. The trained teacher has to endeavor first and to understand that world organize it in the most rational way possible and present it to the learner. This view may still engage the teacher in providing the learner with activities with hands-on learning with opportunities to experiment and manipulate the objects of the world but the intention is always to make it clear to the learner the structure of the world independent of the

learner. These findings thus point to the fact that a teacher is expected to create the environment as well as put forth resources he/she feels are most beneficial to the child to learn how to count numbers, identify numbers, name numbers, colour and draw numbers in learning activities.

Table 4.7: Percentage of ECDE Learners' Performance in Observation Checklist on Acquisition of Number Value Skill

Level of Performance	Number Value				
	Sorting	**Arranging**	**Grouping**	**Matching**	**Pairing**
	%	*%*	*%*	*%*	*%*
Excellent	1.9	1.3	1.9	0.6	1.3
Very Good	1.9	3.2	1.9	4.5	2.6
Good	16.1	16.5	15.5	16.1	14.4
Fair	20.6	25.1	28.7	21.6	23.5
Poor	45.8	39.7	35.8	41.0	45.3
Very Poor	12.3	13.5	14.2	12.9	11.0
Unable	1.3	0.6	1.9	3.2	1.9

Table 4.7: reveals that (45.8%) was the highest percentage of learner's performance in sorting was poor, followed by 20.6% who performed fairly. 1.9% of learners performed very poorly and 1.3 were unable to sort. Learners who performed poorly were 39.7% and 25.1% fairly. Only 16.5 performed good 3.2% very good and 1.3% performed excellently; 13.5% of learners performed very poorly and 0.6% were unable. Most of the learners in grouping performed poorly 35.8% and fairly 28.7%. 15.5% performed good, 1.9% very good and 1.9% excellently. Fourteen point two per cent of learners performed

very poorly while 1.9% were unable. Matching was also performed poorly 41%, 21.6% performed fairly; 16.1% managed to perform good, 4.5% very good and 0.6 excellently. 12.9% of learners performed very poor and 3.2 were unable to match. In pairing performance 45.3% learners performed poorly, 23.5% fairly, 14.4% good 2.6% very good and 1.3% performed excellently 11.9% performed very poorly and 1.9% were unable to perform the pairing activity. It is noted with a lot of concern that efforts to improve learning outcomes of number value skills should be focused in Kathiani Sub-County pre-school institutions due to the poor performance established from the observation checklist on acquisition of number value skills.

Just like in quantitative findings, these views further corroborate the views expressed by Margaret (2009) who emphasized on the importance of play as she observed that most ECDE centres in Kenya emphasize academic and give little or no time for learners to interact with instructional materials. He further observed that in Kenya pre-school children are subjected to academic work due to pressure from parents who would like to see their children read and write within weeks upon joining pre-school. The ECDE curriculum developed by KIE has the provision for learners to interact with instructional materials but this is overlooked by parents and private school managers who insist that the pre-school children have to be taught numeric, literacy and have the ability to read and write this fact is compounded by the fact that the primary school headteachers subject the ECDE children with oral and written interview for them to be admitted to standard one hence giving no room for learners to learn through doing.

Play is one of the main ways in which children learn. It helps to build self-worth by giving a child a sense of his or her own abilities and to feel good about themselves and worth. Because it's fun, children often become very absorbed in what they are doing. In turn, this helps them develop the ability to concentrate. Providing children with a range of playthings will help them to acquire numeracy skills. In addition, most children are naturally imaginative and will happily talk away to someone on their toy phone or drive the sofa to the shops, and this creativity should be actively encouraged. Play activities develop children's imaginations which are closely linked to intellectual development. It's important that learning to be made fun at pre-school age, that is, it needs to be about doing things with them that they like.

For instance, Hoping and skipping helps children learn early introduction to numeracy skills like learning that counting while hoping or skipping, building blocks, jigsaws and shape sorters can help with recognizing different shapes and sizes, putting things in order and developing logic, drawing and painting numbers, play activities can encourage creativity, imagination and expression of feelings. Just like in quantitative findings, these views further corroborate the views expressed by Kioko (2010) who stresses that teachers in pre-schools are expected to play with children, teach them alphabet and numerals and make them be aware of their cultural patterns through play, storytelling or music activities. This study holds that intervention measures towards raising learning outcomes need to start from the early formative stages, that is, from pre-school to the rest of the educational levels, thus need to focus on the acquisition of numeracy skills among pre-school children.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents a summary of the main research findings, conclusions, recommendations and suggestions for further research as discussed under the research objectives.

5.1 Summary of Research Findings

This section provides a summary of the findings of the research objectives which included; establishing how forms of play influence acquisition of numeracy skills among children in pre-school, establishing how the criteria of material selection influence acquisition of numeracy skills among children and establishing how teacher training and experience influences pre-school learner's acquisition of numeracy in pre-school institutions in Kathiani sub-county.

5.1.1 Forms of Play and Acquisition of Numeracy Skills among Children in Pre-school Institutions in Kathiani Sub-County

The study established that teaching/learning interactions between ECDE teachers and their learners is below expectations. It is also evident that most ECDE teachers rarely use play approach to enhance acquisition of numeracy in ECDE learners. That is, most of the ECDE teachers rarely engage learners in activity lessons through effective use of different types of play activities such as hoping and skipping, racing, throwing catching and others. These findings affirm the fact that utilization of different forms of play calls for an imaginative approach by the teacher who needs to constantly be on alert for new

ideas and techniques to make lesson presentation achieve effective outcome with different play activities. This implies that use of different forms of play such as cognitive and social play helps learners improve in numeracy skills such as writing number symbols, number recognition and number value that would make learners discover facts glued firmly to the memory. The mixed findings attest to the fact that use of variety of play activities in ECDE teaching and learning arouses children's attention and sustains their interest. These further points to the fact that ECDE learners build strong foundation for their future numeracy skills.

These findings indicate that, to most pre-school teachers, the best way to teach is by taking on the role of the dictator in the classroom. That is, learning in the eyes of these teachers, means reading, memorizing, and being able to repeat any information. This points to the fact that, instead of communicating, the teacher issues communication and makes deposits which the learners patiently receive, memorize and repeat. Through memorizing and repeating, retention of information is, essentially, short-term. Such a strategy doesn't encourage learners to engage in critical thinking since it requires the learners to be passive and accept facts as they are given without having the option of questioning or debating. It is also evident that most pre-school teachers rarely adopt learner-centred method as a strategy of enhancing acquisition writing skills e.g. drawing shapes and pictures, cut and paste letters, acquisition of numeracy skills such as recognizing time through daily routine nor do they use it to enhance numeracy skills such as number symbols, number recognition and number value.

These findings thus corroborate the fact that if the learners understand the value and importance of the subject, they will be willing to devote their time and energy into learning the subject matter. That is, if pre-school learners are allowed to work together and collaborate in their ideas, learning will be enhanced hence affirming the fact that it is vital that learners are able to formulate their own ideas and opinions, and being able to work with peers certainly facilitates that by practicing active learning. These findings attest to the fact that when learners are able to put their knowledge to use in the real world, they are able to live their education and gain the tools to solve the problems of time. Play method has forced learners to naturally become interested in learning and it has proved to be a very effective as teaching strategy.

5.1.2 Criteria for Selecting Play Materials and Acquisition of Numeracy Skills Among Children in Pre-school Institutions in Kathiani Sub-County

The study also established that quality, content; appropriateness and sophistication are rarely considered when selecting play materials for teaching numeracy in ECDE centres. This has had deleterious effects on teaching and learning of numeracy in ECDE centres. These findings thus point to the fact that in the selection of instructional materials, there should be a criteria used such that there should be appropriateness of the materials to instructional objectives; freedom of the content from bias, degree of the quality, variety of the materials, quality and availability of the materials to clarify objectives of and how to operate the materials, how reasonable the time, effort and expenses are for both the learners and the teachers. That is, instructional media ought to be selected and accessed in ways which ensure they are directly related to a pre-school's or school's curriculum policy and programme and that learners actively construct their knowledge depending on

the type of resources used; they see, hear or do in relation to what they know. Most pre-school teachers rarely engage learners and rarely expose them to different types of resources so that they can construct their knowledge better. Most pre-school teachers rarely consider quality, cost effectiveness; availability, appropriateness and sophistication are rarely considered when selecting media for classroom instruction in ECDE centres. Most pre-school teachers rarely consider the teaching and learning materials to be selected and accessed in ways which ensure they are directly related to a pre-school or schools curriculum policy and programme, based on the department's framework of standards and accountability.

Most institutions have poor facilities, which continue to affect the quality of education offered to pre-school learners in Kathiani Sub-County. Therefore, it is valid to say that the efforts by parents, community, and individual schools to mobilize resources through fundraising have not raised enough funds for the provision of adequate educational facilities in the County.

These findings point to the fact that providing opportunities and materials for children to classify, sort and group objects using various criteria like; shape, size or use, help children to symbolize and use differed imitation and enhance their numeracy skills abilities. Provision of quality, appropriate and teaching materials which are content-based can improve acquisition of numeracy in pre-school centres in Kathiani Sub-County. This is evident by the highest number of pre-school teachers who agreed that there is need to follow criteria when selecting play materials for teaching and learning numeracy. The availability of appropriate teaching and learning materials for numeracy skills such as

books, charts, flashcards, counters and many more aid the pre-school teachers in explaining numeracy skills to the pre-school learners.

5.1.3 Teachers Training and Experience Acquisition of Numeracy Skills among Children in Pre-school Institutions in Kathiani Sub-County

The study also established that ECDE teachers' level of training, mastery, experience and exposure to the teaching/learning process of numeracy skills enhance classroom interactions in ECDE centres. This implies that a qualified teacher has the ability to organize the knowledge of the world in a rationale way independent of the learning since knowledge consists of learning about the real world out there. Thus, a trained and experienced teacher has to endeavor first and to understand that world organize it in the most rational way possible and present it to the learner. These mixed findings are also indicative of the fact that a qualified teacher is expected to create this environment as well as put forth resources he/she feels are most beneficial to the child to learn numeracy skills in classroom. Besides, through effective training and experience on teaching pre-school children to be presented effectively, ECDE teachers can do more than teach routine information and model skills, problem solving strategies, moral codes, performance standards, general rules and principles and creativity. Most pre-school teachers do not prepare lesson plans in time to enhance acquisition of numeracy skills. They do not follow the curriculum to prepare numeracy skills activities. Most pre-school teachers also rarely attend seminars and in-service courses to be updated on curriculum changes to enhance teaching.

The study also established that most pre-school teachers rarely maintain discipline of learners to enhance learning. They rarely engage in teamwork to perform learning activities. It has also been established that most pre-school teachers do not carry out remedial teaching to uplift learners with diverse needs like slow. This points to the fact that teacher education system ought to be redesigned to redirect attention to children's learning, how well teachers have developed the classroom teaching skills to be effective with their learners, a graduate teacher's commitment to teaching as a professional career, feedback from graduates and employers, and high-quality tests of teacher knowledge and skills that are tied to classroom teaching performance.

New assessments strategies are needed to show whether teacher education graduates have developed the classroom teaching skills to be effective with their learners because current teacher tests don't directly measure what teachers do in the classroom, and they don't indicate how well teachers will do in the classroom. Most pre-school teachers rarely engage learners in co-curricular activities like games nor do they prepare learning materials on time and do not ensure maximum utilization of learning materials.

5.2 Conclusions

Some of determinants of poor acquisition of numeracy skills in most ECDE centres in Kathiani Sub-County, Machakos County are inappropriate forms of play, poor criteria of selecting play materials and inability of ECDE teachers to plan, organize and deliver appropriate content. Drawing from the above findings, it is evident that forms of play used to help children acquire numeracy skills in ECDE centres are below expectations. It is also evident that appropriateness in criteria for selecting play materials for teaching

acquisition of numeracy skills among children is poor in ECDE centres. That is, most of the ECDE teachers rarely consider criteria for selecting play materials as important. It is also evident that quality, content, appropriateness and sophistication are rarely considered when selecting material for enhancing numeracy skills in ECDE centres which has had deleterious effects on acquisition of numeracy skills among children in ECDE centres. It is also evident that ECDE teachers' level of training, mastery, experience and exposure to the use of play materials enhance acquisition of numeracy skills among children in ECDE centres. Thus, a trained and experienced teacher has to endeavor first and to understand that world organize it in the most rational way possible and present it to the learner.

5.3 Recommendations

5.3.1 For Practice

The study makes the following recommendations:

i On forms of play, the study recommends to county government through DICECE that; seminars, conferences and workshops should be organized to sensitize ECDE teachers to understand that use of play is educational components which serve to enhance teaching and learning of numeracy in ECDE centres.

ii KICD need to advocate and strategize on provision of variety of teaching and learning materials that encourages use of different forms of play to enhance acquisition of numeracy skills among children in ECDE centres.

iii On criteria for selecting play materials, the study recommends that ECDE teachers should consider relevance, suitability, appropriateness and quality of the instructional resources. Further, the resources should not be sophisticated nor should these be complex to make acquisition of numeracy skills easier for ECDE learners.

iv The school management, through the county government should lobby for funds that will enhance the pre-schools acquire enough and most appropriate teaching materials, which will aid in teaching numeracy skills. These materials should be in line with the required curriculum for mathematics activities for pre-schools in Kenya.

v On ECDE teachers' training and experience in acquisition of numeracy skills, the study recommends that ECDE teachers should remain constant learners on issues pertaining to children education and development and also training on the usage of instructional media as teaching component in ECDE centres. Teacher training colleges should focus more on units that equip teacher on psychology of children and on how children learn. The school stakeholders should also ensure that the teachers employed in the pre-schools have the required training and experience to handle the pre-school learners. These teachers should also be motivated to go overboard, in enhancing the learning and performance of the learners.

vi The Ministry of Education, Science and Technology should enforce the use of play as a critical component of pedagogy in ECDE centres. It should also support ECDE Programme by implementing pre-school teachers' terms of service.

5.3.2 For Further Research

i. A study could be conducted to establish how management support influence ECDE teachers' use of play in teaching and learning in pre-school institutions.

ii. A study could be conducted to establish how improvisation of educational media influences acquisition of numeracy skills in ECDE centres.

iii. A study could be conducted to ascertain the influence of ECDE teachers' preparedness to use play in classroom interactions in ECDE centres.

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APPENDICES

APPENDIX I: Letter of Introduction to Respondents

Mary Mbula Muema

Machakos University

Mobile. No. 0788-640-088

Dear Sir/Madam

RE: REQUEST TO FILL QUESTIONARE FOR RESEARCH PURPOSE

I am a post graduate student at Machakos University pursuing a Master's Degree in Education. I am carrying out a research on '**Play determinants influencing acquisition of numeracy skills among early childhood learners in ECDE centres in Kathiani sub county, Machakos County'.** Your school has been sampled for the study and you have been selected as a respondent. Please answer the questions as truthfully as possible.

Yours faithfully,

Mary Mbula Muema

APPENDIXII: INTERVIEW SCHEDULE FOR HEADTEACHERS

Dear respondent,

The researcher is a student undertaking a degree course in Master of Education in Early Childhood Education in Machakos University carrying out a research on **play determinants influencing acquisition of numeracy skills among early childhood learners in ECDE centres in Kathiani Sub County, Machakos County.** The information you provide will be treated with confidentiality and entirely used for purposes of this study.

Instruction: Please tick against your most appropriate answer and fill the spaces provided.

1. Gender:

Male [ ] Female [ ]

2. Highest Level of Educational Attainment

Certificate [ ] Diploma [ ] Bachelors' Degree [ ] Post-graduate [ ]

Section B: Forms of Play and Acquisition of Numeracy Skills among Children in Your ECDE Centre.

1. How often do ECDE teachers in your school use different types of play?

……..

2. Explain what extent does the type of play done by ECDE children influence acquisition of numeracy skills among children in your ECDE centre?

……

……

Section C: Criteria for Selecting play materials and acquisition of numeracy skills among children in your ECDE centre.

1. Which dynamics do ECDE teachers in your school often consider when selecting play materials for teaching numeracy skills? ……

……

2. Explain how selection criteria for play materials influence acquisition of numeracy skills among children in your ECDE centre……

……

……

Section D: Teachers' Training and experience acquisition of numeracy skills among children in your ECDE centre.

1. How does teachers' training and experience influence acquisition of numeracy skills among children in your ECDE centre?.....

……

……

2. Which challenges do you face in recruiting trained and experienced pre-school teachers?……

APPENDIX III: QUESTIONNAIRE FOR ECDE TEACHERS

Dear respondent,

The researcher is a student undertaking a degree course in Master of Education in Early Childhood Education in Machakos University carrying out a research on '**play determinants influencing acquisition of numeracy skills among early childhood learners in ECDE centres in Kathiani Sub County, Machakos County'.** The information you provide will be treated with confidentiality and entirely used for purposes of this study.

Section A: General Information

Instruction: Please tick against your most appropriate answer and fill the spaces provided.

1. Gender:

Male [ ] Female [ ]

2. Highest Level of Educational Attainment

Certificate [ ] Diploma [ ] Bachelors' Degree [ ] Post-graduate [ ]

Section B: Forms of Play Used in the Acquisition of Numeracy Skills Among Children in Pre-school Institutions

Rate the extent to which you agree with the following statements on the forms of play used in the acquisition of numeracy skills among children in your ECDE centre.

Key: **SA**-Strongly Agree **A**-Agree **U**-Undecided **D**-Disagree **SD**-Strongly Disagree

NO	ITEM	SA	A	U	D	SD
1	Throwing and catching helps in learning numeracy skills					
2	Hoping and skipping helps children learn numeracy skills					
3	Matching and pairing enhances numeracy kills					
4	Modeling numbers helps pre-school learners to acquire numeracy skills					
5	Racing games helps learners to learn numeracy skills					
6	Drawing and colouring numbers helps children to enhance numeracy skills					
7	Singing songs about numbers enhances acquisition of numeracy skills					
8	Grouping objects activity helps children to acquire numbers					

Section C: Criteria that Teachers Use in Selecting of Play Instructional Media to Facilitate Acquisition of Numeracy Skills Among Children in Pre-school Institutions.

Rate the extent to which you agree with the following statements on the criteria that teachers use in selecting of play materials to facilitate acquisition of numeracy skills among children in your ECDE centre.

Key: **SA**-Strongly Agree **A**-Agree **U**-Undecided **D**-Disagree **SD**-Strongly Disagree

No.	Test Items	SA	A	U	D	SD
		5	4	3	2	1
1	ECDE teachers rarely consider quality when selecting play materials and it affects acquisition of numeracy skills in ECDE learners					
2	Selecting play materials based on content has enabled ECDE teachers to facilitate acquisition of numeracy skills among children in pre-school institutions.					
3	Appropriateness is key when selecting play materials for effective acquisition of numeracy skills in ECDE centres					
4	Selecting play materials based on sophistication has made it difficult for ECDE teachers to enhance acquisition of numeracy skills in ECDE centres					

Section D: Teachers' Training and Experience on Acquisition of Numeracy in ECDE Centres

Rate the extent to which you agree with the following statements on the influence of teachers' training and experience on acquisition of numeracy skills in your ECDE centre.

Key: **SA**-Strongly Agree **A**-Agree **U**-Undecided **D**-Disagree **SD**-Strongly Disagree

No.	Test Items	SA	A	U	D	SD
		5	4	3	2	1
1	ECDE teachers' level of training influences delivery and acquisition of numeracy content in ECDE centres					
2	ECDE teachers' mastery of content influences learners acquisition of numeracy skills in ECDE centres					
3	ECDE teachers' experience in teaching influences learners interest acquisition of numeracy in ECDE Centres					
4	ECDE teachers' training exposes the teacher to understand strategies to enhance numeracy skills in ECDE centres					

APPENDIX IV: OBSERVATION CHECKLIST FOR ECDE LEARNERS

Instruction: Please fill in the number of children according to their gender in spaces provided.

1. Gender:

Male [ ] Female [ ]

NUMERACY SKILLS

ASPECTS OF NUMERACY SKILLS	NAMES OF CHILDREN OBSERVED			
	Child A	Child B	Child C	Child D
Number symbols				
Modeling				
Molding				
Sticking				
drawing				
tracing				
Number Recognition				
Counting				
Coloring				
Mounting				
Naming				
Identifying				
Number Value				
Sorting				
Arranging				
Grouping				
Matching				
pairing				

KEY

Excellent	卌 |
Very Good	卌
Good	||||
Fairly low	|||
Poor	||
Very poor	|
Unable	——

APPENDIX V: TIME SCHEDULE

Gant Chat Work Plan for the Study from November, 2016 to June, 2018

Activities	**NOVEMBER TO DECEMBER, 2016**		**JANRUARY TO FEBRUARY, 2017**			**MARCH, 2017 TO JUNE, 2018**		
Theoretical Study and Literature Review								
Proposal Development and Submission								
Proposal Presentation								
Field work and Data Collection								
Data analysis, report writing and submission								

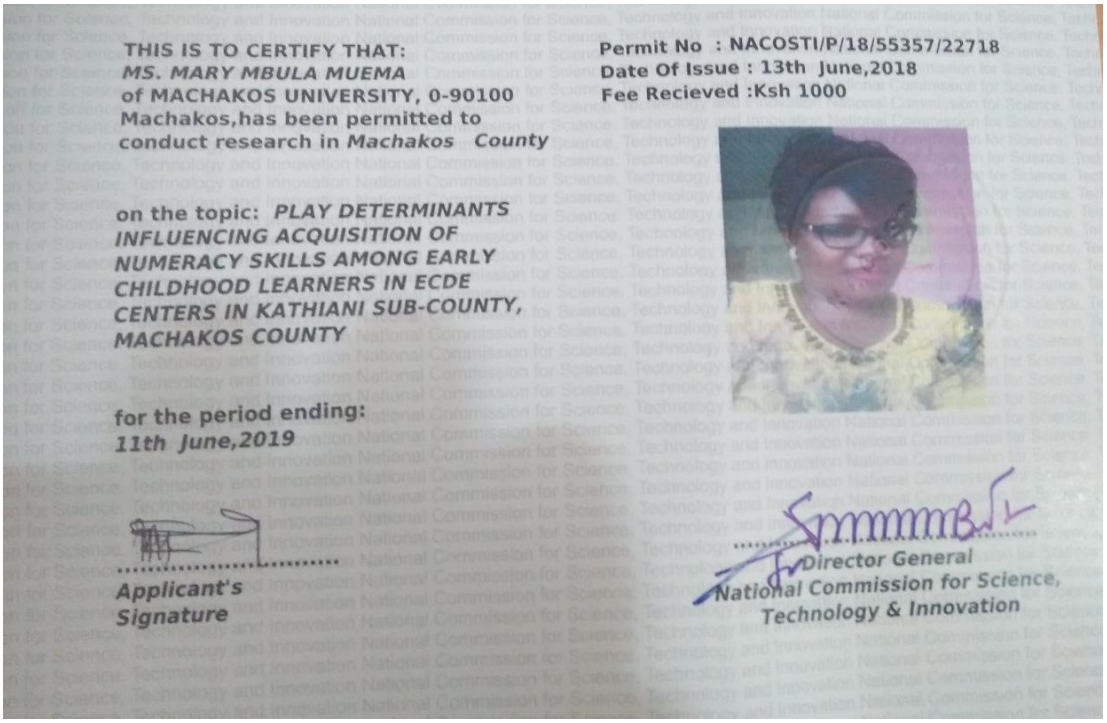
The source (The Researcher, 2018)

APPENDIX VI: THE PROJECT BUDGET

ITEM	QUANTITY	COST PER UNIT(Kshs.)	TOTAL COST(Kshs.)
STATIONERY AND TECHNICAL REQUIREMENTS AND EXPENSES			
Writing pads	3	50	2000
Biros pens	6	20	120
Rulers	2	50	500
Stapler	1	500	500
Whiteout	1	150	150
Flash disk	1	1000	1,000
Printing of Students' Questionnaires	5 pages	50	250
Photocopying of Students' Questionnaires	260 copies (260 X 5 = 1300 pages)	10 per page	25,000
Typing of Report	66 pages	20	1320
Printing of Project Report	6 copies (66 X 6 = 396 pages)	10 per page	3960
Project Report Binding	6 copies	500 per copy	3,000
CD production	1 copy	1000	1,000
Research Assistants	2	2000 per day	40,0000
Airtime cards			1,000
Expenses for traveling within the study site collecting data			30,000
Miscellaneous (50 of overhead)			2,805
TOTAL			**111,700.00**

The source (The Researcher, 2018)

APPENDIX VII: PERMISSION FROM NACOSTI



THIS IS TO CERTIFY THAT:
MS. MARY MBULA MUEMA
of MACHAKOS UNIVERSITY, 0-90100
Machakos,has been permitted to
conduct research in *Machakos County*

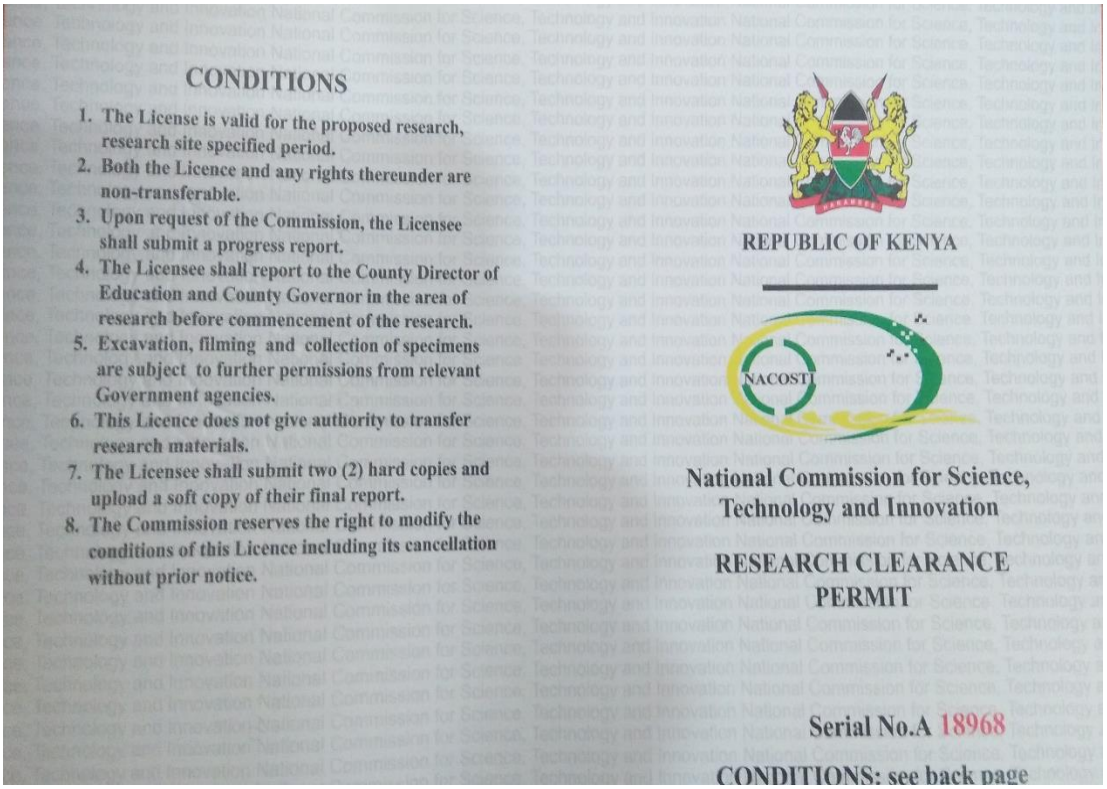
on the topic: *PLAY DETERMINANTS INFLUENCING ACQUISITION OF NUMERACY SKILLS AMONG EARLY CHILDHOOD LEARNERS IN ECDE CENTERS IN KATHIANI SUB-COUNTY, MACHAKOS COUNTY*

for the period ending:
11th June,2019

.....
Applicant's Signature

Permit No : NACOSTI/P/18/55357/22718
Date Of Issue : 13th June,2018
Fee Recieved :Ksh 1000

.....
Director General
National Commission for Science, Technology & Innovation



CONDITIONS

1. The License is valid for the proposed research, research site specified period.
2. Both the Licence and any rights thereunder are non-transferable.
3. Upon request of the Commission, the Licensee shall submit a progress report.
4. The Licensee shall report to the County Director of Education and County Governor in the area of research before commencement of the research.
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REPUBLIC OF KENYA

NACOSTI

National Commission for Science, Technology and Innovation

RESEARCH CLEARANCE PERMIT

Serial No.A 18968

CONDITIONS: see back page

NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION

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Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/18/55357/22718**

Date: **13th June, 2018**

Mary Mbula Muema
Machakos University
P.O. BOX 136 – 90100
MACHAKOS.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Play determinants influencing acquisition of numeracy skills among early childhood learners in ECDE centers in Kathiani Sub-County, Machakos County"*** I am pleased to inform you that you have been authorized to undertake research in **Machakos County** for the period ending **11th June, 2019.**

You are advised to report to **the County Commissioner and the County Director of Education, Machakos County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Machakos County.

The County Director of Education
Machakos County.

APPENDIX VIII: MAP OF KATHIANI SUB-COUNTY