# DETERMINANTS OF TEACHERS' USE OF INSTRUCTIONAL RESOURCE IN TEACHING PRE-PRIMARY SCHOOL SCIENCE AND MATHEMATICS ACTIVITIES IN MACHAKOS COUNTY ,KENYA

**BY**

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**DECEMBER, 2018.**

## DECLARATION

I confirm that this research thesis is my original work and has not been presented in any other university/institution. This thesis has been complemented by referenced works duly acknowledged. Where text, data, graphics, pictures or tables have been borrowed from other works- including the internet, the sources are specifically accredited through referencing in accordance with anti-plagiarism regulations.

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## DEDICATION

Special dedications goes to my family members for the daily prayers they used to offer for me that is: my beloved wife Mary Nyaboke and children Deborah Nyakerario,DiavineBochaberi, Ruth Moraa, Daniel Mokaya and Naomi Kerubo may God shower them with blessings always.

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## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| **DICECE:** | District Centre for Early Childhood Education |
| **ECDE :** | Early childhood development education |
| **ECE:** | Early Childhood Education |
| **ECTASTS:** | Early Childhood Teachers' Attitudes towards Science Teaching Scale |
| **EYE:** | Early Years Education |
| **IM:** | Instructional Materials |
| **N.A.C.E.C.E:** | National Centre for Early Childhood Education |
| **OER:** | Open Education Resources |
| **RC:** | Resource Centre |
| **RK:** | Republic of Kenya |
| **SC:** | Science Classroom |
| **SMASE:** | Strengthening Mathematics and Science Education |
| **SMASSE:** | Strengthening Mathematics and Science in Secondary education |
| **STEAM:** | Science, Technology, Engineering, Art –Mathematics |
| **STEM:** | Science, Technology, Engineering -Mathematics |
| **UNESCO:** | United Nations Education Scientific and Cultural Organization |
| **WB:** | World Bank |

## ABSTRACT

The continuous poor results of science and mathematics in Athi-River Sub-County of Machakos County-Kenya has yielded to the study of determinants of pre-primary school teachers' use of instructional resources in teaching science and mathematics activities. The effects of use of the instructional resources in learning achievement which has led to poor performance in science and mathematics activities in the current study locale. The major purpose of the study was to establish the extent of teachers' use of instructional resources in teaching pre-primary science and mathematics activities in Athi-River Sub County of MachakosCounty, Kenya. The study also found out the effects of teachers' training level in the use of instructional resources in teaching science and mathematics, Teacher- gender and use of instructional resources, Teacher's attitude and use of instructional resources in teaching science and mathematics activities and teacher- motivation on the use of instructional resources in teaching science and mathematics in pre-primary schools. This study employed Bruner's learning theory (1966), which matched well with the determinants of pre-primary teachers' use of instructional resource. The study targeted 40 pre-primary head teachers, 600 pre-primary teachers and 1800 pre-primary children in Athi-River Sub-County, Machakos County. Athi-River Sub-County was sub-divided to 5 bases and stratified sampling technique was used to select 6 pre-schools from each base translating to a total of 30 pre-schools. Random sampling was used to select 6 pupils from each of the sampled schools for focused studygiving a sample size of 1800 pupils. Purposive sampling was also used to select 2 teachers for science and mathematics activities from each of the sampled schools. All head teachers from all the 30 sampled schools were selected leading to a sample of 30 head teachers. A sample size of 270 respondents including 60 teachers, 30 head teachers and 180 pupils) was used in the study. Questionnaires and oral-interviews were used to collect data. Validity of the instruments was determined through examining of the items using content validity. A. Pilot test of the research instruments was done in two schools in the neighboring sub county. Quantitative data was generated from the close-ended items from the questionnaires. Descriptive statistics was used to analyze data such as frequency; standard deviation and mean data analysis was analyzed according. The data was presented in tables. Qualitative data produced from the questionnaire, interview schedules, focused group discussion, as well as data obtained through the observation checklists was analyzed with regards to relevant themes and discussed in line with the research objectives. The findings of the study were as follows: teachers with higher training qualifications were more likely to use instructional resources in teaching science and mathematical activities than their counterparts with less or no training. Male teachers were found to use instructional resources more often in teaching science and mathematics than their female counterparts.Teachers with positive attitude towards science and mathematics were also found to use more instructional resources than teachers with negative attitude. The study recommends that the ministry of education should facilitate pre-primary school teachers to advance their studies through in-service training and that the government of Kenya should motivate pre-primary teachers by paying them reasonable salary. All stakeholders should ensure that instructional resources are made available for better pupil achievement in science and mathematics.

# CHAPTER ONE

# INTRODUCTION AND CONTEXT OF THE STUDY

## 1.1 Introduction

This chapter presents the background of the study, statement of the problem, purpose of the study and objectives of the study. It also presents research questions, significance of the study, limitations and delimitations of the study, assumptions as well as the theoretical and conceptual framework and the operational definition of terms.

## 1.2 Background to the Study

Instructional resources especially in the teaching of science and mathematics is vital in instruction process according to Oladejo, Olosunde, Ojebisi&Isola,(2011)since they have the potential of helping the teacher explain new concepts clearlyOkobia( 2011) stated that instructional resources results in better understanding and aid the teacher in the effective transfer of knowledge to learners.Karaka& Fabian,( 2007)said that instructional resources add value in class performance and upsurges the attainment of content learned as by Baylor and Ritchie( 2002). Eison,(2010).suggested that instructional resource helps in enhancing retention which makes learning more permanent. And instructional resources stimulate and sustain interest in learning by providing first-hand experience with the realities of the physical and social environment of the child. Finally, Sapir(2011) posits that the use of instructional resources assists children in opening up all developmental aspects leading to holistic learning process. It has been observed that children who are exposed to various instructional resources are

actively and better involved in the learning process according to Hattie, & Yates (2013).

In Kenya pre-primary school centers are the receiver of the innocent innate children as they transit from home to school. Hirst, Jewis, Sojo and Cavagh (2011) posits that pre -primary school is basis for learning and it helps children to develop skills, knowledge, personal competence, confidence and a sense of social responsibility. As children move to school, they need to adapt to the new environment which they meet and environment ought to be favorable and rich of instructional resource. Instructional resources encourage children to like schooling and also make learning experiences interesting and enjoyable. Therefore, teaching becomes easier with the use of instructional resources in pre-school .Afshari (2009) andHirst(2011) found that the use of instructional resources in pre-primary schools had a greater value to all children in learning of science and mathematics.

Loucks-Horsley (2009), stated that Science and mathematics are essential for the development of any nation. According to Banilower (2013), learning of science and mathematics enables learners to understand their environment and solve their dailylife problems. At Early Childhood Development (ECD) level, science and mathematics refers to basic concepts, skills and attitudes that enhance children's understanding of the natural environment, Charles worth (2015).The use of instructional resources in teaching science and mathematics therefore enableslearners to explore basic scientific and mathematical skills of observation, manipulation,classification,communication,designingexperiments, measurement,

hypothesis, predictions, problem-solving, recording, and questioning of the eventsMinistry of Education, Science and Technology (MoEST)(2008). Young children are naturally curious which makes their interaction with nature and learning experience and hence the presence of instruction resources in pre-school cannot overstated. Children are inherently, mathematical and scientific minded hence it is essential to provide a conducive and stimulating environment rich of instructional resources so as to enhance their inherent potential according to National Research Council, (2009). The scientific and mathematical process of curiosity, discovery, experimentation, measurement and organization of information and reporting builds positive attitudes towards studying science and mathematics among children.

Catchan (2013) said in his study that teaching of science and mathematics are very important in any educational systems which leads to modern development of any growing county in order to achieve vision 2030.Alot states have brought ideas on the performance of science and mathematics which has created(STEM) sciences and mathematics. The creation of Science, Technology, Engineering and Mathematics, this creation was made for all children to learn effectively for better future of the nation.. There came a proposal to improve STEM by coming up with (STEAM) Science, Technology, Engineering, Arts - Language, Visual and Performing — and Mathematics to create innovation and creativity in children as they enjoy learning science and mathematics.In 2007, the government of Kenya in concurrence with World Bank international monetary fund and Japanese instigated Strengthening Mathematics and Science in Secondary Education(SMASSE) so as to increase science and mathematics. This implied that science and mathematics had a problem in the curriculum that desirable to be

spoken properly, the current study has originate out that the teachers' use of teaching resources will mechanically promote science and mathematics activities.

The importance of pre-primary teachers' use of instructional resources in teaching science and mathematics activities provides skills, knowledge and competence to the children's learning process as by Lampert( 2010) and provides stimulating environment in the learning process. When instruction resources are effectively used by teachers in science and mathematics activities, they make children to create stimulating interaction with them, hence automatically promoting children's academic achievements as stated by Shonkoff and Philips( 2013).

Harris and Sass (2009) found out that teachers with a standard certification had a statistically significant positive impact on student test scores relative to teachers who either held private school certification or were not certified in their subject area. This study showed that teachers' training has an impact on the teaching methods, use of instructional resources and content knowledge which are key for children achievement. Kosgei, Mise, Odera, and Ayugi (2013) investigated the influence of teachers' experience and qualification on students' academic achievement in Biology. The study findings showed that 80 % of teachers who participated in professional development programs such as SMASSE showed better and improved student performance.

Eccles and Wigfield (2002) noted that the sex of ateacher influences and motivates children's abilities as it results good academic achievement. Kueckeny and Valfortz (2012) did a study on the relationship and interaction between the sexes of a teacher on learning outcomes. The study result established that both male and female pupils performed better in reading when taught by female teachers than male teachers while learners performed better in mathematics with male teachers. This study sought to establish the influence of teachers' sex on the use of teaching and learning materials. Odunaike, Ijaduola and Amoda (2013).The study found

that female teachers gives a lot of energy in supporting children in order to improve their academic performance as compared with male teachers who takes teaching as a profession for the females. Another study byOkoro, Ekanem and Udoh(2012), investigated the result of teacher masculinity on the academic realization and presentation of children in primary schools in Uyo Metropolis - Nigeria. The results displayed that teacher-pupil sex connections meaningfully exaggerated pupil's educational performance.

There are mixed findings on the relationship between teachers' use of instructional resources and educational practice. Some studies show that the use of instructional resources is associated with higher educational achievement in pre-primary school. Ng'asike(2012) did a study on training of science teachers for early childhood and primary grade in Kenya and discovered that though the government of Kenya emphasizes science as critical subject for advancement of technologies and attainment of the vision 2030 science activities and resources are not yet offered in the trainings to meet the demands of science for understanding knowledge and logical thinking. This implies that there is still lack of information on proper utilization of instructional resources among teachers at all level of learning since there is minimum scientific training on the use of these resources in instruction.

According to Pramling and Samuelsson (2010) increasing teacher education does not produce as good academic accomplishments as the suitable use of teaching/learnin resources among the teachers. The use of instructional resources successfully contribute toward positive academic accomplishments. Similarly, Hiebert&Grouws (2007) argues that science and mathematics teaching-learning activities depend on teaching and learning aids or use of instructional resources and teaching methods used by young children which makes learning to be more interesting and enjoyable in the class environment, study by Ngololo (2012) in Namibia, found that teachers' competencies in mastering the curriculum contents

wasted the subjects due to deficiency of teachers, inadequacy of instructional resources and poor teaching approaches. Reviewing the vast body of knowledge on the characteristics of teachers and their influence on learner presentation, this study takes advantage of the huge gap on pre-school especially on issues that guidance the teachers' selection, implementation and consumption of instructional resources in teaching science and mathematics activities among pre-school children in Athi River Sub-county of Machakos County.

### 1.3Statement of the Problem

When teaching science and mathematics, early childhood teachers have tremendous impact and influence on shaping the thoughts and opinions of childrenClements &Sarama,( 2014). Research shows that most children have formed an opinion (either positive or negative) about science and mathematics by the time they reach the age of seven years stated Hattie &Yates (, 2013). That puts a tremendous responsibility on early childhood professionals, especially with all of the emphasis being placed on STEM education. Sarama and Clements (2009) asserts that children who are taught math early and learn the basics at a young age are set up for a lifetime of achievement in all aspects of their academic performance. Considering the known importance of mathematics and science in the society, it's important to carry out studies that are geared toward their improvement in our schools.

An analysis of Kenya Certificate of Primary Education (KCPE) results from 2012 to 2015 show a downward trend in performance of science and mathematics in

Athi River Sub-County (District Education Officer - Athi- River, 2015). The results show that the performance of Science is below average. The introduction of the Strengthening Mathematics and Science Education (SMASE) and SMASSE with a view to improve student achievement has not achieved much. Furthermore, most of the teachers who are allowed to attend these forum are high school teachers yet the requisite knowledge and the basis in mathematics and sciences is laid at pre-school level hence there is need for preschool teachers to be given priority.

In Athi River Early Childhood Development and Education (ECDE) has been left to parents resulting topoor and adequate science and mathematics instructional resources. Other than the availability, appropriateness and adequacy of the instructional resources in preschools, their use for instructions by teachers is key in ensuring that children's achievements in science and mathematics activities are assured. However, performance related studies have focused on teacher professional characteristics (Ng'asike,( 2012), teacher training (Goldhaber& Brewer, (2000); Harris & Sass, (2011), teacher education and experience (Zhang,(( 2008),availability and adequacy of teaching and learning materials (Czerniewicz& Brown, (2005). None of the studies focused on influence of the use of the instructional resources by the teachers on learner performance. Furthermore, most of the studies have focused on primary and secondary schools yet these factors established at pre-school level can help to avoid performance issues at higher levels. This study took advantage of this gap to seek the use of instructional

resources and teachers' characteristics and determine the use of these resources in teaching science and mathematics activities among pre-school teachers.

### 1.4 Purpose of the Study

The purpose of this study was to establish the extend of teachers' use of instructional resources in teaching Science and Mathematics activities inAthi-River, MachakosCounty, Kenya.

The study was to explore teacher factors influencing the use of instructional resources in teaching Science and Mathematics activities in pre-school in Athi River sub-county.

### 1.5 Objectives of the Study

The study sought to achieve the following objectives;

i) To establish the extend ofuse of instructional resources in teachingscience and mathematicsactivities amongpre-primary school teachers in Athi –River sub-county.

ii) To establish how teachers' training levels affect the use of instructional resources in teaching Science and Mathematicsactivities in pre-primary teachers.

iii) To examine how teachers' genderdetermines the use of instructional resources in teaching science and mathematics activities in pre-primary school teachers.

iv) To find out whether teacher's attitude affects use of instructional resources inteaching science and mathematics activities

v) To determine the influence of teachers' motivation on use of instructional resources in teaching science and mathematics in pre-primary school in Athi-River Sub-County.

### 1.6Research Questions

This study sought to answer the following research questions:

i. Do what extent to teachers use instructional resources in teaching science and mathematics activities in Athi –River sub-county?

ii. How does teachers' level of training affects the use of instructional resources in teaching Science and Mathematics activities?

iii. How does teachers' gender determine use of instructional resources in teaching science and mathematics activities?

iv. How does teacher's attitude affects the use of instructional resources in teaching science and mathematics activities?

v. How is the use of instructional resources in teaching science and mathematics influenced by teachers' motivation?

## 1.7 Significance of the Study

This study found out the following on the importance of use of instructional resources in the teaching of science and mathematics activities; the Ministry of education under the department of Quality Assurance and Standard might found it very relevance while assessing teaching programmes in early years of education level during their routines.

Kenya institute of curriculum development (kicd) may use the report to develop appropriate instructional resources in the teaching of science andmathematics activities in pre-primary schools in Kenya.

The Parents should understand the effect of motivation of teachers' use of instructional resources in teaching of science and mathematics activities and provide appropriate motivation in order to embrace teachers to use instructional resources in teaching of science and mathematics in pre-primary schools.

Teachers may use the study report to strengthen their use of instructional resources in teaching science and mathematics activities, as it makes teaching and learning realistic, original and interesting to learners

Board of Management of the schools may use the study findings to improve the supply of instructional resources in teaching science and mathematics activities in schools.

Finally, GOK may use the findings of this study toincrease budgetary allocation for pre-primary school education in order to purchase instructional resources for better educational implementations in pre-primary school levels.

## 1.8Delimitation and Limitations of the Study

This section presents the delimitations and limitations of this study.

### 1.8.1 Delimitations of the Study

This study sought to examine how teachers' characteristicinfluence use of instructional resources in teaching science and mathematics in pre-primary schools in Athi-River Sub-county. Among the characteristics, this study focused on teachers' level of training, teachers' gender, teachers' attitude and their motivation. This study wascarried out in both public and private pre-primary schools in Athi-river sub-county.

### 1.8.2 Limitations of the Study

The findings of the study werebased on 30 pre-primary schools in Athi-River Sub County of Machakos County and therefore generalisations to other pre-primary

schools in other counties with similar conditions may be done with caution. There was suspicion and fear of victimization of some respondents which was feared could have resulted in false data. However, this limitation was addressed by assuring them for their confidentiality.

### 1.9 Assumptions of the Study

The study assumed that there was inadequate or lack of instructional resources in many pre- primaryschools in the study area hence affecting their use in teaching science and mathematics activities. The study also assumed that there were characteristics such as teachers' level of training, teacher-gender, teachers' attitude, and teachers' level of motivation that determine their choice, adoption and use of instructional resources in teaching mathematics and science activities in pre-schools.

### 1.10 Theoretical Framework

This study employed Jerome Bruner's learning theory framework which was drawn from Bruner (1966). Bruner described his developmental human psychology in early childhood that pre- primary school children think and reason about their environment through learning, Bruner show pre scholars as being active in the process of learning by manipulating their environment. Bruner was very much opposed to the expectations of the passive learner which automatically associating stimulating responses. This theory is called learning theory by Bruner

(1960), he developed three modes of learning by young children in order to effectively enjoy learning process:namely enactive representation-where children manipulate objects andiconic - children represents internal objects on visual and image or icons and symbolic representations of external objects into words, formulas or other symbolic means among children.

Bruner's learning theory is related to the current studies which tend to investigate determinant of teachers use of instructional resource in teaching science and mathematics because the theory encourages intuition thinking (creativity) it is here where knowledge hunches or guesses are extended in learning. The theory also explains the basis of discovery learning which was realized during the study. And usually the discovery method is through the use of instructional resources which children enjoy to use. According to Bruner any child can be ready and able to learn anything if he is taught intellectually and in an honest fashion, young children understand complex concepts if they are talked in the mode of representation that corresponds them accordingly this will only be done through the use of instructional resources which matches with Bruner's three major learning process that is enactive, iconic and symbolic representations. This was merely the appropriate use of instructional resources in teaching especially science and mathematics in young children.

## 1.11 Conceptual Framework

The conceptual frame work represented how teacher's determinants on the use of instructional resources influence teaching pre-primary school science and mathematics activities. It showed how teachers use instructional resources in teaching science and mathematics activities in pre-primary schools. Independent variables are teachers' training level, teachers 'gender, teachers' attitudes and teachers' motivational level towards science and mathematics activities in Athi-River Sub County of Machakos County Kenya. Dependent variable is the extent of use of instructional resources by pre-primary school teachers in teaching science and mathematics activities which are as seen on the conceptual diagram below, in order to create better results and good academic achievement, good grades and well transitions of children in science and mathematics and the application of technologies effectively. The study was done in Athi-river sub County and delimited to public and private pre-primary schools. The findings of the study were only generalized to few pre-primary schools in Athi-River Sub County of MachakosCounty and pre-primary schools in other counties with similar conditions Might benefit. Pre-primary teachers were used as respondents in the study studied.

## Conceptual framework

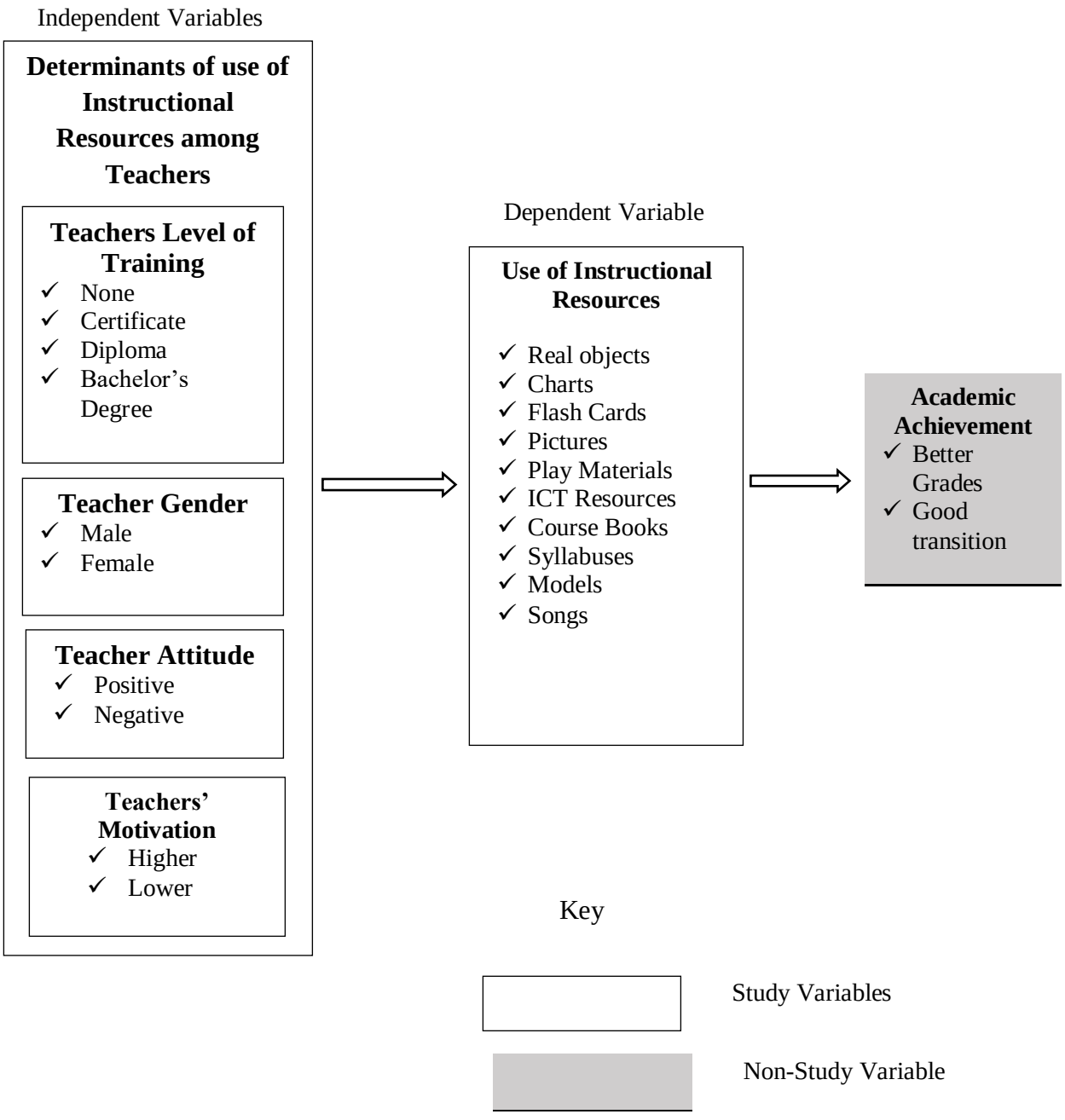


**Figure: 1.1 factors of use of Instructional resources in Science and Mathematics Activities**

### 1.12 Operational Definition of Terms

| | |
|---|---|
| **Extrinsic motivation** | external drives which makes a teacher not to workfor better achievement |
| **Gender** | This refers to both male and female teachers' use of Teaching resources. |
| **Pre-primary** | This the education provided for youngchildrenbefore Joining primary school education |
| I**nstructional resources** | this are teaching and learning aids which assist children to learn effectively |
| **Intrinsic motivation** | internal drives which influences a teacher to achieve better in teaching |
| **Teacher's attitude** | this the perceptions of teachers towards the use of Instructional resources in teaching science and mathematics activities. |
| **Teacher's level of training** | this indicates the parameter of teachers' professional Qualifications |
| **Training** | Professional skills given to a teacher in order toteach successfully |
| **Untrained** | Types of school teachers who teach in pre-schools but are not qualified. Based on the study context, |

| | |
|---|---|
| | public and private schools and also both urban and rural schools will be discussed |
| **Use of resources** | teaching and learning aids used by a teacher ingivingInstructions to learners. |

# CHAPTER TWO

# REVIEW OF RELATED LITERATURE

## 2.1 Introduction

This chapter reviews relevant related literature on the determinants use of instructional resources in teaching science and mathematicsSpecifically, the chapter reviews literature on use of instructional resources in teaching science and mathematics in pre-primary schools; teacher training and use of teaching resources in teaching science and mathematics activities; teacher gender and use of teaching resources in teaching science and mathematics activities; use of teachers' attitude and use of instructional resources in teaching science activities between male and female; and teachers' motivation and use of instructional resources in teaching science and mathematics activities.

## 2.2 Instructional Resources in teachingScience and Mathematics

Use of Instructional resourcesin teaching science and mathematics isvital in improving the academic achievement of the young children. A study done by Mwong and Wanyama (2012) revealed that teaching and learning resources not only enhances a Child's acquisition of science and mathematics skills but also ensures good and smooth transition from preprimary to primary school. Muithungu, (2003) said that teachers should use many of teaching/learning resources locally found within their local environment to avoid purchasing

instructional resources which are very expensive for teaching and learning in the preprimary schools. Parents have the responsibilities to ensure that all the required learning and teaching instructional resources are available in all the pre-primary schools for children to without any tricky.

Muithungu (2003) suggested that the teacher is the major driving source of instructional resources and he/she has to influence children and parents to provide or collect the teaching and learning resources to use during the mathematics and science activities.Muithungu, further adds that teaching and learning resources can be made available by parents and the community as a whole for the ECDE centers within the locality. This can be successfully done by organizing for material development day in school. The community members and parents can collect and others can donate to the school, meet and share thus encouraging early enrolment and learn to provide learning resources.

A study on the approaches to young children's science and mathematics concepts and scientific problem-solving skills on the classroom environment found that there were moderating effects of classroom surroundings on the application of science and mathematics concepts. This findings of the study used theories of both Vygoskey and Piaget and it was done in Indiana by Colgrove (2012), while the current study was conducted in Athi-River and used only Bruner's learning theory in the theoretical framework, and its focuses were on the determinants of pre-

primary school teachers' use of instructional resources in teaching science and mathematics activities.

Australia in 2003. In 2006, over the full range of primary school experience, science occupied 45 minutes per week (3% of an average teaching week of 1486 minutes) while mathematics occupied 263 minutes (18% of an average week according to the study done byAngus, Olney &Ainley, (2007).The findings of the study revealed that science was not adequately utilized in the schools teaching learning processes.

In Bangladesh, Mondal(2011) did a study on teaching practices on Biology in rural and urban secondary schools. The study found that there was a difference in teaching/learning materials in urban and rural in teaching biology. Biology is a science study which was also done in secondary level, while the current study was based on pre –primary school level and the study sought to investigate the use of instructional resources by pre-primary school teachers in teaching science and mathematics activities in Athi-river sub-county of Machakos county Kenya.

In India, Bartsch (2009) found that the use of teaching and learning resources can be relevant in teaching sciencein schools. The study was similar to the current but this was done in India and the study focused on only science activities contrary to the current study which was conducted in Athi-River, Machakos County, Kenya on pre-primary school and focused on the determinants of pre-primary school teachers" use of instructional resources in teaching science and mathematics

activities in order to solve the poor performance of science and mathematics in Athi-River Sub –county Kenya.

Okobia (2011) required to judge the obtainability and teachers' use of teaching/ learning materials and resources in the application of junior secondary school social studies curriculum in Edo state. A sample of fifty social studies teachers were randomly designated from fifty junior secondary schools in five local government areas of Edo State. Data analysis was agreed out using t-test for the hypothesis and simple percentages for questions one and two. The outcomes exhibited that teaching/ learning materials and resources accessible were grossly insufficient. It was also perceived that there was no variance in the use of teaching/learning materials between expert social studies teachers and non-specialist teachers. It is therefore suggested that instructional materials and resources be made available for the teaching of social studies.

In Kenya, studies done by Ogolla (2015) on the relationship between teaching and learning materials on performance in KCSE in Nyakach found that biology has been poorly done over five years. Yes, biology is a science but taught in secondary schools; on contrary the current study which focused on the use of teaching and learning resources in teaching science and mathematics activities in pre-primary schools in Athi-River not Nyakachwhich has a different demographic zone. Ambogo (2012), in his study on effects learning equipment on chemistry found out that there was significance correlation between KCSE Performance in science and

availability of learning materials or equipment, the study was focusing the poor performance of science but in the secondary level, while the current study's focuses on preschool level and on science and mathematics activities. In 2007 the government of Kenya in conjunction with World Bank, international monetary fund and Japanese initiated SMASSE to strengthening mathematics and science in secondary education. There is need to focuses on the improvements of science from preschools which the focuses the basic of science.

Mutai (2006) suggested that learning is strengthened when there are enough teaching and learning materials which increase academic achievements, the study seemed to be similar to current studied study on determinant of teachers' use of instructional resources in teaching science and mathematics activities, but, Mutaifocused on the performance of the KCPE. There is need therefore to study the topic determinant of teachers' use of instructional resources in teaching science and mathematics in pre-primary schools to whether there was any difference between primary and pre-primary school on the use of instructional resources in teaching of science and mathematics activities. The use of computer and internet applications are technologies used in today's teaching/learning, but there is need for skills and knowledge of the teacher to apply in teaching according to the claim by, Butera, Czaja,Harison, Liberal &Plamer (2009).

In science and mathematics activities, children learn physical science which are the study of energy, light, measurement, heat movement and change in early

childhood (Allen, 2002). Pre-primary school teachers should use instructional resources in teaching and learning of science and mathematics activities, the science activities involved are; observation, investigation, measurement and communication on the results and therefore there was a need to use materials in teaching science and mathematics as the case study.

Wanyonyi, and Makokha, (2015) also investigated the utilization of instructional resources by Kiswahili teachers in the teaching of poetry in secondary schools in Nandi North Sub - County. This wasguided by the operant conditioning theory, the study used systematic sampling to select 20 Kiswahili teachers in secondary schools in the sub-county. Using questionnaire, observation and interview schedule to collect data, the study established that secondary schools in the study area had good facilities and resources. The study further revealed that poor performance in Kiswahili poetry was contributed by poor and inadequate utilization of instructional resources among teachers. The study recommended that there was need for teachers to utilize instructional resources in teaching Kiswahili poetry to enhance the amount of information a student could learn and retain. The current study investigated characteristics of teachers that influence the utilization of instructional resources in teaching mathematics and sciences in pre-schools.Bitengo (2005), in his research findings on preschool teacher's age towards the teaching of mathematics in Kasarani division in Nairobi found that there is a significant relationship between the teacher's characteristics, content, instructional

resources, learning activities, individual differences among children and the objectives to be achieved at the end of the learning process.

Ndani (2006) observed that learning in preschools is due to better and an enriched environment with variety of learning materials. Therefore the presence or absence of learning materials distinguish between high and low achievement in children's learning.

### 2.3 Teachers Level of Training and Use of Instructional Resources

A study done by Westbury (2000) distinguishes the teacher as the agent of curriculum application. Fullan (2014) claims that the reputation of the teacher as a central change agent, as the teacher is the one who is primarily accountable for the fruitful execution of a new curriculum. According to Morrison, Bachman, & Connor (2005) the teacher's teaching, classroom organisation tactics, and connections with students at classroom level can define how much is learned or trained for the same profession.

A study by Brill & McCartney (2008) discovered that lack of teachers training and poor teacher retention as key barriers to current curriculum execution. The key to getting teachers devoted to modernisation is to improve their information of the program. This means teachers need to be trained and workshops organized for professional development. Certainly an satisfactory teacher education program should include curriculum development if teaching is to be a profession and if opportunities for learners are actually to be better-quality. Content knowledge

aside, it is only when a teacher can connect excellently that he will be able to draw upon the various social cultural contexts of the learner to facilitate learning according to Tsui(2001). Actual classroom communication can also be improved by specific attention of teachers to their scholars.

Teacher trainings has countless effect on the use of teaching resources in teaching science and mathematics and automatically stimulates children 'successes. Teacher trainings are related to children's successes. Goe, (2007); Rice, (2003) and Zeichner& Conklin, (2005) came up with their uniform test scores to find on the joining between teacher credentials and children's presentation, the extent of the joining between teacher trainings and any learner's performance, are predisposed by attendance or grades, which was generally beyond the scope of this study.

Some developing countries have started computer literacy training for teachers, which has led to a vibrant reason for partaking ICT in education; however, it is prominent that effective training should not stop at computer literacy but should model real teaching applies. Infodev,( 2015), Nonetheless, noted that there are many other countries that provide slight or trivial teacher training connected to ICT in education. For example, hint from Europe shows that 70% and 65% of children in Lithuania and Romania, correspondingly, are taught by teachers for whom it is necessary to participate in ICT training, compared to just 13% or fewer of students in Luxembourg, Austria and Italy (European Commission, 2013).

Learning might also appear and be strengthened through apps that arouse the use of many senses, according to Carr, (2012), which is usually done through the use of teaching and learning by the use of instructional resources. With mobile devices such as smart phones, there is direct collaboration with the wonders, rather than being facilitated through a mouse or keyboard, making the iPad more fit for children than desktop computers as discussed by Sinclair and Heyd-Metzuyanim,(2014).Use of instructional resources in teaching science and mathematics is required for children to recall perceptions properly throughout the learning process. Hegedus, (2013).Proposed that this app also educes multi-touch functionality, enabling children to make sense of single belongings of particular instructional resources therefore very necessary for teachers to train on the correct use of instructional resources for better teaching to be realized.

The affordances of instructional resources in teaching of science and mathematics activities shall led to cognitive risks and make it very difficult to achieve the expected objectives from the learner's feedback activities. Calder and Campbell, (2016). The instructional resources allow children to model in a dynamic, reflective way. According to Meyer (2015) established that instructional resources provides new forms of personal ownership that in turn supports children's personal understanding and conceptual frames as they learn science or mathematics activities.Melhuish and Falloon,( 2010),stated that the problem of lack of qualified teachers has been renowned in the teaching professional

A study by Yeboah-Appiagyei, Joseph, &Fentim (2014) on the effects of professional qualifications of financial accounting on academic performance in Ghana, revealed that teachers with sound training were equipped with the requisite competence that enable them to harvest real package in teaching associated to less trained teachers. In South Africa, Mathevu (2014) did a study on the effect of trained teacher use of computer; Data were composed in research using questionnaires from 146 participants in twelve secondary schools located in the Groot Letaba Circuit, Mopani District Municipality in Limpopo Province, South Africa. The findings exposed that with the exemption of a TVs, photocopiers and laptop/desktop computers, there is a scarcity of ICT resources available at schools. Most teachers have been negatively affected by a lack ICT equipment and/or deficient use of these ICT resources but well trained teachers have skills and assurance to use ICT and any other learning resources in their teaching (Summak, Samancioglu, Goyal, Purohit&Bhaga, 2011). This was a study done in South Africa, but the current study was done in Athi-River sub county of Machakos in Kenya and the focus was how pre-primary teacher use of instructional resources in teaching science and mathematics activities in preschools. Currently, a major issue is intensifying the dynamics of the public schools. Most children are increasingly reflecting negative attitudes towards learning especially as they move from lower class or grade to another in search of knowledge.

Jenkins, Floress and Reinke (2015) in their studysought to found how teachers are encouraged in the use of instructional resources in teaching science and

mathematics and the wish for children to use resources for operative teaching in schools. In pre-primary schools there is about 95% satisfaction; and then it goes steadily down until it bottoms out in standard eight at 37%. This represents a wonderful extent of bored children. For teachers one could say that there is only one thing worse than being bored. Moreover, the last two Met-Life surveys (2008 and 2010) have shown an intense decline in teacher satisfaction, reducing from some 54% to 40% or less. Thus, school, as it is currently planned and experienced, is mentally and literally "pushing" students and teachers out of school. Information and announcement technology (ICT) has the likely to alter teaching and learning processes.

However, most countries expression tasks in computing the influence of savings in set-up, enormous roll-outs of teacher training ingenuities, and usage in the classroom. The lack of a complete set of needles can somewhat clarify current tasks. Moreover, there is a mounting acknowledgement that additional focus is needed to measure teacher training and usage holistically within a systems standpoint whereby needles are not viewed in separation but reflect a complex pattern of how teachers are set and how teaching activities with pupils, in and out schools and the classroom are implemented (Partnership on Measuring ICT for Development, 2010). Following a technical advisory panel (TAP) meeting that carried calm a various group of mathematicians and theme material professionals in the area of ICT in education from 9 to 10 December 2014 in Paris (France), this paper has been developed to help reinforce the theoretical framework of ICT in

education with specific reference to the importance of collecting data relevant to teacher training in relation to ICT and its usage in the classroom. This paper is complementary to a paper authored by Broadley, Downie and Gibson (2015)on 'Evolving Learning Paradigms' and 'Developing new indicators to describe digital technology infrastructure in primary and secondary education'. These three papers were custom-built by UIS to inform the preparation of new ICT in teaching data get-togethers and finding core signs for the post-2015 developmental agenda.

The UNESCO-UIS Guide to ComputingData and Communication Technologies (ICT) in Education, Technical Paper No. 2 (UIS, 2009), put in place a shared set of unchanging globally settled pointers on ICT in teaching with a number related to teachers' expert growth and rehearsal, which are fatigued from administrative sources. This paper however argues that a more complete method, as per example the ICT Education 2013 Survey (CETIC.Br, 2013) on the use of ICT in Brazilian schools, may be useful for shedding additional light on teacher dimensions of ICT in education.

More specifically, this paper tries to measure present pointer gaps in teacher specialised expansion and training by asking elementary questions, including who is being trained in the use of ICTs, where and how are teachers trained, what kind of ICT training is if and founded on which certification standards, and finally, when and for how long are teachers trained? Built on a study of these problems, extra gauges are recommended. This paper also scrutinises teacher practise of ICT

in conveying instruction and makes a case for including cross-cutting elements that point to teachers' usage of ICT-enhanced pedagogy, digital curriculum and charge, ICT in instruction policy, ICT structure, and ICT used for structural and administrative purposes. The schooling of simple computer skills and computing was also addressed.

On enhancing the competence of electronics teachers in the utilization of instructional resources for effective electronics subject delivery which has been reported byOkwelle, and Allagoa, (2014) as lacking among secondary school technology teachers and according to Nigeria.Okwelle, and Allagoa, (2014) study recognized that difficulties related with the actual use of these teaching/learning resources in secondary schools such as poor teachers' qualified knowledge and inadequate mindfulness of kinds of instructional materials for use in instructing diverse electronics contents, were highlighted. Also, the electronics teachers emerging optimistic defiance towards the use of instructional materials; keeping correctness of the materials to instructional objectives and multidimensional exhibitions of these materials among others, were strategies hypothesised for enhancing teachers' ability in instructional material utilization.

Lastly, the rank of obtaining better gender-related statistics regarding teacher exercise and usage of ICT in education, including indicators influenced by sex, is highlighted. digital curriculum and assessment seem to be mostly applicable in countries at more advanced stages of ICT development, various digital materials

are gradually accessible for use, while Open Education Resources (OER) are also progressively existing for re-use and variation within evolving countries. Open Educational Resources (OERs) are any kind of instructive materials that are in the public field or familiarized with an open license. The nature of these open materials means that anyone can legally and freely copy, use, adapt and re-share them. OERs range from textbooks to curricula, syllabi, lecture notes, assignments, tests, projects, audio, video and animation (UNESCO, 2015b). The cumulative obtainability of OERs do not essentially render into use by teachers. For example, in Europe it is conveyed that 15% of students in all grades are taught by teachers announcing that they create digital incomes almost every day, and about an additional 15% at least once a week (European Commission, 2013).

### 2.4 Teacher's Gender and use of Instructional Resources in Teaching Science and mathematics activities.

Eccles andWigfield(2002)on their study on teacher-gender stated that gender plays very vital role in improving children's capacities and self -image.Similar study have recognized that in primary education, pupils taught by women teachers tend to achieve better than those taught by male teachers as by Neugebauer, Helbig&Landmann,( 2011) .Eccles andWigfield(2002) proclaims that female teachers are usually supportive, they compromise a more positive classroom environment, and are more likely to use pupil-oriented approaches of instruction stressing the meaning of motivation. Antecol, Erin and Ozbeklik (2012) conveyed that female teachers have a affirmative result on female pupils' concert. Having a

female teacher has a negative outcome on female pupil math attainment in primary school. The presence of female teachers in primary schools will improve both girls' registration and enlightening achievement.

Most teachers have change in description for gender according to their level of contacts in the classroom and numerous teachers hold difference outlooks for their children according to gender stated Erden,( 2009). All these opportunities are grounded on either the teacher's gender on his or her speculative attainments and the use of instructional resources in teaching science and mathematics. One important aspect of student behavior is how they use their body, how active they are in class, and how they use their voice, which may be different between female and male pre-primary school children.

Femininity variances in the way children rate cooperate materially among themselves and in the way they use their body during quiet time as well as play time have been found as early as in three-year and five-year old children usually behave differently among boys and girls ,Chaplin&Aldao,( 2013). These masculinity changes are, according to the researher, somewhat legalized by the pre-school teachers whose physical interactions with girls and boys differed. Chaplin&Aldao, (2013)detected that children were more normally materially restrained or orderly by teachers than girls. Teachers in Canada tend to hold higher academic expectations for adolescent boys than for girls in mathematics and science but lower expectations in reading and writing.

Antecol, Eren and Ozbeklik (2012) assessed the effect of teacher masculinity on student accomplishment in primary school. Using a randomized experiment, the study generate out that having a female teacher lowered the mathematics test scores of female primary school students in disadvantaged neighborhoods. However, the study did not discovery any outcome of having a female teacher on male students' test scores (mathematics or reading) or female students' reading test scores. These findings ruled out clarifications relating to the ignored excellence alterations between male and female teachers. The study also perceived that this negative consequence appeared to persevere only for female students who were assigned to a female teacher with a limited mathematics background.

Dee (2007) observed the consequence of teachers' masculinity on learners' hypothetical success. He analyzed data from the National Education Longitudinal Survey of 1988. With a sample of 25,000 8th graders, the study found out that same-gender teachers had a confident effect on learners' theoretical victory. The study recognized that the encouragement of teacher-gender was different on the different subject.

Chudgar and Sankar (2008) studied the connection between teacher sex and student success: Evidence from five Indian states. Findings from the study showed that male and female teachers varied in terms of their classroom organization practices and their belief in students' learning ability. The study also originate out that being in a feminine teacher's classroom is beneficial for language learning but teacher sex has no outcome on mathematics education. Winters, Haight,

Swaimand Pickering, (2013) did a study on the outcome of same-gender teacher task on student accomplishment in the basic and secondary grades. The study applied evidence from an administrative panel dataset following the universe of test-taking public school students in Florida over a period of five years to estimate the relationship between same-gender teacher assignment and student achievement. The main objective of the stud was to estimate how a student's achievement changes as he/she is assigned to teachers of different genders throughout his/her academic career, holding constant both observed and unobserved factors related to academic outcomes. The study also provided estimates from models that evaluate how the relative performance of male and female student assigned to the same teacher or in the same classroom relates to the gender of the teacher. The study findings showed that there was no statistically distinguishable relationship between same-gender teacher assignments and student math or reading achievement in elementary school. However, the study found a statistically significant relationship between being assigned to a female teacher and student achievement in middle and high school, however the magnitude of the effect was small. This inconsistency in the findings of the relationship between teachers; gender and learner achievement warranted further studies.

Hoque and Zohora (2014) found out the impact of gender in primary teaching profession on student achievement. Using a quantitative method of research, the study employed test scores of primary grades for five consecutive years which were obtained from a school in Bangladesh. The study findings showed that men

were slightly better to teach in primary when the test scores were analyzed. Although there were some differences in the breakdown analysis, the combined result analysis did not find strong evidence to claim whether students had to be taught by teachers of same or alternative gender.

In India, the issue of women education has always been a matter of grave concern for educationists. In India, till to date there exists a disparity in the ratio between boys and girls in school and so does in the status of man and woman in the society. Historically it has been found that women education had led to the production of women scholars and social advocate who in turn have helped in the development of women education. That study focuses on the work of an investigation on how women scholars have helped in the development of women education, in Bengal, through their literary works. The findings were literary works of these ladies have helped in providing force to women education in Bengal and has led to the development of the foundation on which stands the super-structure of women education of modern times(2014) Indian journal for education research.

In Procedia, a Social and Behavioral Sciences journal (2014) did study on gender wise comparison of trained and untrained teachers' performance on students' learning achievement in science and mathematics and found out that trained male and female teachers are significantly better than untrained male and female teachers and the teachers conduct in private schools are different from public schools' teachers and more devoted in private than public school teachers.

Traditional methods are the most method used in teaching science and mathematics both rural and urban areas. Discussion method is used in small scale only in urban area. Other types of activities like field work, project work are greatly minimized by mostly female teachers the current study examined the difference between male and female teachers in the use of instructional resources in teaching science and mathematics activities in Athi-River,Machakos in Kenya a different demographic and social-economical area.The current study focused on gender and saw how female or male teachers used instructional resources in teaching science and mathematics in preschools not secondary schools' contrary, the current study focused on pre-primary teachers' use of instructional resources in teaching science and mathematics activities in pre –primary schools in Athi-River.

## 2.5 Teachers' Attitude and Use of Instructional Resources in Science and mathematics activities.

Attitude encompasses the thoughts, behavior, feelings and beliefs a person has about the object or an item or a person. In our case, this could be the belief that science and mathematics are hard to understand, the belief that men are more interested in scientific activities and better suited for a career in technology than female or the belief that science is of essential economic value. These beliefs may range from a positive to a negative. A positive attitude is categorized by the understanding of positive physical reactions and emotions when opposed with the object, while a negative attitude is accompanied by negative affective reactions.

Attitude (general attitude toward use of instructional resources in teaching science and mathematics, attitudes towak2rds science and mathematics in high school, or attitudes towards effective teaching of science and mathematics) this affects the use of instructional resources in the teaching of preschool science and mathematics. This consists of feelings and behavior a person involvements in relation to the attitude object. For instance, feelings of anxiety when confronted with science and mathematics teaching, or feeling of a sense of insecurity during teaching may modify teacher's feeling towards science according to Ajzen,( 2001).

In Ethiopia, research conducted with 292 preschool teachers who work in public and private institutes in different districts of Ankara during the second semester of 2006-2007 academic years. The data were collected by administering Early Childhood Teachers' Attitudes toward Science Teaching Scale (ECTASTS) there is a statistically significant relationship between preschool teachers' attitudes toward science teaching in public school to public school but difference in public school to private schools in teaching science and mathematics activities. Also, all factors were found highly related with the teachers' attitudes toward science and mathematics teaching and the frequency of science and mathematics activities except for age and in-service training (Ahmed, 2014). The study was conducted in Ethiopia and not in Kenya where current study will be based on different numbers of teachers' sample study.

In addition, Emine (2010) did a study on the problems that preschool teachers face in the curriculum implementation the study aimed at investigating the challenges preschool teachers faced in the use of instructional resources in rural schools due to the high rate of poverty which made it difficult to acquire appropriate resources for teaching young children in order to implementation the curriculum and whether these challenges differ in relation to teachers' attitude of education, department they graduated from, the type of the school they are working in, teachers' training level and level of in-service training, the study aimed to find out the underlying reasons of most frequently stated issues of operation from the teachers' perspectives.

Colgrove (2012) did a study on the methods to teaching young children science concepts and vocabulary and scientific problem-solving skills and role of classroom environment the answers were current with the appropriate teaching and learning resources and found out that private and public school differs in their approaches of teaching the young children in order to obtain the estimated stresses for learning to take place accordingly. Attitude is not a single unitary concept, but a construct consisting of multiple subcomponents and attributes. The separate evaluations of each of these attributes contribute in varying degrees towards the overall attitude towards the object stated by Ajzen(, 2001).

Ndawula (2014)soughtto scrutinize the teachers' attitudes towards using sponsored instructional materials provided by the Aga Khan Education Service (AES) to

primary schools in Uganda. The objectives of the study were: to found teachers-attitudes towards the AES materials in relation to the level of class taught, size of classes and the nature of subject (s) taught. Data was gathered from twenty-five class teachers, using interview schedules. Majority of the teachers (93%) articulated positive attitude, while only 7% had negative attitudes over using the AES materials. Conclusions were drawn and commendations fixated on: sensitization of teachers on reputation AES; improving on close work relationship between primary schools and AES; extending AES materials to non-project schools and; further research on other variables rather than teachers' attitudes. While the reviewed study observed the teachers' attitudes towards using sponsored instructional materials provided by the Aga Khan Education Service (AES), the present study sought to focus on teachers' attitudes towards using instructional materials and resources for teaching science and mathematics. Subsequently, low accomplishment feminine students' wants are extra often ignored than the needs of underachieving masculine students Jones( 2005). By interviewing teachers along with feminine and male scholars that were recognized by those teachers as either high attaining or underperforming. Nevertheless, this study absorbed on the determinants of pre-primary school teachers' use of instructional resource in teaching science and mathematics activities.

## 2.6 Teachers' motivation and use of instructional resources in teaching science and mathematics in pre-primary schools

In America, Kentucky, teacher partners had a monthly meeting with math and science teachers in rural district, most of the families gathered were from the south Texas rural and speaks Spanish, in the: mathematics and science night meeting they learnt English language and talked**,** but by the end of the evening they have learned how to reinforce lessons taught in school. Parents were reminded to include their children when they cook their foods and talking about native plants and encouraging their children to count and measure ingredients those are simple ways to reinforce science and math in their daily lives. Learning science and mathematics always become excellence during a family project, even at mealtimes. According to the nationwide movement for education reform, rural schools are disadvantage in the use of materials in teaching science and mathematics activities in preschools. And it is frequently said that the smallest and poorest schools, especially, cannot afford to offer the rich menu of advanced math and science classes as found at larger suburban schools. There is lack of space and equipment for computers and science laboratories to teach mathematics and science in some more attractive ways, these are common complaints across rural America. The Rural Systemic Initiative cannot on its own, balance the scale of equity. But it is helping rural educators make the most of the resources they do have and, especially, encouraging schools to look for support beyond the classroom. By viewing the whole community as an extension of the school and the

members of that community as potential teachers' rural schools become, not the poorest, but among the richest in America. More than in many wealthier districts, residents of tight knit rural regions are willing to rally around "their" school and share time and expertise according to Boyer (2014). The current study will attempt to compare rural and urban schools in Athi-River Sub County on the use of instructional resources in teaching science and mathematics.

According to Carnegies Science Centre (2014), stated that most researchers suggest that rural schools and their students are educationally underprivileged compared to urban counterparts in terms of their academic achievement. This is particularly true because the rural pre-primary school teachers are poorly motivated compared to their counterparts. Rural areas and their populations have long been linked with lesser prospects, one of which are being the provision of education in terms of staff and teaching and learning materials. However, the sources for this disparity have long been uncertain in the literature these include individual children factors and educational environment related factors. On an specific level, factors affecting rural learners' science and mathematics achievement have been found to be related to children's academic achievement.

Educational factors particularly in subject areas such as mathematics and science have been found to include teacher retention and shortages issues, lack of access to resources has also been stated as an issue for rural attainment. This research examined differences between science and mathematics achievement in rural and

urban Lincolnshire and how teachers' motivation influences the appropriate teachings the more motivation of the teacher the better academic achievement. The current study focused on the use of instructional resources in teaching science and mathematics activities in Athi-River Sub county of Machakos Kenya.

Klassen and Chiu (2010) sought to scrutinize the relations among teachers' years of experience, teacher characteristics (gender and teaching level), three domains of self-efficacy (instructional strategies, classroom management, and student engagement), two types of job stress (workload and classroom stress), and job satisfaction. The study showed that feminine teachers had larger workload stress, greater classroom stress from student behaviors, and lower classroom management self-efficacy. Teachers with greater workload stress had greater classroom organization self-efficacy, whereas teachers with greater classroom stress had lower self-efficacy and lower job satisfaction. Those teaching young children (in elementary grades and kindergarten) had higher levels of self-efficacy for classroom management and student engagement. The study also showed that teachers with greater classroom management self-efficacy or greater instructional strategies self-efficacy had greater job satisfaction.

Use of teaching aids is completely absent in rural areas and inadequate in urban areas. Learners 'contribution in classroom activities is too narrow in rural area as teachers do not make scope for learners to do so. In urban areas learners share in

classroom activities in few cases. There is a need to make classroom teaching-learning activities "learner centered" both in rural and urban areas to ensure learners quality learning. This study also advocates a commanding need to conduct a broader study on this issue to make the classroom activities more effective as found by Israt,Farha&Shah( 2014). The problem was discovered in Bangladesh and in secondary school level. The researcher wants to see its applicability in Kenya today, by addressing the determinants of pre-primary school teachers' use of instructional resources in teaching science and mathematics in in Athi-River, Machakos County Kenya.

## 2.7 Summary of Literature Reviewed

The study on the determinants of teachers 'use of instructional resources in teaching science and mathematics activities shows significant relationship between teacher use of the instructional resources and children's academic achievements. While studies have been carried out on the utilization of instructional resources in sciences and mathematics and its influence on learner performance in both globally and locally but they focused on secondary school and partly on primary schools. However, this study focused on pre-schools which is the foundation of education.

Studies shows significant relationship between use of instruction resources and pupil achievement. The use of instructional resources improves academic achievement of science and mathematics activities and promote good performance of science and mathematics in both primary and secondary.It is clear that the use of instructional resources greatly promote teaching and learning this is linked to the study on determinants of pre-primary school teachers' use of instructional resources in teaching science and mathematics activities. On the investigations on the teachers' characteristics and use of instructional resources and its effects on children's academic achievements it was discovered that Teachers training level, Teacher-gender.Teacher-attitudes and Teacher motivation affects use of instructional resources in teaching and learning.

# CHAPTER THREE

# RESEARCH DESIGN AND METHODOLOGY

## 3.1 Introduction

This chapter discussed the research design, location of the study, the target population, sampling procedure, sampling size, research instruments, validity, reliability, data collection procedures, data analysis procedures and ethical considerations when carrying out the study.

## 3.2 Research Design

The study applied descriptive survey research design with both qualitative and quantitative approaches. This design is defined by Fraenkel and Wallen (2014) as asking a large group of people questions about a particular issue. In this design, the researcher collected both qualitative and quantitative data at the same time and then integrated the information in the interpretation of the overall results byDenscombe(2008); Creswell (2009); Creswell and zhang( 2009); Creswell and Plano Clark (2011).

The combination of qualitative and quantitative approaches occurred at different stages of the research process, such as formulation of research hypothesis, data collection and data analysis (Bryman 2006; Teddlie and Tashakkori 2009; Creswell and Plano Clark 2011). This approach to research enabled the study to

gather adequate information that provided better understanding of the research problem and answering the entire research questions than using either qualitative or quantitative research approach alone according to Creswell and Plano Clark( 2011). This design is more appropriate because it increases the overall strength of a study by enhancing the validity and trustworthy of data collected as stated by Denscombe(2010). In handling qualitative data, the design has the capacity of collecting data concerning the current status of the problem in which the researcher has no direct control of the independent variables because the manifestation had already occurred as recorded by Denscombe(2008). The design was also more appropriate because it allowed the researcher to gather information from a large number of cases through questionnaires.

This research design was also chosen because it enabled the researcher to explore, collect and explain in-depth empirical data about determinants of Pre-Primary School Teachers' Use of Instructional Resources in Teaching of Science and Mathematics Activities in Athi-River, Machakos County Kenya. The researcher also preferred the descriptive research design since it is broad-based. This implies that it enabled the researcher to collect primary data from a diverse category of subjects. Interviews, questionnaires and observations were the main tools used for collecting data.

Oso and Onen (2009) state that descriptive survey provides numeric descriptions of a sample as they were, as they would be and did not involve manipulation of the

independent variable. The design allowed an economic, rapid data collection, and generalization from a sample suitable for extensive research done by Kothari,( 2004); Grinnel and Unrau,( 2010) as was appropriate in this study.

### 3.3Variables

A variable is an object, event, idea, feeling, time period, or any other type of category you are trying to measure. There are two types of variables-independent and dependent. They are described in the following sub headings.

#### 3.3.1 Dependent variable

According to the present study, use of instructional resources in teaching science and mathematics is dependent variable which was measured by determining how frequent the instructional resources were used in teaching science and mathematics activities by pre-primary school teachers.Oso and Onen (2009) define dependent variables as attributes that represent the output or outcome whose variation is being studied. This variable was measured using a four level Likert Scale of - *Always, Sometimes, Rarely and Never* defined by individual instructional resource.

### 3.2 Independent Variables

According to the current study the independent variables were as follows; teachers' training levels, gender, teachers' attitudes and teachers' motivational levels.Bryman (2006) independent variable is exactly what it sounds like. It is a variable that stands alone and isn't changed by the other variables you are trying to

measure. Creswell and Plano Clark (2011) also defines it as that which represent inputs or causes, i.e. potential reasons for variation. In this study,

i) Teachers' level of training was measured by highest certification attained by the teachers given as certificate, diploma and degree levels.
ii) Teachers' gender was measured by indicating the gender of teacher, as male or female.
iii) Teachers 'attitudes were measured by indicating whether positive or negative attitude towards instructional resources.
iv) Teachers' motivation this was measured by measuring teachers' lower and higher motivation.

### 3.4 Location of the Study

The study was done in Athi River Sub-County, one of the eight Sub-Counties in Machakos County in the Eastern Kenya. The sub-county has four wards namely Athi River Town, Katani/Muthwani, Kinanie/Mathatani andSyokimau/Mlolongo. The sub-county has 19 locations and 39 sub-locations. The economic mainstay for Athi River Sub-County is agriculture, mining, fruit farming and poultry keeping. Therefore, 70% of the population is employed in agricultural activities with very low incomes. Levels of poverty are high where children engage in mining to supplement family income. Due to this poverty index and involvement of children in various forms of child labour, the access to education is hampered and this may

even influence appropriate utilization k2of instructional materials for teaching science and mathematics in preschools.

Despite the fact that most households in the sub-county depend on small scale agriculture and mining as the main source of livelihood, the sector faces a number of constraints which, unless removed continued to work against poverty reduction efforts. Some of these include the high incidences of HIV/AIDS which has led to the loss of life and depletion and diversion of badly needed family incomes, un-economical subdivision of land due to the high population pressure, low agricultural productivity, unaffordable input prices that discourage farmers from investing in agriculture and unstable cash crop prices. This situation is further aggravated by landlessness among women and youth, and mismanagement and near collapse of cooperative societies especially coffee and pyrethrum and poor agricultural produce marketing.

The low level of human resource development is one of the causes of poverty in the sub county. For most people, the cost of education is too high therefore the level of literacy is quite low. This coupled with the fact that further education and training are hampered by the limited number of institutions and low quality of education acquired from them, meaning that the population particularly the labour force is not well equipped to compete effectively in the local job market and therefore the ability to secure remunerative jobs or other income generating opportunities (GDP, 2002-2008).

This area was chosen for the study because of its photographical presentations of both rural and urban settings and it clearly presented the approximate picture of Kenya and accordingly to ministry of education monitoring report (2015) the performance of science and mathematics in both primary and secondary schools in Athi river sub county was poorly done and therefore the researcher wanted to investigate whether the use of instructional resources in teaching science and mathematics activities may be the cause or not. The prevailing trend of poor performance of science and mathematics in the sub-county made it necessary for the research to choose the location.

### 3.5 Target Population

A target population comprises membership from real or hypothetical set of subjects, persons or occurrences to which the researcher would make generalization of the findings of the study by Misigah, Kinyanjui and Ohaya,( 2013); Borg and Gall, (2003) and Mugenda and Mugenda, (2010) also reiterated that population is the entire group of individuals, events or objects having a common observable characteristic. The study targeted teachers in 40 public pre-primary schools in Athi-River Sub-County, Machakos County. This is presented in Table 3.1.

**Table 3.1 Target Population**

| Category | Target Population |
|---|---|
| **Schools** | 40 |
| **Head Teachers** | 40 |

### 3.5.1 Sampling Techniques

Sample selection was guided by stratified random sampling technique since the population was stratified. The study used random sampling techniques identifying the schools selected for the study,Kombo& Tromp (2013) stated that in purposive sampling method the researcher purposively target a group of people believed to be reliable for the study. Therefore, purposeful sampling was used to select Athi-River Sub-County, among other seven Sub-Counties of Machakos namely; Machakos, Kathiani, Mwala, Kangundo,Matungulu, Yatta andMasinga because Athi-river has unique locations or sites for the intended study to be applicable more appropriately. Athi-River Sub-County was sub-divided to 5 bases and a stratified sampling technique was used to select 6 pre-schools from each base translating to a total of 30 pre-schools. Creswell (2005) states that in stratified sampling, researchers divide (stratify) the population on some specific characteristics and then randomly sample from each sub-group of the population. This guarantees that the sample included specific characteristics that the researcher wants included in the sample. Stratification ensures that the stratum was represented in the sample in proportion to that in the population. The schools were

stratified into public and private primary schools and also according to bases in Athi River Sub County.

Random sampling was used to select 6 pupils for focused group discussion, from each sampled school leading to a sample of 180 pupils. Random sampling method helped the researcher to give all subjects equal chances to be selected for the study. Purposive sampling was used to select 2 teachers teaching science and mathematics activities from each sampled school and all the 30 head teachers from all the sampled schools leading to a sample of 60 teachers and 30 head teachers respectively. Purposive sampling technique was appropriate to enable all the key respondents to take part in the study.

### 3.5.2 Sample Size

The sample size of the study were 5 public rural schools, 10 private rural schools, 5 public urban schools and 10 private urban pre-primary school centers in Athi-River Sub-County of Machakos. A sample size of 270 respondents (30 head teachers, 180 pupils and 60 teachers) were included in the study. The sample size was summarized in Table 3.2.

**Table 3.2 Sampling Frame**

| Category by type of School | Teachers | Head Teachers | Pupils |
|---|---|---|---|
| **Public Rural Schools,** | 10 | 5 | 30 |
| **Private Rural Schools,** | 20 | 10 | 60 |
| **Public Urban Schools** | 10 | 5 | 30 |
| **Private Urban** | 20 | 10 | 60 |
| **Total** | **60** | **30** | **180** |

### 3.6 Research Instruments

The selection of these tools was guided by the nature of the data collected, time available, as well as the objectives of the study. The researcher used the following instruments for effective analyses to be realized that was; questionnaires and oral-interviews.

#### 3.6.1 Questionnaire for Teachers

A questionnaire consists of number of questions printed or typed in definite order on a form or set of forms stated by Kothari( 2005). The merits of the questionnaire include low cost, freedom from the interviewer's bias as answers are in respondents' own words and the adequate time it gives to respondents to give well thought out answers by Kothari,( 2014). For the present study, the questionnaires comprised both open and closed ended questions in line with the mixed methods approach. The open-ended questions gave respondents freedom of response and

captured qualitative data. The closed ended questions facilitated consistency of certain data across respondents and were quantitative. The questionnaire was utilized to capture data from pre-primary school teachers who had no problem or difficulties in responding to questionnaire items. Additionally, questionnaires are popular in data collection because of their relative ease and cost-effectiveness with which they were constructed and administered.

### 3.6.2 Interview Schedule for Head Teachers

Interviews involved conversations that were used to gain personal information, knowledge, attitudes or opinions from a list of prepared questions asked to each participant in the same manner. Head teachers of the sampled schools were interviewed to gather information on determinants of Pre-Primary School Teachers' Use of Instructional Resources in Teaching of Science and Mathematics Activities in Athi-River, Machakos County Kenya. Head teachers were interviewed to understand their diverse opinions about determinants of Pre-Primary School Teachers' Use of Instructional Resources. A set list of structured and unstructured questions was used to interview the head teachers on determinants of Pre-Primary School Teachers' Use of Instructional Resources in Teaching of Science and Mathematics Activities. Interview schedules were prepared in advance and these were conducted on the selected head teachers. The semi-structured interview involved the interviewer initiating questions and probes were used in responding to interviewee's descriptions while structured interview

involved the Interviewer following scripted questions and no deviation from question order.

The semi-structured interview was appropriate for the study because the language Level of the respondents could be adjusted, Interviewer could answer questions and make clarifications, the researcher could prompt and probe deeper into the given situation, the interviewer was able to probe or ask more detailed questions, situations and not adhere only to the interview guide but the researcher could explain or rephrase the questions whenever respondents were unclear about the questions. Structured interview was also appropriate for the study because the researcher had control over the topics and the format of the interview by the use of a detailed common interview guide, which made it easier to analyze code and compare data.

Ader, Van, Deltaan and Beekman, (2008) reiterate that the interviews was to solicit data concerned with views, perceptions, and feelings about the implication of the use of instructional resources in teaching science and mathematics activities. In this study, in depth interviews was conducted to collect the required information from the sampled pre-school head teachers. The data were gathered from interview schedule to help to authenticate data acqk2uired through questionnaire. This study preferred to use interview schedule because an interview schedule provided a free environment for the respondents to express themselves and even gave rise to further information which was not catered for in a questionnaire. All interviews

were recorded and transcribed for analysis purposes, with the consent of the respondents.

### 3.6.3 Focused Group Discussion for Pupils

Focused Group Discussions assisted in determining detailed information about personal feelings, perceptions and opinions of teachers and the kind of instructional resources they used for teaching. The use of focus group discussion was cheap compared to conducting individual interview and it also offered an opportunity for the respondents to seek clarification on various issues

### 3.6.4 Observation Guide

Observation checklist was used where it was impossible to collect data using interviews or questionnaires, such as when participants were young children like the case in the current study. For the above reasons, observation checklist was used for direct observation of the pre-primary teachers use of instructional resources in teaching science and mathematics activities, and to check whether conditions in pre-school in terms ofapplication for materials and its environment was encouraged, productive and engagement or not. Kombo and Tromp (2006) argue that direct observation presents data in its natural form, making the observer an active participant in the study and permits time to think about what is occurring rather than on how to record it.

### 3.7 Validity and Reliability of Research Instruments.

#### 3.7.1 Validity of Research Instruments.

Validity is the degree to which the instrument measures what it was designed to measure according to Mugenda&Mugenda,( 2005). Validity can beany form of assessment that is trustworthy and accurate according to Bond (2003,). Messick(1989) said that the extent to which the scores from a measure represent the variables they are intended to is what is called validity. The instruments was presented to respondents to determine whether the questions were clear, comprehensible, and in sound order according to Oswald & Price (2006) defined face validity as the degree to which an instrument appears to measure what it claims. In other words, does the measuring tool look like it measures what it is supposed to measure? Face validity was achieved by asking respondents to rate the validity of tools as it appeared to them. The responses enabled the researcher to authenticate the tools as it was being adequately constructed to collect the required information Expert judgment by lecturers was also be used to ensure validity. This study adopted the triangulation approach so as to measure the validity of the instruments. Triangulation is a powerful way of demonstrating concurrent validity in both qualitative and quantitative research as stated by Campbell and Fiske( 1959). In other words, the study used multiple methods of data collection: interviews, questionnaires as well as observation checklist. By so doing, areas that had been overlooked by one method were strengthened and checked by the other. The cross-checking of data through multiple method approach made the data

collected valid. This is in line with Cresswell (2009) who contends that the use of multi-model technique to data collection averts the possibility of having invalid and unreliable data. Validity of research instrument refers to the extent to which a test or instrument measures what it is intended or supposed to measure as stated by Mbwesa,( 2006). To ensure that the data gathered measures what the study purported to measure, the research study further adopted content validity. Here the research instrument was scrutinized by the two supervisors to assert that the instrument logically appeared to reflect accurately what it purported to measure and covered what it was intended to cover by Mbwesa,( 2006). The two supervisors read through the questions that were used in the study. The ones that were not correct were rephrased and others modified. This helped the researcher to ensure that there was content validity of the instruments.

### 3.7.2 Reliability Research Instruments.

Reliability is the degree to which the result is consistent and accurate over time and represents the target population and checks whether the results can be replicated under a similar methodology as stated by Joppe,( 2000). **Reliability** is equal with the consistency of a test, survey, observation, or other measuring device. **Reliability** refers to the trustworthiness of a measure. Psychologists consider three types of consistency: over time test-retest reliability, internal consistency and inter-rater reliability. Before the actual study, a pilot study was conducted in two pre-primary schools. These schools were not included in the

actual study. Through piloting, item deficiency and ambiguity was uncovered by Faranenkel&Wallen, (2009).

The study employed the split-half method to find out the reliability of the questionnaire. The developed questionnaires were administered once and the scores of each half were recorded separately. Pearson's product moment formula was used to calculate the correlation coefficient between the two halves. The study also usedSpearman-Brown correction formulae so as to improve reliability of split half as stated by Chakrabartly,(2013).

The developed questionnaires were administered once and the scores of each half was recorded separately. On the interview guide for head teachers, item 7 to 9 were deleted completely and some were modified to focus on the purpose of the study. During the first administration is when the items were not filled but during the second one, all the items were filled. The reliability of qualitative responses involved bringing about objectivity to the qualitative data, the truthfulness or credibility of data. The aim of trustworthiness in a qualitative inquiry is to support the argument that the study results are worth paying attention according toLincoln and Guba, (2000).

Credibility was ensured through random sampling of individuals serving as informant and interactive questioning in data collection dialogues was stated by Lincoln and Guba,( 2000). To ensure transferability, the researcher provided sufficient contextual information about the fieldwork sites, which enabled the

readers believe their situations to be similar to that described in the study, making them relate the findings to their own positions was repeated by Lincoln and Guba, (2000). The researcher ensured dependability by employing In-depth methodological description to allow for the study to be repeated. Credibility was censured by thick description of the phenomenon under scrutiny. Transferability was ensured by the provision of background data to establish the context of the study and detailed description of phenomenon in question to allow comparisons to be made. Information about the fieldwork sites was provided to enable the findings to be applied to other situations as found by Shenton( 2004). In order to ensure dependability, theprocesses within the study was reported in detail, thereby enabling a future researcher to repeat the work, if not necessarily to gain the same results. In depth coverage allowed the researcher to assess the extent to which proper research practices had been followed according to Shenton,( 2004).

### 3.8 Pilot Study

Pilot testing of research instruments that was used for this study was done among the twoschools in the neighboring sub county. Simple random sampling was used to generate a sample size of 10 schools (5 public preschools and 5 private preschools schools), which accounted for 33% of the sample size (30 preschools both private and public schools). According to (Connelly, 2008), extant literature suggests that a pilot study sample should be 10%-30% of the sample projected for the larger parent study. Questionnaires were administered to the respondents and

interpretation of the response alternatives and queries were carried out to form items that bear the same meaning but are not identical. Order of response alternatives were similarly changed for questions with normal scale to assess the validity and reliability. Meanwhile, respondents' choices were evaluated for appropriateness.

The questions were also verified to check if all the respondents understood them the same way. In addition, average time taken to complete the questionnaires were noted and the overall pilot test results were analyzed and adjustments made according to the results of the instruments review and pilot test prior to the production of the final instruments.

### 3.8 Data Collection Procedures

The researcher used the interviews and questionnaires in collecting data: The use of instructional resources in teaching science and mathematics activities personally and found out how pre-primary teachers use instructional resources in teaching science and mathematics activities. Questionnaires were used to answer the extent of pre-primary school teachers use instructional resources in teaching science and mathematics activities.

Interviews, the researcher conducted interviews to children in the sample pre-primary schools on the use of instructional resources in teaching science and mathematics activities on all the sampled schools to establish the general objective

of the study on teacher's use of instructional resources in teaching science and mathematics and its applicability inAthi-River Sub County, Machakoscounty Kenya. Lastly, the researcher distributed all questionnaires to sampled schools Head teachers

### 3.9 Data Analysis Procedure

According to Mbwesa(2006). The data was organized according to the objectives that guided the study. Data collected was both qualitative and quantitative. With the qualitative data, the researcher used the analytical technique including; quick impressionistic summary, thematic analysis and content analysis. Quantitative data, descriptive was used to analyze the raw data.

Quantitative data was first coded and entered into the computer for analysis using the Statistical Package for Social Sciences (SPSS**)** version 22.0**.** The descriptive statistics that was used include frequency counts and percentages. The purpose of descriptive statistics enabled the researcher to meaningfully describe a distribution of scores or measurements using a few indices as was stated by Mugenda and Mugenda(2010). This enabled the researcher to transform large groups of data into a more manageable form that was easy to understand and interpret by Mbwesa( 2006).

The data was reflectively analyzed starting from the time it was collected while still in the field just like what researchers say that data analysis in qualitative

research is in parallel with data collection as it was recorded byCreswell,( 2009); Gall *et al*.,( 2007) and Maxwell, (2005). This enabled the researcher to discover important sources and information that may be overlooked in the design. This was achieved in three ways: 1. Having consultative meetings or sessions with respondents and supervisors. 2. Having field note summaries 3. Having data summary sheets as indicated byDrew, Hardman &Hosp, (2008). The recorded interviews were transcribed, while the memos, observational & teaching documents and recorded reports and notes were read and analyzed. Field notes were analyzed and interpreted in readiness for coding in relation to the answers of the structured questions. Creswell (2009) defines coding as, "…the process of organizing the material into chunks or segments of texts before bringing meaning to information…segmenting sentences…or images into categories…"

Transcripts were read carefully. They were then coded into themes in relation to the research questions and information collected by Gerstenfeld and Berger, (2011). Then a list of all topics was made and sorted according to similarities and differences using highlighters of different colours. The topics were later abbreviated as codes and the codes written near the related text in word document. Then these topics were turned into categories – major topics, unique topics, leftovers and emerging themes.

Finally, the information assembled according to category and a preliminary analysis was made and adapted from Creswell (, 2009). The categories were

developed from both the data and research questions based on theory and determined at the formulation of the research instrument. The sub-themes were mostly developed from the data. The data from questionnaires, interviews and observation were also sorted according to themes.

Therefore, interpretational analysis largely examined carefully so as to find constructs, themes and patterns that were useful in understanding the phenomenon under study. Above all, the researcher tried by all means to make sense of the meanings that the respondents attached to the phenomenon just like argued by Cohen et al., (2007). This was a challenging task but through reading books and Consulting the two supervisors, a meaningful analysis was made.

**Table 3.3: Quantitative Data Analysis Framework**

| Objectives | Independent Variables | Dependent Variables | Method of Analysis |
|---|---|---|---|
| **To establish the extent of teacher's use of instructional resources in teaching science and mathematics in pre-primary schools in Athi –River sub-county.** | Extent of usage of instructional resources | Use Of Instructional Resources In Teaching Science And Mathematics Across Pre-Primary School | Frequency counts and percentages |
| **To find out if there is a difference in the use of instructional resources in teaching science and mathematics across pre-primary school teachers' level of training.** | Teachers' level of training. | Use of instructional resources in teaching science and mathematics across pre-primary school | Frequency counts and percentages and regression analysis |
| **To find out if there is a difference in the use of instructional resources in teaching science and mathematics between male and female pre-primary school teachers.** | Gender | Use Of Instructional Resources In Teaching Science And Mathematics Across Pre-Primary School | Frequency counts and percentages and regression analysis |
| **To investigate the relationship between teachers' attitude towards instructional resources and use of instructional resources in teaching science and mathematics.** | Teachers' attitude | Use Of Instructional Resources In Teaching Science And Mathematics Across Pre-Primary School | Frequency counts and percentages and regression analysis |
| **To determine the relationship between teachers' motivation and use of instructional resources in teaching science and mathematics in pre-primary schools** | Teachers' Motivation | Use Of Instructional Resources In Teaching Science And Mathematics Across Pre-Primary School | Frequency counts and percentages and regression analysis |

### 3.9.3 Qualitative Data Analysis

The study also followed the principles of thematic analysis as proposed by Braun and Clarke, (2006). According to Braun and Clarke (2006) thematic analysis is a method for identifying and analyzing patterns (themes) contained by data. It simply organizes and describes data set in details. Furthermore, thematic analysis interprets various aspects of research. Thematic analysis was appropriate for this study because it is not grounded in any particular theoretical framework and can hence be applied across a broad range of qualitative approaches, making it flexible. In carrying out thematic analysis, the study followed suggested procedures to ensure rigor in data analysis which is grouped in six phases as presented in table 3.2.

**Table 3.1: Qualitative Data Analysis Process**

| Phase | Description of process |
|---|---|
| **1. Familiarizing yourself with data** | Transcribing data by reading and re-reading the data, noting down initial ideas. |
| **2. Generalizing initial codes** | Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code. |
| **3. Searching for themes** | Collating codes into potential themes, gathering all data relevant to each potential theme. |
| **4. Reviewing themes** | Checking if themes work in relation to coded extracts and the entire data set (level 2) generating a thematic map of the analysis. |
| **5. Defining and naming themes** | On-going analysis to refine the specific of each theme, and overall story the analysis tells, generating clear definitions and names for each theme |
| **6. Producing the report** | The final opportunity for analysis. Selection of vivid, extract examples, final analysis of selected extracts, relating back the analysis to the research question and literature, producing scholarly report of the analysis |

Source: Braun and Clarke (2006)

### 3.10 Logistical and Ethical Considerations

Ethical consideration is very vital in any research and therefore the researcher compiled to it. In terms of ethical thought Leedy (2005) categorizes ethical issues into four classifications that is protection from harm, right of privacy, informed consent, and professional honesty with colleagues. According to Oso and Onen (2009), the respondents in a research were informed on consent before westarted the study.Additionally, confidentiality was a very important aspect in research. Getu and Tegbar (2006) argues that in order to deal with confidentiality, one should state confidentiality of information right on the top of the first page of the questionnaire, use code numbers instead of names and aim of the study

wasexplained at the beginning. Due to the above deliberations, confidentiality was ensured by putting statements on confidentiality on the questionnaires and verbally by explaining during the administration of instruments. The researcher also obtained a permit from the National Commission of Science, Technology and Innovation through the Post Graduate Studies of Kenyatta University. The researcher sent introductory letters to all respondents. The first visitation was made to the pre-schools concerned and the researcher met the heads of institutions and briefed them about the study and date for data collection upon the agreement.

# CHAPTER FOUR

# DATA ANALYSIS, INTERPRETATION AND DISCUSSIONS

## 4.1 Introduction

This chapter focuses on the findings and discussion of data on the determinants of pre-primary schoolteachers' use of instructional resources in teaching science and mathematics activities in Athi-River Sub-County, Kenya. Two teachers were selected from each of the 30 pre-schools using simple random sampling.

The findings were analyzed and discussed under the following objectives:

i) To establish the extent of use of instructional resources in teaching science and mathematics activities among pre-primary school teachers in Athi-River sub-county.

ii) To determine the how teachers level of training affects the use of instructional resources inteaching scienceand mathematics activities in pre-primary schools.

iii) To examine how teachers gender influences the use of instructional resources in science and mathematics activities among pre-primary school teachers.

iv) To find out whether teacher- attitude affects the use of instructional resources in science and mathematics activities.

v) To determine the influence of teachers motivation level on use of instructional resources in teaching science and mathematics in pre-primary school in Athi-River sub-county.

### 4.2 Return Rate

The return rate information is shown in Figure 4.1.

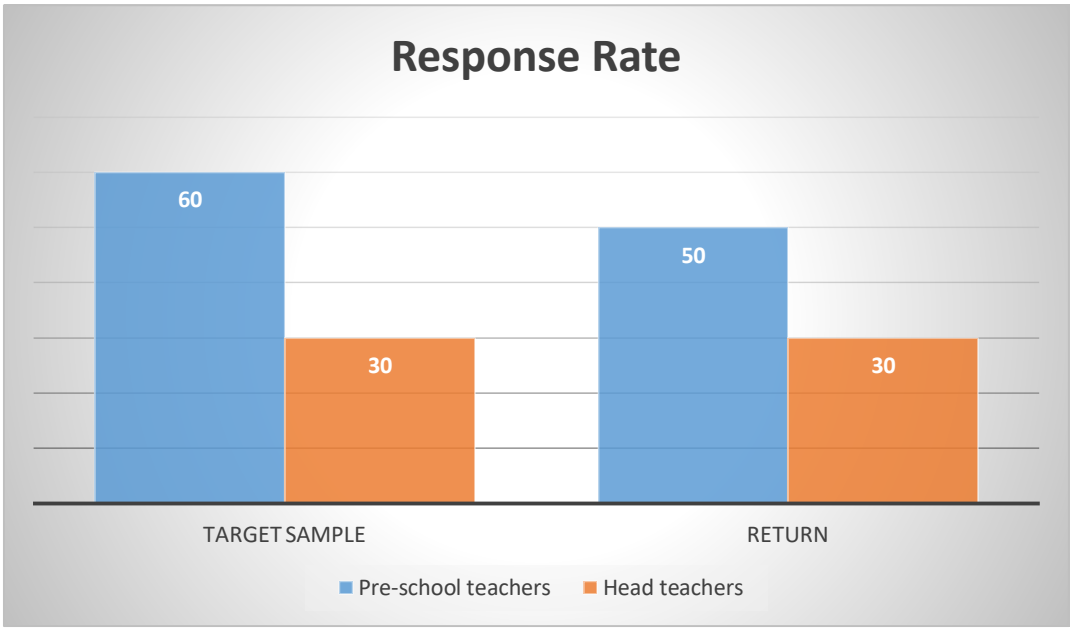


**Figure 4.1: Response Rate**

FromFigure 4.1, it can be seen that 50 pre-school teachers out of 60 teachers returned the questionnaires giving a response rate of 83.3%. All questionnaires for head teachers were returned making 100% response rate. According to Mugenda and Mugenda (2002), a response rate of 50% is adequate, 60% is good and above

70% is rated as very good. This implies that basing on this assertion; the response rate in this case of 83.3% is very good.

### 4.3 Teachers Demographic Information

In order to accomplish the main aim of the study, the study sought to assess demographic information of the respondents. The demographic information included teachers' gender, level of training and professional qualification. These findings are presented using frequency and percentages as summarized in Table 4.2.

**Table 4.1 Background Information of the Pre-School Teachers**

| Demographic Data | | Frequency | Percentage (%) |
|---|---|---|---|
| **Gender** | Male | 12 | 24 |
| | Female | 38 | 76 |
| **Level of academic** | KCPE | 5 | 10 |
| | KCSE | 7 | 14 |
| | Diploma | 24 | 48 |
| | Bachelors | 14 | 28 |
| **Level of training qualification** | No training | 8 | 16 |
| | Certificate ECDE | 6 | 12 |
| | Diploma ECDE | 26 | 52 |
| | Degree ECDE | 10 | 20 |
| **Years served as a pre-primary school teacher** | Less than 1 year | 9 | 18 |
| | 1-3 years | 15 | 30 |
| | 4-6 years | 20 | 40 |
| | **Above 6 years** | **6** | **12** |

Table 4.1 indicates that majority 38(76%) of the pre-school teachers (n = 50) were female while 12(24%) were male. These findings revealed a gender imbalance

among pre-school teachers in Athi-River Sub-County. This means that pre-school teaching is a profession preferred by more women than men. However, the high number of female teachers in pre-schools could be a pointer to poor performance in mathematics and science activities among children in the pre-schools agreeing with Antecol, Erin &Ozbeklik (2012) findings showed that female teachers had a negative effect on female pupil mathematics achievement in primary school.Kueckeny and Valfortz (2012) also established that all learners performed better in mathematics with male teachers.

Majority 24(48%) of the pre-school teachers had diploma level of education, 14(28%) attainedbachelors'degree of education, 7(14%) attained certificate level of education, while 5(10%) had form four level of education. table 4.1 also shows that 26(52%) of teachers attained diploma training in ECDE, 10(20%) attained bachelor's degree training in ECDE, 69(12%) attained certificate in ECDE while 6(12%) had no formal training in ECDE. The high number of trained teachers is attributed to the fact that training of pre-school teachers is enhanced by the government through in-service programs. This is a positive sign that most teachers hold at least a minimum requirement for teaching at the pre-school level. This renderedpre-schools in Athi-River Sub-County in a better place with regards to capacity building and creates a better foundation for achievement of better results. This study shows that most pre-school teachers are qualified toteach science or mathematics activities in ECDE centers. Kirembu (2012) found out that students taught by teachers with high academic and professional training qualifications

performed better in mathematics and then their counterparts taught by teacher with lower qualifications in Kirinyaga district.

Findings in Table 4.2 further indicated that majority 20(40%) had a teaching experience of between 4 - 6 years. The study also revealed that at least 50% of the pre-school teachers who participated in the study had taught for more than one year and hence were eligible to provide relevant information as required by the study to meet the objectives.Darling-Hammond (2010) established that learners taught by more experienced teachers score highly because experienced teachers had better mastery of subject content and had gained classroom management skills which helped them handle learners with care. The study showed that 48% of the teachers had only taught for a maximum of three (3) years indicating that they had just joined the teaching profession and therefore with less experience undertheir belts. This partly contributed to the low performance of pupils in pre-schools in the study area.

Demographic information for head teachers was also assessed in terms of frequency and percentage.

**Table 4.2 Observed Instructional Resources in Pre-Schools**

| Facility observed | Adequate | | Not adequate | |
|---|---|---|---|---|
| | **Freq** | **%** | **Freq** | **%** |
| **Story books related to Science** | 11 | 22 | 39 | 78 |
| **Story books related to mathematics** | 7 | 14 | 43 | 86 |
| **Science resources books** | 5 | 10 | 45 | 90 |
| **Mathematics resource books** | 9 | 18 | 41 | 82 |
| **Science course books** | 47 | 94 | 3 | 6 |
| **Mathematics course books** | 50 | 100 | 0 | 0 |
| **Charts** | 41 | 82 | 9 | 18 |
| **Drawings** | 24 | 48 | 26 | 52 |
| **Models** | 9 | 18 | 41 | 82 |
| **Creative Arts** | 4 | 8 | 46 | 92 |
| **Computer** | 2 | 4 | 48 | 96 |
| **Projectors** | 0 | 0 | 50 | 100 |
| **Outside-classroom science projects** | 0 | 0 | 50 | 100 |

Results in Table 4.2 shows that teachers in pre-schools were majorly concerned with course books and charts in the classes. All the schools had mathematics course books while 47 (94%) of the schools had science activities course books. The study also revealed that 82% of the pre-schools had adequate charts for science and mathematics activities in the classes. However, 78% of the schools had inadequate story books on science while 86% of the schools had inadequate story books on mathematics activities. Resource books for both science and

mathematics activities were highly inadequate. Of more concern was the creative arts, computers, projectors and outside classroom science projects that absent in most schools. There was none of the schools with projectors and science projects outside classrooms. The lack of these essential resources in teaching of science and mathematics activities in pre-school is an important indicator to the poor performance of science and mathematics activities in pre-school in the study area.

With the status of teaching resources in the schools, the study sought to establish the extend of use of the resource in teaching of science and mathematics activities. This was done using a teacher questionnaire. Responses of the teachers regarding the use of instructional resources were rated as always, sometimes, rarely and never.

**Table 4.3 Background Information of the Pre-School Head Teachers**

| **Teachers related factors** | | **Frequency** | **Percentage (%)** |
|---|---|---|---|
| **Gender** | Male | 16 | 53.3 |
| | Female | 14 | 46.7 |
| **Teachers' level of Training** | Certificate in ECDE | 25 | 3.4 |
| | Diploma in ECDE | 4 | 13.3 |
| | **Degree in ECDE** | **1** | **83.3** |

Findings in Table 4.3 show that 16(53.3%) of the head teachers (n = 30) were male while 14(46.7%) were female. This implies that gender was evenly distributed in leadership in ECDE sector although the number of male head teachers who

participated in the study was slightly higher than their female counterparts. Majority 25(83.3%) of head teachers fall in the certificate level of training, this is followed by 4(13.3%) of the respondents who said that their education qualification is diploma level of education while only 1(3.4%) of the head teachers hadbachelor's degree in their training levels.

### 4.4 Extend ofUse of Instructional Resources in Teaching Science and Mathematics

The first objective of this study sought to find out ***the extent to which teachers used instructional resources in teaching science and mathematics activities***.Through observation, the researcher established the availability and adequacy of the instructional resources used in teaching of science and mathematics activities in pre-schools in the study area. The observation was made as either adequate, inadequatestudy first established the availability and adequacy of the instructional resources for teaching science and mathematics activities in pre-schools. This data was obtained from observation schedule.

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**Table 4.4: Extent of Use of Instructional Resources among Pre-school Teachers**

| Instructional Resources | Frequency of Use | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Always | | Sometimes | | Rarely | | Never | |
| | Freq | % | Freq | % | Freq | % | Freq | % |
| **Real Objects** | 4 | 8 | 11 | 22 | 24 | 48 | 11 | 22 |
| **Charts** | 31 | 62 | 13 | 26 | 6 | 12 | 0 | 0 |
| **Flash Cards** | 0 | 0 | 6 | 12 | 11 | 22 | 33 | 66 |
| **Pictures** | 7 | 14 | 22 | 44 | 12 | 24 | 9 | 18 |
| **Play materials** | 19 | 38 | 21 | 42 | 9 | 18 | 1 | 2 |
| **ICT resources** | 2 | 4 | 5 | 10 | 14 | 28 | 29 | 58 |
| **Course books** | 48 | 96 | 2 | 4 | 0 | 0 | 0 | 0 |
| **Syllabus** | 50 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Models** | 4 | 8 | 7 | 14 | 33 | 66 | 6 | 12 |
| **Songs** | 24 | 48 | 20 | 40 | 5 | 10 | 1 | 2 |

The results show that the majority (48%) of the pre-school teachers always used songs in instruction, 22% sometimes used real objects in teaching while only 8% of the teachers always used real objects as teaching resources. The study revealed charts, course books and syllabuses were the most used instructional resources among preschool teachers in Athi River sub-county. Charts were always used by 62% of the teachers, course books were used by 96% while syllabuses were used by all the teachers. Course books and the syllabuses were mostly used since the study established that they were core required books and professional documents that were necessary for effective teaching. The study revealed that 48% of the teachers always used songs as instructional resource while 40% used songs

sometimes. The study however indicated that some key instructional resources were commonly not used by pre-school teachers in the study area. For instance, 66% of the teachers indicated that they rarely used models while 12% never used models in teaching. From the study findings, 22% of the teachers rarely used flash disks while 66% of the teachers never used flash disks in teaching. While in the 21st century ICT resources have been shown to improve instruction and pupil achievement, more than half (58%) of the pre-school teachers in the study area never used them for instruction. Audio tapes and videos are integral resources in teaching science and mathematics. Lack of use of ICT resources and other vital instructional resources among pre-school teachers in Athi River is a possible cause of poor performance in science and mathematics activities among pre-school pupils.

On the same context it has been stated thatteacher's gender, academic qualifications and teaching experience doesn't influence the utilization of instructional resources in any level of teaching according to the study done by Ngeru (2015).on his study about influence of teacher characteristics on utilization of instructional resources in teaching number work in preschools in west lands Nairobi county.

Koech (2017) found out that age of learners, entry behaviour, number of children, sex, social economic background of the learners, safety of the school environment and the abilities plus the language level of the learners greatly influences the

selection of instructional resources. All the above factors will determine the extent of the teachers' use of instructional resources in teaching science and mathematics

On interviewing the teachers on the extend of use of instructional resources in teaching;

*Teacher A stated that most times I teach using only the text book because have no time to look or money to pay other resources to use since our school cannot afford.*

*Teacher B echoed that I have been teaching mathematics and science for many years without using any other resources apart from the syllabus and my students have been passing very well, so whether you use instructional resources or not depends on many factors.*

> *Instructional resources are not ends in themselves but means of attaining specific instructional functions. The ability of the teacher to effectively use the available instructional resources optimizes the attainments of instructional situation; this varies with the level of use, teacher competency and teachers 'levels of training. For instance, a situation where an electronics teacher pays "lip service" to activity-oriented instructional methods and resources that could enhance*

*Creative thinking in the learners negates the objectives of electronics education for learners in preschools stated Teacher C during the interview on the extent of use of instructional resources by teachers;*

On support of the study Karaka and Fabian (2007) stated instructional resources are crucial to any successful teaching and learning process worldwide. This is because these resources aid the teacher to transfer the content to learners effectively, therefore teacher-use of instructional resources in teaching is paramount,

.It has been noted that when children are exposed to various instructional resources they tend to be active and involved in the learning process better. Therefore it is worth noting that pre -primary school teachers can testify that teaching become easier with the use of instructional resources, according to Mwonga&Wanyama ,(2012). A study done by Mwong and Wanyama (2012), revealed that teaching and learning resources not only enhances a Child's acquisition of science skills but also ensures that the transition from preprimary to primary school is smooth. Therefore, all the education stakeholders should ensure that the teaching and learning resources are available in pre-primary school centress. Muilkiungu (2003), suggests that teachers should use variety of teaching learning resources easily found within the locality. It is the responsibility of the stakeholders to ensure that the required resources for learning are provided to enhance learning of children in ECDE centers. Muikiungu notes that the teacher is the main source of teaching learning resources is that he/she initiates their provision in the centers like, involving the children in the material collection. According to Muithungu (2003), teaching/ learning resources can be made available by parents and the community as a whole for the ECDE centers within the locality. This can be,

successfully done by organizing for material making day in school. The community members and parents can collect and others can donate to the school. Meet and share, encouraging early enrolment and learn to provide learning resources.'

In addition to the above findings, Ng'etich and Chemei (2015) noted that insufficient. And lack of available instructional materials in the sampled schools make teaching of conflict and resolutions in primary schools very difficult. Thus the availability of instructional resources makes teacher ready to use as they make teaching real, purposive and meaningful to the learners as they enjoy learning with resources which make their learning interesting and pleasurable.

In support of the current study; Waithaka(2005) observed that in Kenya ECE curriculum developed by KICD has provision for learners to have adequate resources to interact with, but most learners in ECDE centers, however they do not interact with a variety of instructional resources in number work. This is because most preschool teachers do not care and most of the time, teach without adequate resources, hence learners fail to develop learning concepts in number work. She further observed that preschool teachers emphasized academics and gave little or no time for learners to interact freely with instructional resources.Joash (2011) in his research on survey of availability and utilization of learning materials in preschools found out that most of the preschool teachers were not utilizing relevant instructional resources and this affected children's performance. Hence support the current study finding which found that the extend of teachers' use of

instructional resources affects the future outcomes of the learners achievements in schools.

### 4.5 Teachers' Levels of Training and Use of Instructional Resources

The second objective of this study sought ***to find out the how of teachers' levels of training affects the use of instructional resources in teaching science and mathematics among pre-primary school teachers.*** The resultsare illustrated in Table 4.5 below.

**Table 4.5: Cross Tabulation of Pre-school Teachers' Levels of Training and Use of Instructional Resources**

| Use ofInstructional Resources | | Teachers levels of training | | | |
|---|---|---|---|---|---|
| | | None (n=8) | Certificate ECDE (n=6) | Diploma in ECDE (n=26) | Degree in ECDE (n=10) |
| 1. **I make use of the models in teaching science and math** | F | 4 | 3 | 17 | 8 |
| | % | 50 | 50 | 65.4 | 80 |
| 2. **I make use of resource persons in teaching science and math** | F | 1 | 4 | 15 | 9 |
| | % | 12.5 | 66.7 | 57.7 | 90 |
| 3. **I make use of excursions/field trips in teaching science and math** | F | 0 | 2 | 14 | 10 |
| | % | 0 | 33.3 | 53.8 | 100 |
| 4. **I make use of the charts in teaching science and math** | F | 7 | 6 | 24 | 10 |
| | % | 8.75 | 100 | 92.3 | 100 |
| 5. **I make use of the recreational facilities to entertain and teach science and math** | F | 0 | 2 | 15 | 10 |
| | % | 0 | 33.3 | 57.7 | 100 |
| 6. **I make use of discussion groups in teaching science and math** | F | 1 | 3 | 14 | 10 |
| | % | 12.5 | 50 | 53.8 | 100 |
| Mean | | 0.35 | 0.63 | 0.65 | 0.94 |

Table 4.6 above reveals that the extent of useof instructional resources was high among those teachers with bachelor's degree (mean=0.94) while the use of instructional resources in pre-school was lowest in teachers with no training in ECDE (mean=0.35).For instance, while all teachers with Bachelors' degree used excursions/fieldwork trips, charts, recreational facilities and discussion groups in their teaching, none of the teachers with no training used any of them other than charts. This implied that teachers with higher qualifications understood the importance of the use of instructional resources in teaching mathematics and sciences among pupils in pre-schools than those without any training at all. On the other hand, teachers with less or no training, rarely used instructional resources because either they did not understand their importance and therefore they were not available or they did not know when and how to use them. It was noted that all teachers who participated in the study said that they made use of text books in the teaching of science and mathematics subjects. However, such important instructional activities in science as excursions/field trips in teaching science and mathematics recreational facilities were not fully used by pre-school teachers who had no training in ECDE.

These findings imply that they had limited skills and knowledge to incorporate different instructional resources in teaching and learning of science and mathematics in ECDE centers. The findings also meant that teachers who were more qualified academically and professionally were likely to influence pre-school children to highly achieve in science and mathematics activity than less qualified

teachers. The conclusion is that there is a difference among pre-school teachers' levels of training and the extent at which they effectively select and use instructional resources in teaching Science and mathematics in ECDE centers.

On the same vein, Nannyonjo's (2007) study of factors influencing learning achievement in Ugandan schools, found out that teachers' characteristics may contribute to the improvement of learners' performance; these characteristics include; teachers' training levels, in-service training of teachers, age, teachers' experience, tenure of leadership, teaching strategies and evaluation systems in a school. This finding concurs with that of Olembo, Wanga and Karangu (2002) on role of teachers in school performance in Nyanza Province, who also pointed out that, learners' performance depends on the role of the teacher in curriculum planning, classroom management, instructional programme and general curriculum implementation. Hence, the role of the teacher is significant in influencing learners'performance in examinations.

According to UNESCO (2012), though the Kenyan government has made efforts to ensure "education for all" as previously suggested by the Millennium Development Goals as well as the UNESCO Medium Term Strategy (2008-2013), Kenya still however, faces serious shortage of qualified teachers which is causing schools performance to be negatively affected. The report also reiterated that the problems of shortage of financial and human resources, particularly physical infrastructures and teaching personnel are factors influencing children's education.

Beecher (2009) also echoed these sentiments when he found that lack of trained teachers in schools contributes to the poor performance. It was for these reasons that the government of Kenya established an institution referred to as KESI, Kenya Education Staff Institute (KESI) to scale up professional and managerial training for the provision of quality education

Kangori (2014) also revealed that teachers with bachelors'degree were the best in implementing science and mathematics activities while those with no formal training in ECDE were the poorest. In his study, Kangori (2014) also revealed that a whole class of 14 children taught by an untrained teacher achieved very low and 76.7% of the low achievers were under care of teachers with certificate in ECDE. The study findings also concur with Jacob (2007) that full certification of teachers is positively related to student achievement in Science and mathematics. The subject area of teachers is one of the teacher qualification most consistently and strongly related to improved student success in academics. The findings also agree to those of Raymond (2001) who showed that teachers with higher licensure test scores have a marginal positive impact on middle school science and mathematics achievement. According to Kathuri (1986), a professionally trained teacher contributes more positively to effective learning than untrained one. This explains why teacher training exists as a major part of education systems throughout the world.

A study by Karuga (1996) revealed that only 80% of science and mathematics teachers in Kenya were qualified and the issue of teachers could be enhanced by advancing in education through in-service training. The findings are in line with Darling-Hammond (2001) who noted that sustained professional development that is aligned with the curriculum and focused on instruction positively effect on school level achievement in Science and mathematics at both Early childhood and high school studies. Therefore, higher quality early childhood education programs are those where teachers have bachelor's degrees specifically in majors of child development or similar areas according to Whitebook& Ryan, (2011).

During another interview with the head teachers, the respondents were asked to explain how teachers' qualification influenced the use of instructional resources in teaching science in pre-primary schools. One of the head teachers reported that:

*"Training of teachers in ECDE is important in acquisition of basic skills in selecting suitable instructional resources for teaching specific concepts in Science and mathematics in pre- primary schools."*

Another respondent added that:

> *"Teacher qualification is significant in preparation and updating of professional documents which ensure proper planning, set the pace and scope for work coverage and help in evaluation. It generally enables the teachers to prepare before presenting science and*

*mathematics related activities to learners. Thus, the higher the qualification of the teacher the higher the performance among pupils in their tests because they effective use the instructional resources available"*

In disagreement with the findings of the current study, Xu, Jane and Collin (2011) reported that there is no association between teachers holding master's degree and students' science and mathematics test score gains in any level or grade. Also in contrast to the study findings,Early (2006) found that teachers who had more than a Bachelor's degree received higher scores on the teaching and interaction subscales of the Early Childhood Environment Rating Scale (ECERS) than those teachers who had an associate's degree. Nevertheless, only a few studies have proved these claims which are mostly based at the school level.

During the interview with the head teachers, it was found that teachers' training levels and professional qualification have positive influence on the achievement of pre-school children in science and mathematics activities. One of the head teachers had this to say when interviewed;

*Instructional resources are not ends in themselves but means of attaining specific instructional functions. The ability of the teacher to effectively use the available instructional resources optimizes the attainments of instructional situation; this varies with the level of use, teacher competency and teachers 'levels of training. For instance, a*

*situation where an electronics teacher pays "lip service" to activity-oriented instructional methods and resources that could enhance creative thinking in the learners negates the objectives of electronics education for learners in preschools*

This implies that the delivery of quality instruction in the classroom in any education system depends largely on academic qualification, quality and competence of the teachers. This is because the teachers are expected to perform the important function of guiding, directing, evaluating, imparting, asking and answering questions among others for maximum benefits of the learners. Similarly, Goe, (2007) in his study reiterated that teacher qualifications have greatly influence the use of instructional resources in teaching science and mathematics and mechanically promotes children 'achievements.

Moreover, studies done by Rice, (2003); Zeichner& Conklin, (2005) found that teacher trainings are related to children's achievements, as stated by came up with their uniform test scores to find on the connection between teacher qualifications and children's performance. Zeichner& Conklin, (2005) also in their study on the effects of professional qualifications of financial accounting on academic performance, revealed that teachers with sound training were equipped with the requisite competence that enable them to produce effective service in teaching compared to less trained teachers. A survey by GOK and UNICEF (1995) revealed that lack of teachers training and poor teacher retention as key barriers to

effective curriculum implementation. The key to getting teachers committed to an innovation is to enhance their knowledge of the program. This means teachers need to be trained and workshops organized for professional development.

### 4.6 Teachers' Gender and the Use of Instructional Resources in Teaching Science and mathematics in Pre-Primary Schools

The third objective of this study ***sought to find out the influence of teachers' gender on the use of instructional resources in teaching science and mathematics in pre-primary schools in Athi-River sub county Kenya.*** The use of instructional resources was assessed through aLikert scale consisting of 12 items. The researcher then cross-tabulated pre-school teachers' gender and the use of instructional resources in teaching science and mathematics activities. The results have been presented and discussed using mean as shown in Table 4.6.

**Table 4.6: Cross tabulation of pre-school Teacher's Gender and Use of instructional resources**

| Teachers extent of use of instructional resources in teaching Science and mathematics | | Gender of Teachers | |
|---|---|---|---|
| | | **Male(n=12)** | **Female (n=38)** |
| 1. **I make use of the facilities in the classroom in teaching Science and mathematics** | F | 11 | 24 |
| | % | 91.7 | 63.2 |
| 2. **I make use of the facilities in the library in teaching Science& math** | F | 10 | 21 |
| | % | 83.3 | 55.3 |
| 3. **I make use of the facilities in the Science or mathematics room in teaching** | F | 9 | 19 |
| | % | 75 | 50 |
| 4. **I make use of the computer room teaching Science and mathematics** | F | 10 | 15 |
| | % | 83.3 | 39.5 |
| 5. **I make use of reference books for further inquiry in teaching Science or math** | F | 12 | 25 |
| | % | 100 | 65.8 |
| 6. **I make use of text books in the teaching of science or mathematics subject** | F | 12 | 38 |
| | % | 100 | 100 |
| 7. **I make use of the models in teaching science and mathematics** | F | 11 | 21 |
| | % | 91.7 | 55.3 |
| 8. **I make use of resource persons in teaching science or mathematics** | F | 11 | 18 |
| | % | 91.7 | 47.4 |
| 9. **I make use of excursions/field trips in teaching science** | F | 12 | 14 |
| | % | 100 | 36.8 |
| 10. **I make use of the charts in teaching science or mathematics** | F | 12 | 35 |
| | % | 100 | 92.1 |
| 11. **I make use of the recreational facilities to entertain and teach science or mathematics** | F | 11 | 16 |
| | % | 91.7 | 42.1 |
| 12. **I make use of discussion groups in teaching science or mathematics** | F | 11 | 17 |
| | % | 91.7 | 44.7 |
| Mean | | 0.92 | 0.58 |

Findings in Table 4.6 reveal that both male and female teachers equally make use of text books in teaching and learning of science and mathematics. However, it

was revealed that 12(100%) of the male teachers used excursions/field trips in teaching science or mathematics as compared to 14(36.8%) of the female teachers who used the same resource. The findings indicated that the extent of utilization of instructional resources in teaching science and mathematics was high among male teachers (mean=0.92) while the use of instructional resources in pre-school was lowest in female teachers (mean=0.52). These findings imply that more male teachers made use of variety of teaching resources than the female teachers. Therefore, it can be concluded that there is significant association between gender and utilization of teaching resources.

Findings from the interview guides also showed that female teachers did not like Science or mathematics even though they were teaching it. Ina statement of one of the respondents, it was reported;

> *"Most female teachers do not like Science or mathematics because they involve more activities that are tedious and require more energy to accomplish."*

During the study, it was observed that female teachers did not fully involve pupils especially those with slow learning abilities during science or mathematics lessons where demonstrations were carried out in classes. In one of the pre-school, male teachers used groups of 10 pupils during experiments and the learners were given opportunities to report what they physically observed. Three senses (sight, smell and sound) were emphasized during Science and mathematics activities even

though learners were not provided with special treatment with regards to difference in learning ability.

These findings are in line with the findings of Procedia (2014) who revealed that trained male and female teachers are significantly better than untrained male and female counterparts. Further, Procedia (2014) showed that male teachers were more involved in selection of appropriate teaching and learning resources related to Science and Mathematics. In contrary, public female teachers were more devoted in private schools than their male teachers in public schools with regards to use of teaching instructional resources related to Science and mathematics.

The findings also agree with Ashley (2015) that girls in secondary schools who were taught by female teachers were considered not capable to perform better in Science and Mathematics in Zimbabwe. The passion for Science and mathematics as subjects begins at early stages of learning in which parents and teachers are opted to give courage to the child. Lest the desire for Science and mathematics is established at early stages of a female child, she is likely to drop and develop negative attitude towards the subjects. This encouragement ought to be embraced and facilitated by teachers among learners at pre-primary school level.

In support of the findings of the current study, Muchimba (2015) revealed that many teachers not only believe that girls are less capable in Science or Mathematics but also believed that girls are less interested in Science and mathematics activities and more easily troubled by the subjects. This stereotype is

still being felt today in most schools by female teachers who are specialized to teach Science and mathematics in most cases become afraid or somehow nervous to apply certain instructional resources in Science and mathematics activities. Perhaps the female teachers believe that certain instructional methods are masculine and henceforth change the attitude of the learners.

## 4.7 Teacher-Attitude and Use of Instructional Resources in Teaching Science and mathematics Activities

The fourth objective of this study ***sought to find out whether teacher- attitude affects the use of instructional resources in teaching science and mathematics activities.*** Teachers were required to give information about their attitudes and perceptions towards Science and mathematics activities. The responses were in a range of 1-5 using Likert scale (5=strongly agree, 4=Agree, 3=Neutral, 2=Disagree and 1=Strongly Disagree). Their responses to the 9 items were used to determine teacher attitude towards Science and mathematics activities as presented in Table 4.7

**Table 4.7: Teachers' Attitude towards Science and math Activity**

| Attitude towards science**in Kenya** & math activity | | 5 | 4 | 3 | 2 | 1 | StdDev | Mean |
|---|---|---|---|---|---|---|---|---|
| **I always have a good rapport with children during science& math lessons** | F | 24 | 3 | 22 | 1 | 0 | .93 | 4.2 |
| | % | 48 | 6 | 44 | 2 | 0 | .73 | 3.5 |
| **I am comfortable in teaching Science& math as a subject in this school** | F | 0 | 47 | 3 | 0 | 0 | .57 | 2.9 |
| | % | 0 | 94 | 6 | 0 | 0 | .46 | 3.1 |
| **I do involve pupils in the improvisation of teaching and learning materials in classroom** | F | 0 | 5 | 30 | 10 | 5 | .71 | 2.5 |
| | % | 0 | 10 | 60 | 20 | 10 | .23 | 3.3 |
| **I am well prepared to handle all issues related to Science& math with children** | F | 3 | 39 | 0 | 6 | 2 | .25 | 3.2 |
| | % | 6 | 78 | 0 | 12 | 4 | .11 | 2.8 |
| **Solving science& math work problems is passion and part of life** | F | 0 | 35 | 15 | 5 | 5 | .42 | 2.9 |
| | % | 0 | 70 | 30 | 10 | 10 | .61 | 3.4 |
| **Science& math activity gives me a sense of security and self-assurance** | F | 17 | 20 | 0 | 11 | 2 | .74 | 3.5 |
| | % | 34 | 40 | 0 | 22 | 4 | .65 | 3.4 |
| **The end of science& math activity lesson is always good riddance** | F | 0 | 23 | 11 | 9 | 7 | .67 | 2.9 |
| | % | 0 | 46 | 22 | 18 | 14 | .13 | 2.2 |
| Overall mean | | | | | | | 0.52 | 3.13 |

N=50

Table 4.7 shows that the scores were very high as indicated by the overall mean score of teachers 'attitude and use of instructional resources in the teaching of science and mathematics activities

This indicates that majority of the pre-school teachers had a positive attitude towards the Science and mathematics subjects and this might be influencing the implementation of Science and mathematicsas a subjects in pre-schools. These findings concur with the Myers and Fouts (1992) who found that positive attitudes toward Science and mathematics related to students' participation, supportive social learning environment, positive association with classmates and the use of variety of teaching strategies and interest in Science and mathematics activities.

in support to these findings, studies revealed that teachers with negative attitudes towards Science and mathematics spend less time teaching it and also use didactic methods rather than approaches that focus on learners' active participation and explorations as stated by Fulp,( 2002); Varelas, Plotnick, Wink, Fan & Harris, (2008). These researchers pointed out that there is a significant association between teachers' attitude and use of instructional resources for Science and mathematics activities.

In an interview with the head teachers, one of the respondents reported that;

> *"Science and mathematics classes in previous ECDE colleges give teachers broader background or foundation knowledge to*

*comprehend Science and mathematics, but not necessarily the capability to teach in ECDE centers. It is the interest of the trainee to develop his/her love and enjoyment of teaching Science and mathematics."*

This implies that teachers' attitude towards Science and mathematics is dictated by the environment and personal goals and achievement. The researcher sought to investigate the cross tabulation of teacher attitude and the level of use of instructional resources in teaching of Science and mathematics. The findings are shown in Table 4.8.

**Table 4.8 Cross tabulation of pre-school teachers' attitude and Learners Levels of Achievement**

| Teachers attitude on extent of use of instructional resources in teaching Science and math | | Learner level of Achievement in Science and mathematics | | |
|---|---|---|---|---|
| | | **High** | **Medium** | **Low** |
| **I always have a good rapport with children during science& math lessons** | F | 11 | 20 | 4 |
| | % | 22 | 40 | 8 |
| **I am comfortable in teaching Science& math as a subject in this school** | F | 10 | 16 | 5 |
| | % | 20 | 32 | 10 |
| **I do involve pupils in the improvisation of teaching and learning materials in classroom** | F | 9 | 13 | 6 |
| | % | 18 | 26 | 12 |
| **I am well prepared to handle all issues related to Science& math with children** | F | 10 | 10 | 5 |
| | % | 20 | 20 | 10 |
| **Solving science& math work problems is passion and part of life** | F | 12 | 19 | 6 |
| | % | 24 | 38 | 12 |
| **Science& math activity gives me a sense of security and self-assurance** | F | 12 | 29 | 9 |
| | % | 24 | 58 | 18 |
| **The end of science& math activity lesson is always good riddance** | F | 11 | 13 | 8 |
| | % | 22 | 26 | 16 |
| Mean | | 0.21 | 0.34 | 0.12 |

Findings in Table 4.8 show that the performance in most pre-school pupils was medium when cross tabulated with teachers' attitudes (highest mean=0.34). This implies that majority of children with high achievement were taught by teachers with positive attitude towards the teaching of Science and mathematicsactivity.The findings further indicate that low achievers in Science and mathematics were also taught by the same teachers with positive attitude in Science and mathematics activities. This implies that the achievement of pupils could not be pegged on teachers' attitude alone. The interaction of other factors like learners' ability, teachers' experience and attitude of pre-school children towards science and mathematics activities could be an issue of concern. These findings implied that there was no relationship between teachers' attitude and achievement of the pre-school learners. However, it is the attitude to direct the teachers to select and use appropriate instructional resources in Science and mathematics activities.

These findings are in line with Aiken (1970) who concluded that the association between attitude and performance is certainly the congruence of reciprocal influence in that, attitude affects achievements and in turn influences attitude. The findings also concur with Onasanya (2008) who observes that the change and behaviours from teachers would be beneficial to the learners. Even when the resources are available but the management does not show commitment and teachers do not see the need, no utilization can possibly occur.

The findings are in agreement with Eble (1988) when he found out that pleasure in teaching and learning is the basic foundation essential to sustain great teaching. If teachers are more enthusiastic in teaching Science and mathematics, their positive attitude will show through and will have a powerful influence on learners' motivation and hence causing the learners to acquire knowledge in the subject effectively and therefore achieve good grades in the subject.

However, these results are in disagreement with Ndawula (2014) who sought to examine the teachers' attitudes towards using sponsored instructional materials provided by the Aga Khan Education Service (AES) to primary schools in Uganda. The study established that the majority of the teachers (93%) expressed positive attitude, while only 7% had negative attitudes over using the AES materials. Conclusions were drawn and recommendations focused on: sensitization of teachers on importance AES; improving on close work relationship between primary schools and AES; extending AES materials to non-project schools and; further research on other variables rather than teachers' attitudes. The low attitude of the teachers in science and mathematics among teachers was an important factor in their choice and use of instructional resources in teaching of science and mathematics activities in pre-schools

### 4.8 Teachers' motivation level and the use of instructional resources in teaching science and mathematics in pre-primary schools

The fifty objective of this study sought ***to determine the influence of teachers' motivation level on use of instructional resources in teaching science and mathematics in pre-primary school in Athi-River Sub-County.*** Teachers were required to give information about their motivation (both intrinsic and extrinsic) on Science and mathematics activities. The responses were in a range of 1-5 using Likert scale (5=strongly agree, 4=Agree, 3=Neutral, 2=Disagree and 1=Strongly Disagree). Their responses to the 15 questions were used to determine their motivation towards Science and mathematics activities as presented in Table 4.10.

**Table 4.10: Motivation Level of Teachers**

| **Items measuring motivation indicators** | | **Response** | | | | | |
|---|---|---|---|---|---|---|---|
| | | SA | A | SD | SD | Mean | Stddev |
| **Teaching profession was my first choice** | F | 15 | 4 | 8 | 23 | 1.82 | 0.86 |
| | % | 30 | 8 | 16 | 46 | | |
| **Teaching is a noble profession** | F | 3 | 4 | 20 | 23 | 1.3194 | 0.81 |
| | % | 6 | 8 | 40 | 46 | | |
| **I enjoy teaching profession** | F | 5 | 11 | 15 | 19 | 1.97 | 1.03 |
| | % | 10 | 22 | 30 | 38 | | |
| **teaching gives me a lot of satisfaction** | F | 25 | 5 | 24 | 6 | 1.28 | 0.89 |
| | % | 50 | 10 | 48 | 12 | | |
| **teaching gives me a recognition in the community** | F | 12 | 16 | 14 | 18 | 1.27 | 0.89 |
| | % | 24 | 32 | 28 | 36 | | |
| **teaching was my dream career** | F | 13 | 15 | 11 | 11 | 1.68 | 1.05 |
| | % | 26 | 30 | 22 | 22 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **my salary is enough to meet my basic needs** | F | 13 | 8 | 15 | 14 | 1.67 | 1.16 |
| | % | 26 | 16 | 30 | 28 | | |
| **My school provides accommodation for teachers** | F | 15 | 11 | 18 | 6 | 1.71 | 1.09 |
| | % | 30 | 22 | 36 | 12 | | |
| **I am paid my salary on time** | F | 14 | 17 | 12 | 7 | 1.70 | 1.08 |
| | % | 28 | 34 | 24 | 14 | | |
| **My salary is paid in full at the end of the month** | F | 11 | 10 | 9 | 20 | 1,70 | 1.08 |
| | % | 22 | 20 | 18 | 40 | | |
| **My school pay extra work or teaching** | F | 14 | 15 | 11 | 10 | 2.87 | 1.19 |
| | % | 28 | 30 | 22 | 20 | | |
| **There are enough and appropriate resources for teaching** | F | 25 | 11 | 6 | 8 | 1,68 | 1.24 |
| | % | 50 | 22 | 12 | 16 | | |
| **My school provides financial assistance to teachers who perform well** | F | 12 | 15 | 7 | 16 | 1.17 | 1.03 |
| | % | 24 | 30 | 14 | 32 | | |
| **My school provides financial assistance to teachers when they have problems** | F | 11 | 15 | 18 | 6 | 1.97 | 1.42 |
| | % | 22 | 30 | 36 | 12 | | |
| **My School organizes parties to celebrate achievements** | F | 0 | 12 | 17 | 21 | 1.67 | 0.47 |
| **Average Score** | **%** | **0** | **24** | **34** | **42** | **1.70** | **1.08** |

**KeySA-**Strongly Agree **A-**Agree **D-**Disagree **SD-**Strongly Disagree

The findings in Table 4.8 indicated that majority of participants reported low motivation levels as indicated by the lowest overall mean (Overall mean=1.70 and Std. Dev=1.08).To establish whether there was a relationship between teacher motivation and the use of instructional resources in teaching Science and mathematics in ECDE centers, mean scores of trainees' of the use of instructional resources were calculated and presented alongside the intent to which teachers used instructional resources to teach Science and mathematics activities in pre-

primary schools in Athi river sub county Machakos county Kenya. Table 4.9 summarizes the findings.

**Table 4.9: Influence of Teachers' motivation level on the use of instructional resources in teaching science and mathematics in pre-primary schools**

| Motivation indicators | Level of agreement | Freq | % | Mean score of use of instructional resources |
|---|---|---|---|---|
| **Teaching profession was my first choice** | Agreed | 19 | 38 | 1.94 |
| | Disagreed | 31 | 62 | 1.71 |
| **Teaching is a noble profession** | Agreed | 7 | 14 | 1.19 |
| | Disagreed | 43 | 86 | 0.76 |
| **I enjoy teaching profession** | Agreed | 16 | 32 | 0.68 |
| | Disagreed | 34 | 78 | 0.29 |
| **teaching gives me a lot of satisfaction** | Agreed | 30 | 60 | 1.75 |
| | Disagreed | 20 | 40 | 0.89 |
| **teaching gives me a recognition in the community** | Agreed | 28 | 56 | 0.98 |
| | Disagreed | 22 | 44 | 0.76 |
| **teaching was my dream career** | Agreed | 28 | 56 | 1.24 |
| | Disagreed | 22 | 44 | 1.03 |
| **my salary is enough to meet my basic needs** | Agreed | 21 | 42 | 1.78 |
| | Disagreed | 29 | 58 | 1.16 |
| **My school provides accommodation for teachers** | Agreed | 26 | 42 | 1.87 |
| | Disagreed | 24 | 48 | 1.03 |
| **I am paid my salary on time** | Agreed | 31 | 62 | 1.24 |
| | Disagreed | 19 | 38 | 0.69 |
| **My salary is paid in full at the end of the month** | Agreed | 21 | 42 | 1.07 |
| | Disagreed | 39 | 78 | 0.21 |
| **My school pay extra work or teaching** | Agreed | 29 | 58 | 1.11 |
| | Disagreed | 21 | 42 | 0.23 |
| **There are enough and appropriate resources for teaching** | Agreed | 36 | 72 | 1.14 |
| | Disagreed | 14 | 28 | 1.02 |
| **My school provides financial assistance to teachers who perform well** | Agreed | 27 | 54 | 1.05 |
| | Disagreed | 23 | 46 | 0.72 |
| **My school provides financial assistance to teachers when they have problems** | Agreed | 26 | 52 | 0.99 |
| | Disagreed | 24 | 48 | 0.43 |
| **My School organizes parties to celebrate achievements** | Agreed | 12 | 24 | 1.75 |
| | Disagreed | 38 | 68 | 0.23 |

The result from Table 4.10shows the relationship between teachers' motivation level on the use of instructional resources in teaching science and mathematics in pre-primary schools. Findings revealed that there were higher scores in the columns where the items were agreed with by the respondents. On the other hand, the mean score was relatively lower in the columns where the items were disagreed with by the respondents. This implies that the higher the motivation levels among teachers the more the use of instructional resources in teaching Science and mathematics. This means that teacher motivation directly influences the utilization of instructional resources in teaching Science and mathematics. Teacher motivation is the application of certain measures that tend to energize the teacher in the work place and which in turn encourages the use of instructional recourses. According to Herzberg (1968), motivators are the factors that energize teachers to perform in order to accomplish set objectives.

During the interview with the head teachers, it was found that poor working conditions of teaching may also influence negatively effective utilization of instructional resources in teaching science and mathematics in pre-primary schools. For instance, one of the head teachers had this to say;

> *Large class sizes and inadequacy of instructional resources have an effect on distribution of instructional resources. The teacher-learner ratio of say 1:50 is a threat to delivery of quality mathematics education among the preschool learners. This is because preschool*

*teachers with large classes are not able to meet the needs of all learners with regard to provision of individualized attention. Mathematics teachers with heavy work load have little or no time to prepare and develop, select and organize teaching and learning materials. It is also a challenge to improvisation of learning materials from the environment because it requires time. With manageable classes, preschool teachers are able to determine the learners needs so the instruction can be adapted and adjusted accordingly.*

These views by the head teacher was also supported by the findings of Wasiche(2006), who also found that large class size and teachers' heavy work load were also found to affect mathematics teaching techniques. Keeping learners actively engaged in a large class and helping them perform better in mathematics is a challenge to teachers. Similarly, a study conducted by Tayyab (2010) in India, Rawalpindi found that teachers who were not satisfied with their working condition, compromised their professionalism and service delivery. Kilgallon (2006) also examined factors that influence early childhood classroom teachers' sustainment in the profession and in teaching in Perth, Western Australia and found that ECE teachers were sustained through maintenance of personal well-being and a life with balance, that is enjoyment of daily interactions with learners and the relationships developed with work colleagues; positive attitudes towards

learning, teaching and change were found to impact on sustainment as did participants emotional intelligence and personal well-being.

Class size had also come out strongly as one of the determinants for utilization of instructional resources in teaching science and mathematics in pre -primary schools. For instance, one of the head teachers said that:

> *Class size is one of the significant factors that would influence utilization of instructional resources in teaching science and mathematics in preschools.In smaller classes, teachers have more contact with individual learners and learners have more support for learning. In large classes there are more and larger groups, which pose instructional and management difficulties for teachers. Learners in large classes are more often inattentive or off-task.*

These findings concur with that of O'Sullivan (2006) who also did a study in Ugandan primary schools based on the size of classrooms, teacher-pupil ratio, class equipment, site and appropriateness of latrines, playground and their effectiveness in relation to appropriate application of instructional materials in schools. O'Sullivan (2006) found that even though these are important factors for primary schools in Uganda, they were not provided to children thereby affecting instructional activities of the teachers. O'Sullivan notes that most schools in Uganda do not offer conducive environment to facilitate effective utilization of instructional resources in teaching science and mathematics in preschools.

The other factor influencing utilization of instructional resources in teaching science and mathematics in preschools according to the head teachers was availability of adequate instructional resources. When asked to comment on this one of the head teachers said:

> *"Appropriate application of instructional materials/resources for teaching science and mathematics is effectively checked when learners are given variety of instructional resources such as number charts, picture books and wall charts to read. This helps preschool teachers develop proper number work skills andscience knowledge"* .

Another head teacher when asked to explain how instructional materials help in teaching science and mathematics in preschools said that:

> *"Instructional resources help the learners learning number work properly, identifycolours, shapes and pronounce the words correctly. This helps them achieve much in learning science and mathematics in their later years in education"* .

A head teacher in another school continued that:

> *"Instructional resources in learning environment improve the performance of the learner in various learning activities such as ability to read and write. Compared to children that are not*

*taught with instructional resources, these children perform generally well in letter writing, identification of shapes and sentence construction".*

Another head teacher when probed on this said:

*"Instructional resources improve the number work performance of the learner, because they are ready to draw letters, draw and name pictures and use small letters, color shapes and copy patterns with the help of available materials"* .

These findings reinforce the need for instructional materials to utilization of instructional resources for teaching science and mathematics in preschools. During the interview with the head teachers, when asked to indicate the implication of instructional materials on teaching science and mathematics in preschools, one of them had remarked:

*"With the availability of instructional resources such as pencils, crayons, papers and markers, learners are able to model shapes, letters and objects, join letters, and draw pictures. These activities can significantly help in improving utilization of instructional resources for teaching science and mathematics in preschools".*

Another head teacher echoed these sentiments when he said that:

> "*Through instructional resources, learners are able to draw the named pictures rewrite small letters and copy letters, since when they interact more with these instructional resources, they become more innovative and are ready to write letters"*

From these statements made by the head teachers, it can be concluded that instructional resources and utilization of instructional resources for teaching science and mathematics in preschools is paramount in the current teaching and effective learning process. Instructional resources promote learners' readiness to learn how to construct sentences and learn number work. This is also supported by the findings of Barclay (2009) who found that with the availability of different instructional resources, children in lower primary are able to experiment with writing by forming scribbles, letters-like forms, and random writing of letters. Barclay further found that children begin to use "mock writing" or wavy scribbles to imitate adult cursive writing. Letter like forms or mock letters are the young child's attempt to form alphabetic letters. Such writing readiness activities when practiced on daily schedules lead to fluent or actual writing amongst preschool learners.

These findings support the findings of Nsa, Ikot and Udo (2013) in their study conducted in Nigeria, where they also found that there was a significant difference between the reading performance between learners taught with instructional chart

and those without and there was significant difference between the performance of learners taught with instructional pictures and those taught without. A study by Momoh (2010) also indicated that instructional materials had implications on early learners' performance on prerequisite skills taught in an early childhood education such that they offer variety of experiences to the lesson and thus keep monotony and boredom at bay.

Similarly, the findings also agree to those reported by Myers (2011) who noted that the use of sand to "write" words also helps the learners to make letters and words out of materials like sand. Learners can also model numbers, alphabets and simple pictures using clay. This helps learners to recognize words and also help build the muscles in their fingers and enhance the fine motor skills they will need to write.

Moreover, the findings agreed to the words by KIE, (2011), which stated that at preschool level children should be given writing readiness activities to prepare them for the actual writing. They need activities which prepare them physically for the activity of writing but also mentally so that they will have ideas and concepts to write about. Many activities which children do in school such as scribbling, painting, drawing, coloring, tracing, lacing, threading are writing readiness activities that prepare them for actual writing. These activities strengthen and develop control of the finger muscles used in the number work activity.

The findings are in agreement to the emphasis made by Hall and Williams (2010) that writing may be the most important part of kindergarten curriculum. Further, Hall and Williams (2010) argue that the goal of a kindergarten is to admit all children regardless of their status and assist them to develop their literacy skills.

Creating a positive, risk-free environment is important to enhancing literacy. Learning to read and write is essential and provides the basic foundation for all future school success. The American National Association for Education of Young Children (NAEYC) stated that one of the best predictors of whether a child will function competently in school and go on to contribute actively in our increasingly literate society is the level to which the child progresses in writing. Although reading and writing abilities continue to develop throughout the lifespan, the early childhood years-from birth through age eight is the most important period for literacy development.

These sentiments show that using instructional materials, learners are able to speedily learn number work and also encourage teachers in using instructional materials in teaching science and number work among learners. Similarly, Wangui (2011) found that factors affecting a child's readiness to learn number work are inadequate facilities and failure to appropriately use teaching methods.

On teacher motivation, qualitative data from interview schedule with the head teachers that sought to find out the extent to which to teacher motivation such as monetary incentives influence pre-school teachers' utilization of instructional

materials found that most of the respondents reported that salary for the teachers was inadequate to meet their needs in the current increase cost of living, hence demoralizing them to effectively carry out their functions, which included effective utilization of instructional materials for teaching science and mathematics in preschools. In fact, one of the head teachers said;

> *Most of my teachers earn little salary and the inadequacies discouraged them to perform their work effectively up to including appropriate application of instructional materials in teaching science and mathematics in preschools.*

The above finding reveals that salary has not been able to increase teachers' morale to perform their professional duties. This study finding is concurs to that of Fraise (2012) whose study emphasized the value of financial rewards when he said that money provides themeans to achieve a number of different ends.

The observation was also reiterated by another respondent who reported that,

> *In most schools, low pay has forced teachers to find the additional sources of income inform of petty trading andother secondary sources of income. These secondary income activities have created divided attention and loyalty to teachingand thus impacting negatively on the quality of teacher performance.*

In agreement, Cissokho (2010) cited that when teacher's salary fail to keep pace with the cost of living they undergo a reduction inreal income their morale suffers and the able ones shift to better paying jobs thus pulling down the quality of education. Theimplication of the above findings will benefit the community to invest on the payment of teaching force for them to be well motivated, hence they can achieve much for the quality of education even against great odds.

# CHAPTER FIVE

# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## 5.1 Introduction

This study aimed at establishing the extent to which teachers use instructional resources in teaching science and mathematics in pre-primary schools in Athi-River sub county of MachakosCounty, Kenya. The study also sought to find out the influence of teachers factors in use of instructional resources in teaching science and mathematics in pre-primary schools. This chapter presents the summary of the study, conclusions, and recommendations by the researcher and areas of further research.

## 5.2 Summary of Findings

The first objective of the study ***sought to establish the extent of teachers' use of instructional resources in teaching science and mathematics in pre-primary schools in Athi-River Sub-County in MachakosCounty,Kenya.*** The researcher used descriptive statistics such as frequency, percentage and mean. Findings indicated that there was highest mean score in the use of instructional resources in teaching Science and mathematics among the teachers whom always use instructional resources in teaching of science and mathematics. However, teachers with no training in ECDE had the lowest mean score in the utilization of

instructional resources in teaching Science and mathematics in pre-primary schools.

The second objective of the study ***sought to establish teachers' training levels on the use of instructional resources in teaching science and mathematics in pre-primary schools in Athi-River Sub-County***. Findings indicated that teachers with degrees tending to use instructional resources more than the diploma and certificate levels of trainings in teaching of Science and mathematics activities in pre-schools. For instance, the extent of utilization of instructional resources in teaching Science and mathematics was high among those teachers who had degree followed by teachers with diploma levels and those with teachers' certificate seem to be rated lowest in terms of use of instructional resources in teaching of science and mathematics activities.

The third objective of the study ***sought to find out the influence of teachers' gender on the use of instructional resources in teaching science and mathematics in pre-primary schools in Athi-River sub county Kenya.***The findings indicated that gender was a factor of utilization of instructional resources in teaching Science and mathematics. It was found that more male teachers made use of variety of teaching resources than the female teachers.

The fourth objective of the study ***sought to find out whether teacher- attitude affects the use of instructional resources in teaching science and mathematics activities.***The findings indicated that majority of pre-school teachers had positive

attitude towards Science and mathematics. Attitude was found to influence the selection and use of instructional resources in teaching Science and mathematics. However, there was no direct influence of teachers' attitude on the performance of pre-school children in Science and mathematics activities since both high and low achievers were taught by the same teacher.

The fifth objective of this study ***sought to determine whether teachers' motivation level affects the use of instructional resources in teaching science and mathematics in pre-primary school in Athi-River Sub-County***. Majority of teachers in pre-schools were not motivated to execute their instructional duties in pre-schools. It was revealed that motivation influenced the extent to which teachers use instructional resources and employ certain teaching methodologies with regards to presentation of Science and mathematics activities to learners.

## 5.3 Conclusions

The following conclusions were drawn from the findings:

Teacher training is a significant factor since it enables teachers acquires basic skills in implementing curriculum. Well trained teachers have the capability to select and use suitable instructional resources in teaching specific concepts in Science and mathematics. The study concludes that there is a positive relationship between the teacher qualification and teachers use of instructional resources in teaching and learningScience and mathematics activities.

Gender is a significant determinant in effectiveness of selecting and use of instructional resources in teaching and learning Science and mathematics activities. Male teachers are therefore perceived to perform better than their female counterparts with regards to making use of variety of instructional resources in teaching Science and mathematics in pre-schools. Teachers attitude influences the use of the use of instructional resources in teaching science and mathematics activities does not direct influence the performance of pre-school children in Science and mathematics activities since both high and low achievers were taught by the same teacher.

There is a positive relationship between teacher motivation and teachersuse of instructional resources and employ certain teaching methodologies with regards to presentation of Science and mathematics activities to learners which consequently affects performance of children in Science and mathematics activities.

High teacher training levels enhances the familiarity of teachers with suitable teaching approaches in the field of Science and mathematics. A more qualifiedteacher is capable to appropriately select and use instructional resources in teaching Science and mathematics activities since he/she is in a position to compare and contrast the validity of the contemporary approaches with the previous ones, through experience, weaknesses of approaches can be identified and adjusted appropriately based on the emerging issues in Science and mathematics education.

## 5.4 Recommendations of the Study

Based on the study findings and conclusions the following recommendations were made:

1. A pre-school teacher is recommended to have a roper academic background and be professionally trained and specialize on child development. This should be facilitated by the Ministry of Education through in-service training.
2. Male and female teachers should be equally encouraged to undergo frequent seminars and in-service courses to equip themselves with various teaching methods to enhance their teachings and rip off the fear of Science and mathematics from female teachers.
3. Teachers' attitudes towards the use of instructional resources should be created by teachers as way of loving their profession

4 The government and stakeholders should motivate teachers through salary increment and other incentives that will have a positive attitude towards Science and mathematics teaching.

5. Ministry of Education should ensure proper implementation of curriculum which needs effective use if instructional media in teaching. This would ensure production of pre-primary school teachers who have the ability to utilize instructional media in teaching regardless of their teaching experience.

6. The school, parents, teachers and the education officers should warrant that the teaching and learning resources are available in pre-primary school centers for effective learning of science and mathematics to be realized.

### 5.5 Recommendations for Further Research

The study found out there is need for further research in the following areas:

1. A similar should be replicated to a wider population of pre-schools Athi-River Sub-County and other parts of Machakos County to establish factors influencing implementation of Science and mathematics activity and compare the findings.
2. A similar study should be done in pure urban area to establish the dynamics of utilization of instructional resources in these ECDE centers which would establish a good platform for comparison with the findings of the current study.
3. Further research should be done to establish whether factors that had not been attained at the time of study like teacher participation of the parents and pupils' attitude towards Science and mathematics influence the use of instructional resources in teaching Science and mathematics among teachers in pre-schools.

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## APPENDICES

### Appendix I: Teachers' Questionnaire

I am a PhD student of Kenyatta University Kenya, intending to conduct a research. I am therefore going to ask you a few questions related to the study. The purpose of this study is to establish the extent to which teachers use instructional resources in teaching science in pre-primary schools in Athi-River Sub County, Kenya You are kindly requested to respond to the questions below. Be assured that all the answers you provide will be kept in the strictest confidentiality (Please tick as appropriate)

**Section A: Bio-Data**

1. Identify gender

   Male [ ] Female [ ]

2. Which age bracket do you belong?

   21 years -30 years [ ] 30 years -40 years [ ] Above 40 years [ ]

   **Section B: Extend of use of instructional Resources in teaching**

   The table below show instructional resources that can be used among pre-school pupils.**Kindly tick appropriately.**

| **Instructional Resources** | **Frequency Of Use** | | | |
|---|---|---|---|---|
| | **Always** | **Sometimes** | **Rarely** | **Never** |
| Real Objects | | | | |
| Charts | | | | |
| Flash Cards | | | | |
| Pictures | | | | |
| Play materials | | | | |
| ICT resources | | | | |
| Course books | | | | |
| Syllabus | | | | |
| Models | | | | |
| Songs | | | | |

**Section C: Teachers' Education Level and Experience**

3. Please indicate by ticking your level of education

   KCPE/KCSE [ ] Certificate [ ] Diploma [ ]

   Degree [ ] Others specify……..

4. Which school did you attend during your studies?

   Private ( ) Public () Rural ( ) Urban ( )

5. How long have you served as a pre-primary school?

Less than 1 Year [ ] 1-3 Years [ ] 4-6 Years [ ] Above 6 years [ ]

6. Have you ever attended teacher training in pre-primary school curriculum?

   Yes ( ) No ( )

7. Are you trained in computer applications?

   Yes [ ] No [ ]

8. a) Do you think teachers' level of education influence the use of instructional resources in teaching science in pre-primary schools?

   Yes [ ] No [ ]

b) If Yes, brief explain how it affects.

**Observed Instructional Resources in Pre-Schools**

| **Facility observed** | **Adequate** | | **Not adequate** | |
|---|---|---|---|---|
| | **Freq** | **%** | **Freq** | **%** |
| Story books related to Science | | | | |
| Story books related to mathematics | | | | |
| Science resources books | | | | |
| Mathematics resource books | | | | |
| Science course books | | | | |
| Mathematics course books | | | | |
| Charts | | | | |
| Drawings | | | | |
| Models | | | | |
| Creative Arts | | | | |
| Computer | | | | |
| Projectors | | | | |
| Outside-classroom science projects | | | | |

……

……

**Section D: Gender and Teaching Science and mathematics**

9. a) Do you think teachers' gender influence the use of instructional resources in teaching science in pre-primary schools?

   Yes [ ] No [ ]

b) If Yes, brief explain how it affects.

……

……

**Section E: Teachers' Attitude and Teaching Science and mathematics**

10. In the following section indicate the extent to which you agree or disagree with the statement

Key: SA=Strongly Agree A=Agree D=disagree SD=Strongly Disagree

| **Statement** | **SA** | **A** | **D** | **SA** |
|---|---|---|---|---|
| I always have a good rapport with children during science and mathslessons | | | | |
| I am comfortable in teaching Science and mathematics subjects in this school | | | | |
| There is enough time scheduled for Science and mathematics | | | | |
| I do involve pupils in the improvisation of teaching and learning materials in classroom | | | | |
| I am well prepared to handle all issues related to Science and mathematics with children | | | | |

11. a) Do you think teachers' attitude influence the use of instructional resources in teaching science and mathematics in pre-primary schools?

    Yes [ ] No [ ]

12. In your opinion, what challenges associated with teachers' attitude affect children learning in Science and mathematics?

    ……

    ……

| **Teachers extent of use of instructional resources in teaching Science and mathematics** | | **Gender of Teachers** | |
|---|---|---|---|
| | | **Male (n=12)** | **Female (n=38)** |
| **13.** I make use of the facilities in the classroom in teaching Science and mathematics | F<br>% | | |
| **14.** I make use of the facilities in the library in teaching Science& math | F<br>% | | |
| **15.** I make use of the facilities in the Science or mathematics room in teaching | F<br>% | | |
| **16.** I make use of the computer room teaching Science and mathematics | F<br>% | | |
| **17.** I make use of reference books for further inquiry in teaching Science or math | F<br>% | | |
| **18.** I make use of text books in the teaching of science or mathematics subject | F<br>% | | |
| **19.** I make use of the models in teaching science and mathematics | F<br>% | | |
| **20.** I make use of resource persons in teaching science or mathematics | F<br>% | | |

| | |
|---|---|
| **21.** I make use of excursions/field trips in teaching science | F<br>% |
| **22.** I make use of the charts in teaching science or mathematics | F<br>% |
| **23.** I make use of the recreational facilities to entertain and teach science or mathematics | F<br>% |
| **24.** I make use of discussion groups in teaching science or mathematics | F<br>% |
| **Mean** | |

**Section F: Teachers' Motivation and Teaching Science and mathematics**

13. In the following section indicate the extent to which you agree or disagree with the statement.

Key: SA=Strongly Agree A=Agree D=disagree SD=Strongly Disagree

| **Statement** | **SA** | **A** | **D** | **SA** |
|---|---|---|---|---|
| Resources for Science activities are availed on time | | | | |
| Science teachers are motivated based on merits and improvement | | | | |
| The school have adequate teaching and learning materials for teaching science activities | | | | |

14. a) Do you think teachers' motivation influence the use of instructional resources in teaching science in pre-primary schools?

    Yes [ ] No [ ]

15. In your opinion, what challenges associated with teachers' motivation affect children learning?

    ……

    ……

**Section G: Teachers' Experience and Teaching Science and mathematics**

16. a) Do you think teachers' experience influence the use of instructional resources in teaching science and mathematics in pre-primary schools?

    Yes [ ] No [ ]

b) If Yes, brief explain how it affects.

……

……

**Appendix II: Head Teachers' Interview Guide**

I am a PhD student of Kenyatta University Kenya, intending to conduct a research. I am therefore going to ask you a few questions related to the study. The purpose of this study is to establish the extent to which teachers use instructional resources in teaching science and mathematics in pre-primary schools in Athi-River Sub County, Kenya. You are kindly requested to respond to the questions below. Be assured that all the answers you provide will be kept in the strictest confidentiality.

1. Gender…….
2. Level of education…….
3. Duration served as a head of pre-primary school?

   ……

4. How does teachers' level of education influence the use of instructional resources in teaching science and mathematics in pre-primary schools?

   ……

   ……

   What challenges, associated with teachers' gender, influence the use of instructional resources in teaching science and mathematics in pre-primary schools?

……

……

Do you think teachers' attitude influence the use of instructional resources in teaching science and mathematics in pre-primary schools?.....

5. In your opinion, what challenges associated with teachers' attitude affect children learning in Science and mathematics?

……

……

6. How do you motivate Scienceand mathematics teachers in your school?

……

……I

n your opinion, what challenges associated with teachers' motivation affect children learning?

……

……

Are you satisfied with the teaching personnel in Science and mathematics?.....

7. How does teachers' experience influence the use of instructional resources in teaching science and mathematics in pre-primary schools?

……

……

**Appendix III: Pupils' Focused Group Discussion Questions**

I am a PhD student of Kenyatta University Kenya, intending to conduct a research. I am therefore going to ask you a few questions related to the study. The purpose of this study is to establish the extent to which teachers use instructional resources in teaching science in pre-primary schools in Athi-River Sub County, Kenya.

1. Let's do a quick round of introduction. Can each of you tell the group your name, school, and age?
2. Is science and mathematics your favorite subjects? Yes ( ) No ( )
3. What is your current score in science and mathematics?

20-30 ( ) 30-40 ( ) 40-50( ) 50-60 ( ) 60-70 ) 70-80 ( ) 80-90 ( ) 90- 100 ( )

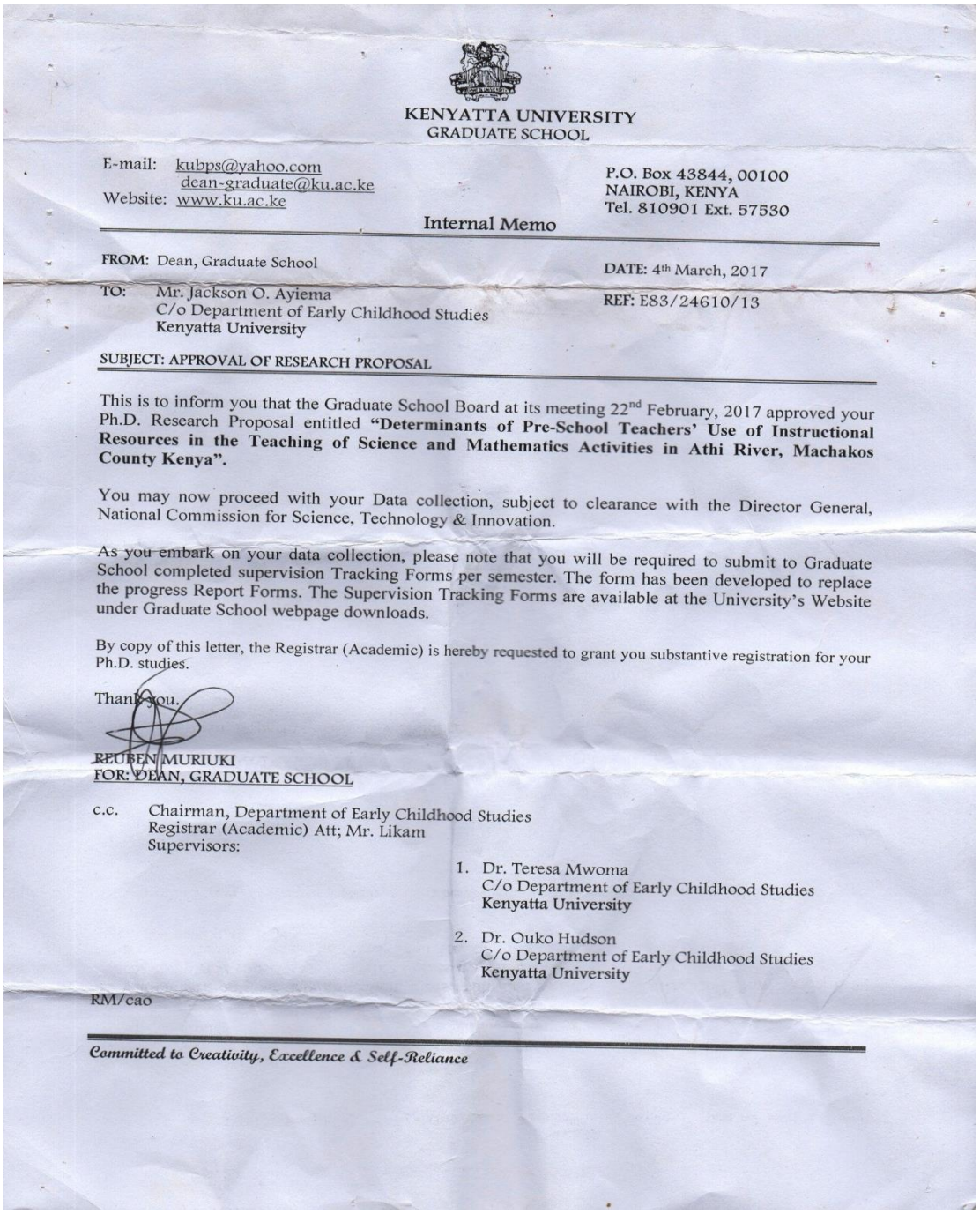
4. How often do you do activities in school during science lesson?
5. Does your teacher involve you in the preparation of teaching aids?
6. Does the school provide reference materials during science and maths lesson?
7. Agree or disagree with each of the following statements?
    a. I have good rapport with my science and mathematics teacher [ ]
    b. During science and maths lesson, my teacher comes to class early [ ]
    c. The teacher gives a lot of activity work in science and maths [ ]
    d. When involved in an experiment, I develop scientific skills [ ]
    e. I gain a lot by participating in the teacher demonstration [ ]
8. How often do you carryout experiments in science and mathslesson?

9. How often do you have group discussions during science and mathematics lessons?
10. How often do you practice peer teaching during science and mathematics lessons?
11. How often do science teachers give class demonstrations in science and mathematics ?

**Appendix IV: Observation Schedule**

| **Facility observed** | **Adequate** | **Not adequate** | **Comment** |
|---|---|---|---|
| Story books related to Science | | | |
| Science resources books for kids | | | |
| Charts | | | |
| Drawings | | | |
| Models | | | |
| Creative Arts | | | |
| Computer | | | |
| Projectors | | | |
| Outside-classroom science projects | | | |

## Appendix V: Research Approval from Kenyatta University.



KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: kubps@yahoo.com
dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 810901 Ext. 57530

Internal Memo

FROM: Dean, Graduate School

DATE: 4th March, 2017

TO: Mr. Jackson O. Ayiema
C/o Department of Early Childhood Studies
Kenyatta University

REF: E83/24610/13

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

This is to inform you that the Graduate School Board at its meeting 22nd February, 2017 approved your Ph.D. Research Proposal entitled **"Determinants of Pre-School Teachers' Use of Instructional Resources in the Teaching of Science and Mathematics Activities in Athi River, Machakos County Kenya".**

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission for Science, Technology & Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed supervision Tracking Forms per semester. The form has been developed to replace the progress Report Forms. The Supervision Tracking Forms are available at the University's Website under Graduate School webpage downloads.

By copy of this letter, the Registrar (Academic) is hereby requested to grant you substantive registration for your Ph.D. studies.

Thank you.

REUBEN MURIUKI
FOR: DEAN, GRADUATE SCHOOL

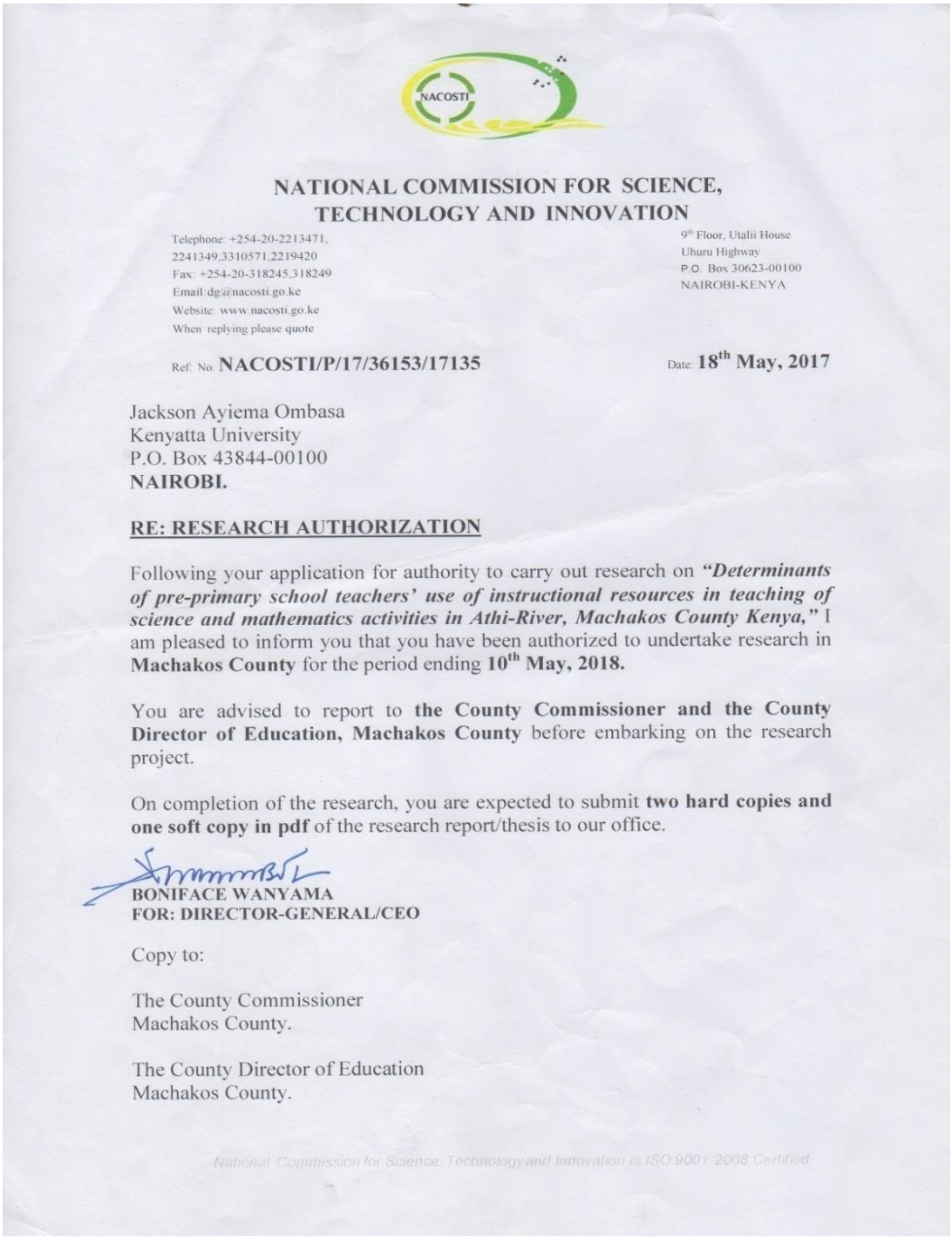
c.c. Chairman, Department of Early Childhood Studies
Registrar (Academic) Att; Mr. Likam
Supervisors:

1. Dr. Teresa Mwoma
   C/o Department of Early Childhood Studies
   Kenyatta University
2. Dr. Ouko Hudson
   C/o Department of Early Childhood Studies
   Kenyatta University

RM/cao

*Committed to Creativity, Excellence & Self-Reliance*

## Appendix V: Research Authorization from NACOSTI



NACOSTI

**NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION**

Telephone: +254-20-2213471, 2241349,3310571,2219420
Fax: +254-20-318245,318249
Email:dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/17/36153/17135**

Date: **18th May, 2017**

Jackson Ayiema Ombasa
Kenyatta University
P.O. Box 43844-00100
**NAIROBI.**

**RE: RESEARCH AUTHORIZATION**

Following your application for authority to carry out research on ***"Determinants of pre-primary school teachers' use of instructional resources in teaching of science and mathematics activities in Athi-River, Machakos County Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Machakos County** for the period ending **10th May, 2018.**

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

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

**BONIFACE WANYAMA**
**FOR: DIRECTOR-GENERAL/CEO**

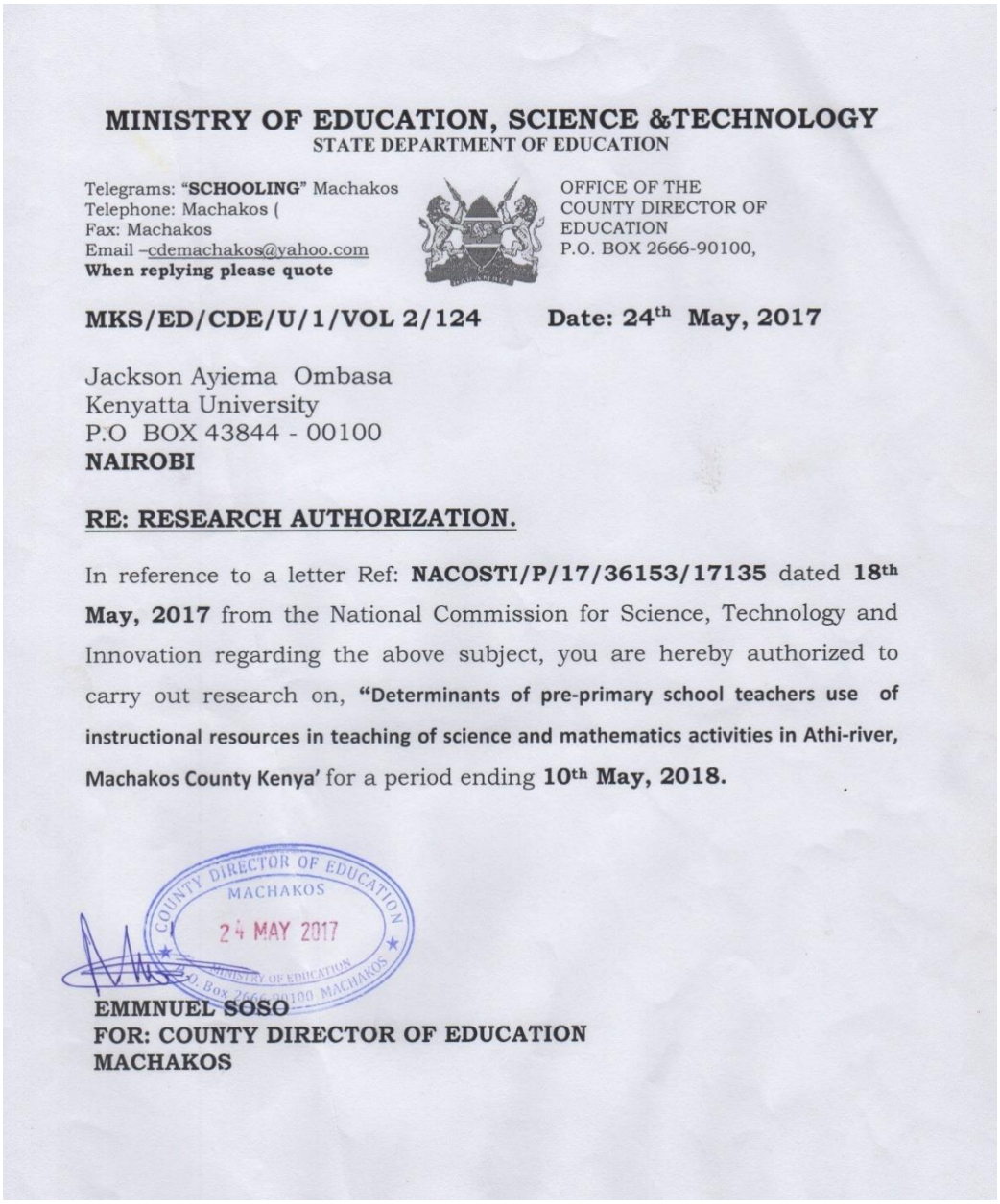
Copy to:

The County Commissioner
Machakos County.

The County Director of Education
Machakos County.

National Commission for Science, Technology and Innovation is ISO 9001: 2008 Certified

**Appendix VI: Research Authorization from Ministry of Education.**



**MINISTRY OF EDUCATION, SCIENCE &TECHNOLOGY**
**STATE DEPARTMENT OF EDUCATION**

Telegrams: **"SCHOOLING"** Machakos
Telephone: Machakos (
Fax: Machakos
Email –cdemachakos@yahoo.com
**When replying please quote**

OFFICE OF THE
COUNTY DIRECTOR OF
EDUCATION
P.O. BOX 2666-90100,

**MKS/ED/CDE/U/1/VOL 2/124** **Date: 24th May, 2017**

Jackson Ayiema Ombasa
Kenyatta University
P.O BOX 43844 - 00100
**NAIROBI**

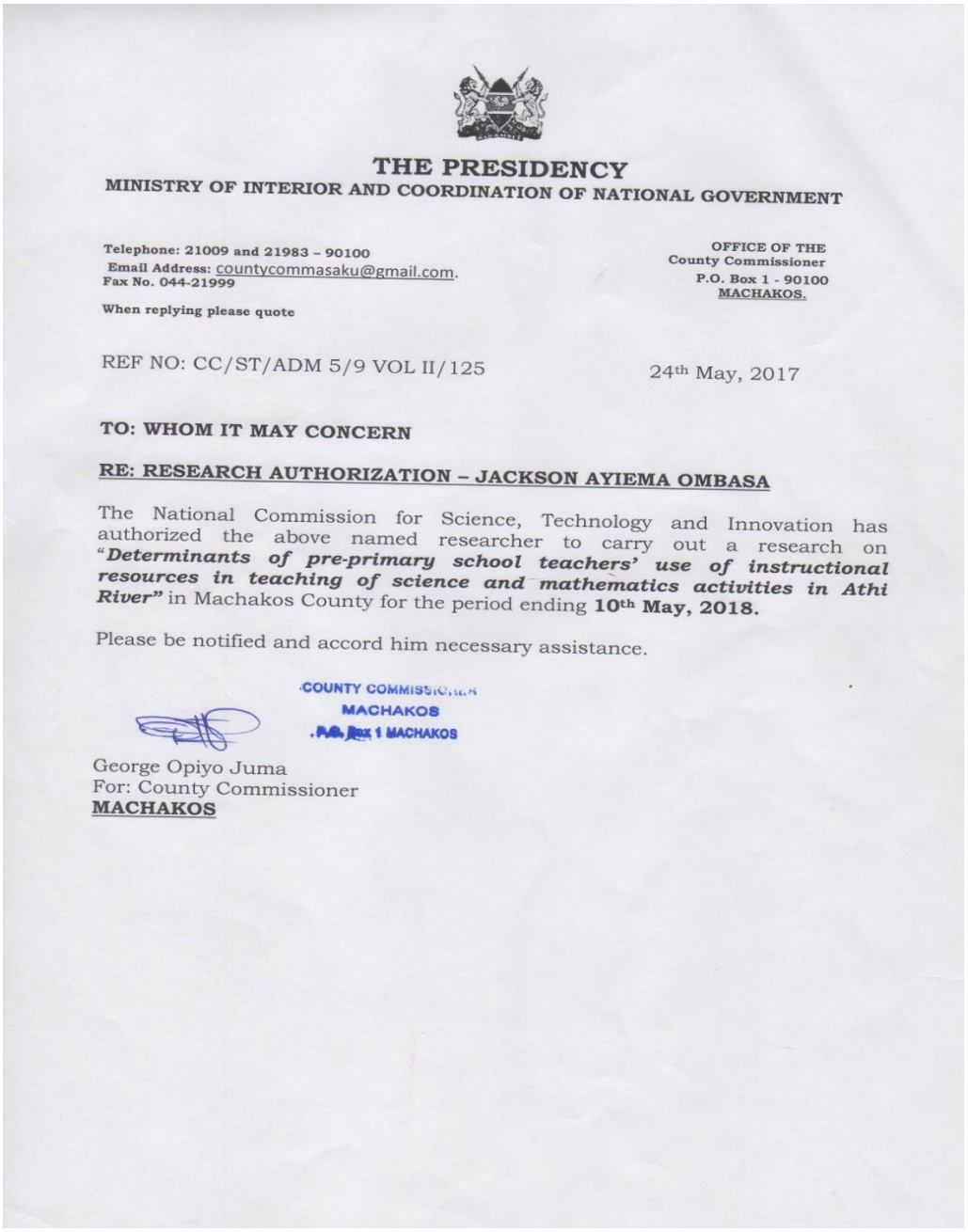
**RE: RESEARCH AUTHORIZATION.**

In reference to a letter Ref: **NACOSTI/P/17/36153/17135** dated **18th May, 2017** from the National Commission for Science, Technology and Innovation regarding the above subject, you are hereby authorized to carry out research on, **"Determinants of pre-primary school teachers use of instructional resources in teaching of science and mathematics activities in Athi-river, Machakos County Kenya'** for a period ending **10th May, 2018.**

COUNTY DIRECTOR OF EDUCATION
MACHAKOS
24 MAY 2017
MINISTRY OF EDUCATION
P.O. Box 2666-90100 MACHAKOS

**EMMNUEL SOSO**
**FOR: COUNTY DIRECTOR OF EDUCATION**
**MACHAKOS**

**Appendix VII**: **Research Authorization from Office of the President.**



THE PRESIDENCY
MINISTRY OF INTERIOR AND COORDINATION OF NATIONAL GOVERNMENT

Telephone: 21009 and 21983 – 90100
Email Address: countycommasaku@gmail.com.
Fax No. 044-21999

When replying please quote

OFFICE OF THE
County Commissioner
P.O. Box 1 - 90100
MACHAKOS.

REF NO: CC/ST/ADM 5/9 VOL II/125

24th May, 2017

**TO: WHOM IT MAY CONCERN**

**RE: RESEARCH AUTHORIZATION – JACKSON AYIEMA OMBASA**

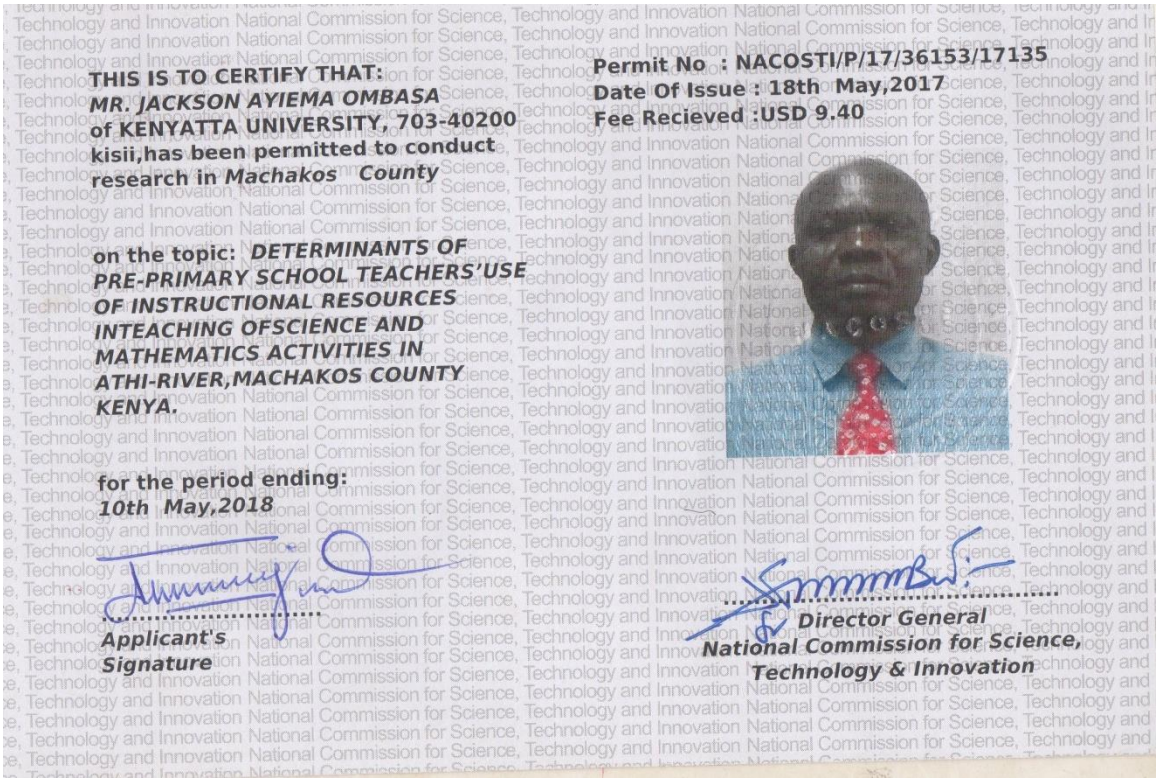
The National Commission for Science, Technology and Innovation has authorized the above named researcher to carry out a research on ***"Determinants of pre-primary school teachers' use of instructional resources in teaching of science and mathematics activities in Athi River"*** in Machakos County for the period ending **10th May, 2018.**

Please be notified and accord him necessary assistance.

COUNTY COMMISSIONER
MACHAKOS
P.O. Box 1 MACHAKOS

George Opiyo Juma
For: County Commissioner
**MACHAKOS**

## Appendix:VIII:Reseach Permit From NACOSTI



THIS IS TO CERTIFY THAT:
*MR. JACKSON AYIEMA OMBASA*
of KENYATTA UNIVERSITY, 703-40200
kisii,has been permitted to conduct
research in *Machakos County*

on the topic: *DETERMINANTS OF PRE-PRIMARY SCHOOL TEACHERS'USE OF INSTRUCTIONAL RESOURCES INTEACHING OFSCIENCE AND MATHEMATICS ACTIVITIES IN ATHI-RIVER,MACHAKOS COUNTY KENYA.*

for the period ending:
*10th May,2018*

.....
*Applicant's Signature*

Permit No : NACOSTI/P/17/36153/17135
Date Of Issue : 18th May,2017
Fee Recieved :USD 9.40

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