RELATIONSHIP BETWEEN TEACHERS' TRAINING AND STIMULATION OF
SCIENCE PROCESS SKILLS IN PRE-PRIMARY SCHOOLS IN RORET
DIVISION, KENYA

BY

KIRUI DICKSON KIPRONOH

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DECLARATION

I declare that this research project is my original work and has not been presented for a degree in any other university or any other institution of higher learning for certification. This research project has been complemented by referenced sources duly acknowledged. Where text, data, graphics, pictures, or tables have been borrowed from other sources, including the internet, these are specifically accredited and references cited in accordance with anti-plagiarism regulations.

Signed----------------------------

Date......................

Dickson Kipronoh Kirui
E55/CE/22519/2010

Supervisor’s Approval

This research project has been submitted for examinations with our approval as university supervisors.

Signed------------------------

Date......................

Dr. Gladwell N. Wambiri
Department of Early Childhood Studies
Kenyatta University

Signed------------------------

Date.............

Dr. Wanjohi Githinji
Department of Early Childhood Studies
Kenyatta University
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<td>Kenya certificate of primary education</td>
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<td>SMASE</td>
<td>Strengthening of Mathematics and Science Education</td>
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ABSTRACT

This study established the relationship between teachers training and stimulation of process skills in science instruction in pre-primary schools centers in Roret Division Bureti Sub County Kenya. One of the objectives for teaching science is to enable children use their knowledge and skills acquired to solve problems in every day. Achievement of this objective depends on stimulation and techniques used by teachers during science instruction. However, what have not been addressed are the circumstances of the teachers more specifically in relation to process skills stimulation. The purpose of this study was to investigate the relationship between teachers training and stimulation of science process skills in pre-primary school centers in Roret Division, Buret sub-county, Kenya. The research findings of this study will be useful in evaluating pre-primary school teachers training programs and how it influence teachers’ ability to stimulate process skills during teaching. Quantitative data for this study was obtained through classroom observation schedule and by means of science process skills questionnaires. The target population included 86 pre-primary school teachers in 41 registered public and private pre-primary school centers in Roret Division. Multistage Sampling techniques were used to select study sample. Inferential statistics was the main data analysis technique that were presented in forms of percentages, frequencies, tables, and graphs respectively and subjected to Statistical Package for Social Science (SPSS) analysis. Ethical and logistical issues pertaining to research, voluntary participation, and consent seeking was observed during the entire process of writing this report. The level of significance of acceptance or rejection of the hypotheses was set at 0.05 level. Data generated from this study were carefully analyzed and on basis of their interpretations, it was concluded that there was no significant relationship between pre-primary schools teachers training and the extent to which they stimulate process skills of observation, classification, measurement, communication, and prediction. A significant relationship exist between teachers level of training and the extent they stimulate inferring skills among pre-primary school children. This findings has implications for policy formulation, teacher training and teaching science education in pre-primary schools centers in Kenya. It was recommended that more attention be given to increasing the level of stimulation of science process skills of pre-primary school teachers’ through teacher preparation programs and in-service professional development that incorporate science process skills. Quantitative research should be conducted to verify the second findings of this study.
CHAPTER ONE

INTRODUCTION AND CONTEXT OF THE STUDY

1.0 Introduction

This section of the study gives details on the background to the study, statement of the problem, purpose of the study, objectives of the study, research questions, and significance of the study, theoretical and conceptual frameworks, and assumptions of the study, limitation of the study and definition of significant terms. This chapter entails both theoretical and conceptual frameworks.

1.1 Background of the Study

Physical and mental abilities through science process are needed for effective problem solving, individual and societal development. Chiapetta and Kobella (2006) established that the production of scientific society is constructed based on science process skills for knowledge. According to Martin et al (2009), there are no specific methods used by scientists in carrying out their research. In his study, Martin (2006) established that both basic and integrated skills are contained in the common definition of science process skills. The major six process skills including communication, observation, classification, making inferences, experimentation and measuring were some of the processing skills identified by the American association of advancement of science (AAAs). Basic science process skills are vital for science learning and concept for early years of learning.

From Sri Lanka to Indonesia, United States of America, New Zealand, United Kingdom, Israel and Australia, there has been teaching and learning of science in pre-primary and
lower primary school levels since the mid 1960s. Harlen (2001) acknowledged that there has been concern from researchers to determine the worthiness of science teaching in terms of its repercussion on children’s later scientific knowledge at the pre-primary level. It was discovered through recently carried research regarding children’s learning that besides early helping children to form scientific thinking ideas; it also offers the potential for modifying and addressing children’s ideas before they enter higher levels (Davies, 2005; Harlen, 2001; Ravannis, 2014). In early childhood classrooms, minimal attention has been given to science, (Dickson, Burns & Johnson 1998). There is lack of clarity and little empirical evidence to support these claims on the nature of science teaching in the early childhood.

One of the national philosophies underpinning provision of education in Kenya emphasize on provision of holistic quality education and training that promotes cognitive ability of children’s Republic of Kenya (2012). All the subjects taught in Kenyan schools are presumed to be the means through which this goal of education is to be achieved, towards this end science education promotes development of children’s cognitive abilities. This will be achieved if science education will equip children’s with the process skills. Much of the existing policies (ST&I 2008, Republic 2012, Kenya Development Blueprint 2012). Little attention has been given to address the needs for process skills and how it can be achieved hence the aim of this study.

Teachers play a key role in educating children. It is inevitable that there is need for pre-primary school teachers’ to acquire science process skills and the way of stimulating it to the children in science class. Teachers stimulating strategies, which is informed by ones professional background, can be seen in from teacher’s behavior in class. Evidence points to the fact that despite the importance of science process skills in Kenya, there is no
publication of any study regarding stimulation of science process skills in pre-primary schools. Despite numerous reports on acquisition of some science process skills at higher levels and the findings were that it is between average to poor in Kenya (Chebii, 2011; Ongowo & Indushi, 2013; Muraya & Kimano, 2011; Kiang’ahi et al. 2012; Alego, 1987; Osodo, 1988). This gives the impression that stimulation of process skills does not happen in the process of teaching science. There was little attention to process skills stimulation in pre-primary schools. There was need to verify this empirically.

Teachers training programs should provide human resources that have the capacity to guide learners to develop process skills as opposed to rote learning. According to Kerre (2008), Khatete (2010), most pre-primary and primary school teachers felt there was lack of connection between the theoretical knowledge in early childhood education programs and school teaching experiences. Training at early childhood colleges does not encourage hands on that leads to development of process skills. It is hard for teachers to effectively undergo training in teaching science because they required a lot of guidance to teach science from a practical approach that embraces process skills acquisition (Ngasike, 2012). There was a need to review the ECD training to establish how effective it is in preparing skilled-trained science teachers. Early childhood training from universities to the certificate level is theoretical and examination focused preparing teachers for examination and not necessarily for skills appropriate for science instruction in pre-primary school classrooms (Khatete 2010, Ngasike 2012, Amedelo and Musera, 2012).

In Kenya, most of the primary school teachers are trained in unfamiliar environment inappropriate for training early childhood teachers. In addition, these institutions serve as temporary training facilities during training sessions. This limits exploitation of resources
that leads to development of process skills. Besides resource, rooms for science teaching cannot be initiated in institutions that serve for short sessions. Yet teachers all are to teach science once they graduate hence this study evaluated the relationship between teachers training and stimulation of process skills in pre-primary schools.

1.2 Statement of the Problem


If anything is to be regarded as specific preparation for stimulation of science in Kenya’s pre-primary schools priority must be given to teacher’s strong foundation in process skills stimulation strategies. Though pre-primary school teachers trained theoretically and prepared for examinations with little resources that lead to process skills development, they are to teach science among other subjects in pre-primary school classes. The concern was whether pre-primary teachers trained in theoretical content with little resources in temporary institution will acquire appropriate process skills knowledge that will enable them lead
children do science as opposed to learning about science. The study was set to establish the relationship between teachers training and stimulation of process skills in pre-primary school in Roret division, Bureti Sub County, Kericho County Kenya.

1.2.1 Purpose of the Study

The purpose of the study was to determine the extent to which pre-primary school teachers’ training relates to stimulation of process skills in science.

1.2.2 Objectives of the Study.

The specific objectives of the study was to

i. To establish the relationship between teachers level of training and the extent to which they stimulate pre-primary school children’s observation skills

ii. To establish the relationship between teachers level of training and the extent to which they stimulate pre-primary school children’s classification skills.

iii. To establish the relationship between teachers level of training and the extent to which they stimulate pre-primary school children’s measurement skills.

iv. To establish the relationship between teachers level of training and the extent to which they stimulate pre-primary school children’s communication skills

v. To establish the relationship between teachers level of training and the extent to which they stimulate pre-primary school children’s inferring skills

vi. To establish the relationship between teachers level of training and the extent to which they stimulate pre-primary school children’s predicting skill
1.2.3 Research Hypothesis

The following research hypothesis was tested at 0.05 & level

\[ H_1 = \text{There is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's observation skills.} \]

\[ H_2 = \text{There is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's measurement skills.} \]

\[ H_3 = \text{There is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's communication skills.} \]

\[ H_4 = \text{There is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's inferring skills.} \]

\[ H_5 = \text{There is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's observation skills.} \]

\[ H_6 = \text{There is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's predicting skills.} \]

\[ H_7 = \text{There is a relationship between teachers' level of training and the overall stimulation of science process skills.} \]

1.3 Significance of the Study

The study will highlight teacher training and how they stimulate process skills in science instruction in pre-primary school education. Information provided on the impact of teacher training on stimulation of process skills in pre-primary school. This may lead to improved
learning process, thus lay a good foundation for science learning. The study findings provided indicators for interventions and modification of early childhood education program; they may use the findings to formulate strategies that will improve stimulation of process skills in pre-primary school science activities and at other levels. It may assist in resource allocation to equip pre-primary school and train personnel for better teaching and learning of science activities. Curriculum planners may have information for comprehensive framework for improvement of science teaching and learning. ECE trainers will use the findings of the study for instructional strategies training in science activities in pre-primary school especially planning for science activities that stimulate process skills learning. Policy makers may benefit from the findings in terms of resource allocation to enhance effectiveness in stimulation of science process by pre-primary school teacher. The findings will enlighten teachers and parents on the need to provide a rich environment that promotes acquisition of process skills that leads to a good foundation for future science learning. In addition, teachers and parents will be enlightened on the need to provide an enabling environment for learning of science.

1.4 Delimitation and Limitation of the Study

1.4.1 Delimitation of the Study

The study addressed itself mainly to the following process skills: observation, classification, measurement, communication, inferring, prediction skills, and teacher training. The study only collected data from pre-primary school teachers; however, the research could be useful in stimulating further research in other areas in Kenya.
1.4.2 Limitations of the Study
The study was limited to Roret Division, Bureti sub-county Kenya and the sample included pre-primary school teachers, thus the study may not be a representative of all the 47 counties in Kenya.

1.5 Assumptions of the Study.
The study assumes that teachers are aware of the importance of stimulating process skills. The teacher can plan and organize science activities. The study assumed that the pre-primary school teacher was familiar with teachers’ activity guides. It also assumed the respondent answered questions correctly and truthfully.

1.6 Theoretical and Conceptual Framework

1.6.1 Theoretical Framework
(i) Social constructivism

The study was based on the social constructivism theory. Constructivism refers to ideas that learners construct new knowledge themselves with the teacher’s guidance during learning process under careful structured activities (Piaget 2001 & Vygotsky.1986). In the theoretical framework, the teacher facilitates and guide during the learning process. Constructivist maintain learning is more effective when the teacher uses more constructivist methods involving active learning that is centered toward the child, child to child learning experience and the interaction between the child and teacher using concrete to solve realistic problems. This implies that teachers need to accommodate learner’s conceptions and views as a starting point during the learning process. This means that children try to provide answers
and solutions to conflicting ideas thus the child’s background and prior knowledge plays a major role during the learning process. The role of the teacher is that of a facilitator of children’s learning of science process skills. Science teachers should be able to determine and use children’s knowledge to frame and develop new concept. Pre-primary school teachers need to; learn how to listen and to probe to various concepts and then use this knowledge to frame the way the concepts to be learned are stimulated.

(ii) Jean Piaget: Theory of Cognitive Development

The aim of Piaget in his theory of cognitive development was contribution towards constructivist learning theory. He had an interest of establishing the child’s knowledge of the world. In his constructivism theory, Piaget was of the view the process of acquiring knowledge is a continuous process meaning acquiring knowledge was not internal for children; therefore children could acquire knowledge regarding the world by engaging in their own activities and the discovery from previous experiences and through mental constructions. This means that children can acquire their own system of knowledge making their intellectual development to control other aspects of their development. To ensure children learning of science, teachers should match science concepts to children intellectual levels, the use of manipulation helps to create a supportive environment in which children can work.

Apart from the stages of development, three different types of knowledge described by Piaget were independent. They included social knowledge, logico-mathematical knowledge and Physical knowledge. There is a consideration of physical knowledge involving experiences to experiment with the world and learning that is derived from interaction with
objects. This includes shape, size, texture, color, and smell of the objects and knowledge about how objects react to different actions on them. Physical knowledge is obtained by acting on objects feeling, testing, smelling, seeing, and hearing them by children. Social knowledge is acquired through interactions with more experienced persons. On the other hand, logico-mathematical knowledge is abstract and children invent this kind of knowledge by developing relationships with physical and social knowledge.

(iii) Lev vygotsky: Theory of social constructivism

Lev vygotsky believed that an individual's development depends on the interaction of biological and maturational environment and social factors. He believed that when learners are challenged within close proximity to, yet slightly above their current level of development what he called zone of proximal development (ZPD). ZPP is an intellectual space where learners and teachers interact. He believed that when a child is at ZPD for a particular task, providing the appropriate assistance would give the child a chance to achieve the task (vygotsky, 1978).

In the teaching process, the teacher employs techniques in which he/she adjusts the amount of guidance to fit the child's present performance level and this translates to high achievement. He argued that by experiencing the successful completion of challenging tasks, children gain confidence and motivation to embark on more challenging activities, thus children are able to acquire higher process skills with the stimulation by teachers during science learning.
1.6.2 Conceptual framework

Training was conceptualized to influence pre-primary school teacher stimulation and performance in process skills, the relationship between independent and dependent variables of the study were conceptualized as illustrated in figure 1. The non-study variables pre-primary school teachers’ performance in science at Kenya certificate of secondary education KCSE. Pre-primary school teacher perception towards science and interest in teaching science subject in addition to quality of science teaching can influence the independent and dependent variables by either the researcher not being aware.

Figure 1: The conceptual framework for determining influence of pre-primary school teachers training on stimulation and performance in science process skills
1.7 Operational Definition of Terms

Teacher training: In this study, it refers to teacher’s professional qualification such as certificate, diplomas, and degrees.

Stimulation: In the study it refers to the teachers teaching strategy such as directing children’s activities, asking questions, carrying out demonstrations in science learning that enable children to learn process skills.

Observation: In this study, it refers to the frequency of a teacher using a strategy that enables children to use five senses to gather information during science instruction.

Classification: In this study, it refers to the frequency of a teacher using a strategy that enables children to group objects based on the characteristics established in science instruction.

Measurement: In this study it refers to the frequency of a teacher using a strategy that allows children to express comparison using non-standard measurement units during science instruction.

Inferring: In this study, it refers to the frequency of a teacher using a strategy that enables children to formulate assumptions based upon observations.

Communication: In this study, it refers to the frequency of a teacher using a strategy that enables children to use words, symbols, graphics, and written oral representations to describe and exchange information from one another.

Predicting: In this study, it refers to the frequency of a teacher using a strategy that allows children to state the outcome of a future event based on a pattern of evidence, past experience or observation.

Process skills: In this study, it refers to the rational activities involving range of skills.
CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents the review of past literature, which was relevant to the study. Learning of science is spontaneously; most children come to school ready and willing to learn (OECD 2004), which therefore implies that schools must strengthen their learning.

2.2.1 Observation Process skill

Observation is one of the most important tools of science particularly in viewing the nature, conducting experiments in the laboratories, where observation is very useful. According to Harlen (2006), observation has a useful characterization of science including having information about many things around the world and using the senses as appropriate and safe: observation also involves the identity of similar and different things, establishing details and sequence, ordering observations. There are value of skills and its crucial nature for the process of conduction scientific inquiry and the process of teaching and studying the ways of science. According to Ango (2002), having skills in observation that is expected in science involves reading instruments correctly including noticing of color, taking cognizance of the required detailed specimen, locating the desired parts of specimen accurately and taking careful observation in the right order without studies to explain if the preschool teachers are taking observation accordingly, there remains inadequate information.
2.2.2 Measurement process skill

Children learn about solutions to their problems through the process in which they are provided with feedback. It is easy for children to engage in formulation of new problems, they can also network problems and solve them. There are different ways by which children receive feedback, one of the ways is from their scientific learning is through measurement. Adetula (1981) stated that the process in science skills could give children an opportunity to appraise themselves realistically. Adetula (1981) argues that there is importance in measuring; which is applicable in nearly every aspect of contemporary civilization and its application ranging from relatively simple to complex measurements, which also involves evaluation and value judgment.

Learners are expected to compare and order objects through weight, length, area, and volume, in measuring learners. On the other hand, there are also measuring properties of objects or events by using non-standardized and standardized units of measuring volume, mass, weight, temperature, area, length, and time, using appropriate units and appropriate measuring instruments. Teachers have undertaken the measurements themselves by use of inappropriate approaches that do not stimulate children's measurement skills.

2.2.3 Classification process skill

This requires children to organize their observations in ways that carry special meaning (Martin et.al, 1994, 12). The classification of items ranges from specific to general where teachers are required to classify issues on the basis of traits that are essential to the idea of the set; for instance, putting in place ball beads and having certain color into one group. Akinbóbola (2006) stated that science subject is made meaningful through the acquisition of this skill since it related very much to our daily life. Science subject encourages both logical
and rational thinking, including promoting higher order thinking which is also linked with problem solving ability (Akinbobola & Afolabi, 2010). A child will always draw on his or her ability to observe to assess whether a particular attribute is true or vice-versa in the process of coming up with classification. Due to this process of observation, children use their logical and rational thinking, which clearly illustrates that classification is closely linked to thinking skills. Specific studies on process skills in pre-primary schools are limited specifically on how teachers stimulate process skills.

2.4.4 Communication process skill

Communication is a central aspect of scientific investigation (Abdullah, 1996). According to study done in Turkey communication was the least process skills stimulated among grade 8 learners. Communication is an important process skill without scientific investigation may be pointless. Abdullah (1996) also confirms that the original investigator will be able to know the results or the findings of the investigator. It is therefore important to include the skills of communication in the early stages of teaching and studying science. Ango (2002) findings in a study at Nigeria, indicates that communication is necessary to be able to pass thought, ideas, research, findings learning and instruction. This is through speech, writing, pictures, diagrams, graphs, and tables. Several researchers acknowledge the close relationships between science process skills. Osodo 1988; Toili 1985). Due to the importance of these claims, it has to be elevated to find out whether learners in Kenyan Primary schools acquired the process skill of communication.

2.2.5 Predicting process skill

Prediction must also be testable as it emerges from a database rather than being just a guess by defining. The nature of the skill of predicting is to be able to identify a trend in a way that
is tested. Most important question that pre-primary school teachers ask is a question that has
to do with prediction (Martin 2003). Children normally learn to do a comparison of what
actually happens with what ought to have happened as per their wish, instead of accepting
what happened without thinking about it. Prediction is widely acknowledged in the field of
science but it has attracted little attention in pre-primary school level.

2.2.6 Inferring process skill
The term inferring described the process of inventive where an assumption of course is
generated to explain an observed event. Through inferring, the conclusion is also drawn
based on reasoning or past experience including the process of concluding about the course
of an observation. The process of direct object observation or events enables children to
suggest something in interpreting and explaining things and activities that happen in their
environment (Rambuda, 2004). As an example, explanation or interpretation of an
observation is indeed an inference. In a study by Githinji 2007) about the skills of prediction
and hypothesizing indicated, the skill of prediction had been given preference while that of
hypothesizing had been ignored. This could happen especially where teachers felt
incompetent to handle the hypothesizing skill probably due to poor knowledge. Little is
known about the skill of inference and how pre-primary school teachers stimulate during
learning of science.

2.3 Previous Literature on Science Process Skills
Akinbobola (2010) analyzed the skills in science process in West African senior secondary
school certificate where practical in physics examined in Nigeria for close to ten years in
1998 to 2007 by adopting ex post facto design during the study. Out of the fifteen used in
the study, the prominent science process skills identified calculating (fourteen percent)
manipulating (seventeen percent), observing (twelve percent), recording (fourteen percent) and communicating (eleven percent). It was also shown in the results that there was high percentage rate of basic (lower order) science process skills of sixty three percent in comparison with the integrated (higher order) science process skills of thirty seven percent.

In the results, it also indicated that there is significant number of basic skills higher than the integrated process skills in West African senior secondary physics examination bodies in Nigeria. There was recommendation to the examination bodies in Nigeria secondary schools physic practical examination to enable the children to be prone to creativity, problem solving, reflective thinking, originality, and invention that are vital ingredients for science and technology development of any nation. Even though the claims are important, they have not been done in pre-primary school in establishing whether Kenyan learners acquire them.

Osodo (1988) carried a study on the relationship between science solving problems and acquisition of science process skills among primary school pupils in urban and rural settings, which mainly focused on skills of prediction, classification, and quantification. It was found in the study that girls performed poorer than the boys in science process skills. It was also established in the overall comment that the skills acquisition level was wanting, but it did not investigate specific science practical skills. It was concluded that there was largely under research in the process skill stimulation in pre-primary.

Alego (1987) carried a study on competence of junior secondary school students in some selected science skills of prediction, observation, control of valuables, and generalization. The findings indicated that, the nature of Kenya secondary schools is not process oriented there is no emphasis on skills in syllabus although there is expectation that pupils acquire them informally through laboratory experiences. There was a demonstration of low
competency skills of observation, generalization, and controlling valuables by JUnior secondary school pupils despite the importance of this study, which falls short of explaining whether these skills are stimulated during science learning. In his investigation of the relationship between acquisition of science process skills and achievement in science among class 7 pupils, Toili(1985) found out that there is positive correlation between performance in science process skills and science achievement even though, similar studies are necessary at pre-primary school level (Faridah, 2013).

A study of how primary school pupils acquire the skill of making prediction in Malaysia. It was established in the findings of this research that there was low ability to make prediction among primary school pupils was low and there was a weak basic concept of the skill. Findings indicated that some of the pupils memorized statements related to prediction; they were only able to provide correct answers for some situations but not the rest. There was inconsistency of how they mastered prediction due to memorization of facts, which also made them lack the ability to explain their answers correctly.

Due to relationship between scientific process and skills in learning science, the subjects' ability to predict is dependent on their comprehension of scientific concepts. The concepts of mastery of basic scientific concepts take place in multiple stages beginning from the basic scientific processes. Although, the findings indicated that this mastery among primary school learners is somewhat low. There are no studies done in pre-primary school to find out if teachers are developing the basic process skills among children in Kenya.

A study by Mutisya (2013), on the conceptual understanding of science process skills and gender stereo-typing, a critical component for inquiry teaching of science in Kenya's
Primary schools, the results show that majority of the SMASE trainers had poor understanding of basic science process skills. Most of the SMASE trainees could not identify the correct definitions for predicting, communicating, observation, and inferring either a good number of the participants giving the correct definition of measuring and classifying.

Similar studies by Farsakuglut. al (2008) and Emereole (2009) that focused on pre-service high school science teachers found out that the teachers had insufficient mastery of science process skills. The study indicates that SMASE trainers did not have sufficient understanding of basic science process skills so they would face challenges helping their peers understand the skill during training. This would compromise their ability in helping their pupils acquire process skills and their application in teaching science in a meaningful way. The study recommended primary teacher education for pre-service teachers to ensure trainees develop mastery of science process skills but no similar studies have been done to find out how Pre- primary school teachers stimulate basic process skills during science learning in Kenya.

2.4 Summary of the Literature Review

This chapter has presented a review of literature related to the study. Literature review has shown the process skills education globally. The literature has reviewed various studies done on the teacher's training and stimulation of process skills in science learning. However, there are no studies done in Kenya on the same at pre-primary school level. This study seeks to fill the existing research gap by conducting a study on the teachers training and stimulation of process skills in science Instruction in pre-primary school centers in Roret Division Bureti sub county Kenya.
CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research design, variables, location of the study, target population, and sample description, sampling techniques and size, data collection methods, the pilot study, statistical procedures for data analysis and ethical issues.

3.2 Research Design

The study used an ex-post facto correlation design method to determine whether there was a relationship between pre-primary school teacher training and how they stimulate process skills during science instruction in selected pre-primary school centers in Roret Division Bureti sub-county. In the ex-post factor, design the researcher does not have direct control over independent variable because their manifestations have already occurred or because it cannot be manipulated. The researcher therefore examined the training level (independent variable) and process skills (dependent variables) after the effects have been experienced.

3.2.1 Variables

The study explored two levels of variable, that is, Teachers' training as an independent variable and the process skills as the dependent variable. Teacher training was measured by use of a teacher questionnaire that sought to obtain demographic data about teachers' level of training in the following categories. Untrained (UT) Under Going In-Service Training (IT), Certificate (CT) Diploma (DP) and Bachelors (BT).
Dependent variables process skills which in this study observation, classification, communication, measurement, prediction and inference was measured by the use of data obtained in the classroom observation schedule (CaS) and teachers' questionnaire on how a teacher stimulates these skills during science instruction.

3.3 Location of the Study
The study was carried out in Raret Division Buret Sub County. In the Division, Pre-primary school teachers are trained in primary and secondary institutions that are poorly equipped raised concerns to the researcher. The Division is in rural set up and has many pre-primary school teachers who are targeted.

3.4 Target Population
The population far this study consisted of pre-primary school teachers in public and private schools in Roret division, Buret Sub County. The target population was around 86 pre-primary school teachers. Pre-primary school teachers are trained under different early childhood curricula in both DICECE managed and private colleges in primary and secondary institutions. This raised concerns to the researcher on how they stimulate process-skills because they establish foundation for future science learning. Roret zone has 23 pre-primary schools (16) public and seven private schools. Tebasonik zone has 18 pre-primary school centers 13 public and 3 private schools.
3.5 Sampling Techniques and Sample Size.

3.5.1 Sampling Techniques

Multi stage sampling was to select the study sample used in the following procedure:

Stage 1: Selection of Bureti Sub County

Bureti Sub County was selected purposively for the study. The area was selected because pre-primary school teachers are trained in DrCECE managed and private colleges in poorly equipped institutions. Most of the reviewed studies shows that it has been done in urban areas especially Nairobi and its environs, hence creating the need to conduct a study in other counties in the country.

Stage ii: Selection of Division Purpose of the Division

Purposive sampling was used to select one division from five divisions in Bureti Sub County. Roret division was selected for the study; the zones are Roret and Tebesonik zones.

Stage iii: Selection of Pre- Primary School Centers

The sample of this study was from both public and private pre-primary schools in the division. Schools were stratified into public and private pre-primary schools to constitute strata. This sampling design ensured that each zone contributes to the sample. A number that is proportional to its size in the population. Subsequently pre-primary school centers were drawn from each stratum by simple random sampling utilizing the lottery technique. This offers every school of the stratum equal choice of being selected
Stage iv: Selection of Pre-Primary School Teachers.

In the Division, there are 86 pre-primary teachers. In every sampled school, pre-primary school teachers present at the time of study in every sampled school were stratified according to the level of training and the random sampling technique were adopted to select the participants.

3.5.2 Sample Size

The determination of sample size was based on prior calculations of the sample size, which is required for specified confidence limits for the population values to be specified. According to Nkpa (1997) and Gorard (2001), a sampling fraction of between 50-90% of the population in a correctional research is acceptable.

3.6 Construction of Research Instruments

Data was collected using the following instruments

3.6.1 Pre-Primary Teachers Questionnaire

Pre-primary school teachers questionnaire was used to obtain data from pre-primary school teachers in selected pre-primary school centers, the data was consequently be used to identify relationships between teacher’s training and stimulation of process skills. A teacher questionnaire (appendix ii) contained items on background information of the respondent and science Process skills. Pre-primary school teacher’s questionnaire was administered in written form to respondents.
3.6.2 Classroom Observation Schedule (CaS)

The classroom observation schedule (CaS) see (appendix i) was adopted from (Kathuri and Paulo 1999, Kiboss, 1997 and Wambiri 2007) and modified to suit the study. The CaS was used to observe lessons that provide data on teachers' activities during the lesson that stimulates process skills. It contained background information and process skills to be observed.

3.7 Pilot Study

A pilot study was carried out in two pre-primary school centers. This was in the division where the final study was conducted. The two schools were not included in the main study.

3.7.1 Validity

The researcher was concerned with degree to which questionnaires and classroom observation schedule measured teachers' training and stimulation of process skills in science. Ascertaining the content validity involved consultations with research supervisors to provide expert judgment in this area of study. The researcher used the information to modify the questionnaires to address the objectives of the study.

3.7.2 Reliability

Reliability of the instruments was determined by the use of split half technique. The items of the instruments was be split into two subsets after a single administration of the instrument. The total set of the items was divided into two halves and the scores of the halves correlated to obtain an estimate reliability. The Cronbach's alpha was used to measure the internal consistency and a value of 0.75 above the instrument was judged as reliable.
3.8 Data Collection Procedures

The researcher after piloting and revising the instruments visited the sampled schools to seek for permission to gain entry to administer questionnaire and classroom observation schedule to the sampled pre-primary school teacher's as follows.

The researcher administered questionnaires to the sampled respondents in the pre-primary school centers in the morning because most of the pre-primary school centers only run for half day. Before collecting the completed questionnaires, the researcher checked for errors because of misunderstanding by the respondent in order to achieve reliable results.

Before the commencement of the classroom observation schedule, (COS) sample pre-primary schools teachers was informed in advance that observation will continue until enough information is collected regarding the stimulation of process skills. Each pre-primary school teacher was therefore, observed for a lesson of 30 minutes. To clarify certain issues, a brief discussion was held with each pre-primary school teacher to determine the topic, the learning content to be covered, and learning objective.

3.9 Data Analysis

The data generated in this study was quantitative. Seven hypotheses as shown below was tested. The chi-square test was used to analyze each of these hypotheses. Chi-square test will was used to test all the seven hypotheses. Chi-square test was used because the independent variable in all the hypotheses is categorical. All the hypotheses was tested at .05 levels.

Hal- -There is a relationship between teachers' level of training and the extent to which they stimulate pre-primary school children's observation skills.
Ha2 - There is a relationship between teachers' level of training and the extent to which they stimulate pre-primary school children's classification skills.

Ha3 - There is a relationship between teachers' level of training and the extent to which they stimulate pre-primary school children's measurement skills.

Ha4 - There is a relationship between teachers' level of training and the extent to which they stimulate pre-primary school children's communication skills.

Ha5 - There is a relationship between teachers' level of training and the extent to which they stimulate pre-primary school children's inferring skills.

Ha6 - There is a relationship between teachers' level of training and the extent to which they stimulate pre-primary school children's prediction skills.

H7 - There is a relationship between teachers' level of training and the overall stimulation of science process skills.

3.10 Logical and Ethical Considerations

A research permit was sought from the Ministry of higher education Science and Technology after introductory letter from Kenyatta university graduate school to allow collection of data in sampled schools in Buret-Sub-County, Roret Division. Once in the school, permission was obtained from the respective school administrators to gain entry before talking to the sampled respondents. The respondent was informed that their participation was voluntary and assured that their identity was to not be revealed and that they can withdraw anytime of the study should they choose to. Additional information such as the purpose of the study the processes involved and their role as participant was highlighted. Before the actual administration of the questionnaires and the classroom observation schedule (CaS), the role of each participant was clearly explained and data
collection instruments discussed. Head teachers signed consent forms as an acceptance for participation of their pre-primary schools. Pre-primary school teachers were assured that information arising from the study was confidential. The content of the consent form is contained in appendix (iii)
CHAPTER FOUR

FINDINGS, INTERPRETATION AND DISCUSSION

4.0 Introduction

The chapter focuses on the analysis of data on the relationship between teachers training and the extent they stimulate science process skills in pre-primary school centers in Roret Division, Bureti Sub County in Kenya. The study was based on the following objectives to:

- establish the relationship between teachers' level of training and the extent to which they stimulate pre-primary school children's observation skills. The study established the relationship between teachers' level of training and the extent to which they stimulate pre-primary school children's classification skills. The other object of the study was to establish the relationship between teachers' level of training and the extent to which they stimulate pre-primary school children's measurement skills.
- establish the relationship between teachers' level of training and the extent to which they stimulate pre-primary school children's communication skills. The study further established the relationship between teachers' level of training and the extent to which they stimulate pre-primary school children's inferring skills and the relationship between teachers' level of training and the extent to which they stimulate pre-primary school children's predicting skill.

4.1 General and Demographic Information

This section deals with the demographic information of the respondents more particularly the teachers. The characteristic of participants in social science research plays a very significant role in giving their views on issues upon which the study is being carried, keeping this in mind, in this study a set of demographic information were established.
The questionnaire items were first analyzed descriptively and inferentially. Out of all the (86) questionnaires distributed to preschool teachers, 81 questionnaires which is (94.2%) were properly filled and returned, 4 (5.8%) were not returned. The results were presented in tables and figures. In terms of demographic information, the study focused on gender of pre-primary school teachers, their training status, teaching experience, level of training and the type of school.

4.1.1 Gender Analysis

The pre-primary school teachers were asked to state their gender and Figure 4.1 presents the findings.

Figure 4.1: Gender of Pre-primary school Teachers

As shown in Figure 4.1 above, 12.3% were male and 87.7% female. The Gender analysis was an important variable in this study as it affects any study that deals with any social, educational, or economic phenomenon. The genders was established to fulfill the desire and expectations of the researcher in sampling both male and female teachers in order to
establish their opinion on relationship between teachers training and stimulation of process skills in science instruction in pre-primary schools centers. Also due to unavoidable presence of more female preschool teachers in Roret Division, Bureti Sub County and not because of any attitudinal or skewness hence large numbers of teachers were females by gender in this study. The findings of this study supports the results of a study by Wachanga and Mwangi (2004) who found no significant differences between boys and girls who were exposed to cooperative learning in chemistry. Similarly, Cirila (2003) did not find significant gender differences in mathematics achievement when student were taught through cooperative learning approach.

4.1.2 Training Status
The variable teachers training status was investigated by the researcher and the data presented in Figure 4.3 below.

![Figure 4.2 Training Status](image)

Figure 4.2 Training Status
As presented in Figure 4.3 above, majority 74.1% were trained, followed by 18.5% who were ongoing in service training and only 7.4% were untrained. The level of training in any
profession including teaching, affects the way a person behaves including classroom practices in an academic research, which makes it the most important characteristics that might affect the way of looking and understanding social phenomenon. The training status of a respondent in most cases determines the way, an individual responds to issues and therefore educational background of the respondents becomes an important aspect in a research. Abagi (1997) posits that the knowledge and understanding, efficiency and effectiveness of professionally trained teachers are better than untrained ones. This is supported by the fact that the government spent 5.0 % of its 2013/14 financial year on teachers' education. In Kenya, poor teaching of science subjects mainly attributed to poor teacher training, overloaded curriculum and subject specialization among teachers during secondary level education (Abungu, Okere & Rotich, 2013; Nga'sike 2012; Amedelo & Musera, 2012). It is reasonable to suggest that the development of professional skills is closely related to the science process skills stimulation experience in the classroom.

4.1.3 Teaching Experience

Pre-primary school Teachers were asked to state their years of teaching experience and Table 4.3 presents the findings.

Table 4.1: Teaching Experience

<table>
<thead>
<tr>
<th>Years of Experience</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 5 years</td>
<td>29</td>
<td>38.5</td>
</tr>
<tr>
<td>6-11 years</td>
<td>30</td>
<td>37.0</td>
</tr>
<tr>
<td>11 years and Above</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td>Total</td>
<td>81</td>
<td>100</td>
</tr>
</tbody>
</table>
As shown in Table 4.1, majority 38.5% had less than 5 years teaching experience, 37.0% had between 6 to 11 years and 12.5% had 11 years and above of teaching experience. To determine teaching experience was important to this study to enable the researcher to establish a correlation between teachers training and stimulation of process skills in science instruction in pre-primary schools centers. Goldhaber (2004) and Johnson et al., (2007) in their study established that teachers' level of experience was a factor that had much impact on the attributes of quality interaction during science instruction, which according to him directly affected quality of education in school. The ability to manage classroom effectively and efficiently is represented by the level of teacher education and experience classroom as this promotes student achievement. In a study by Madsen and Cassidy (2005) found out that experienced teachers are more critical in their classrooms teaching than pre-service teachers they found out that explanations and activities given in class by more experienced teachers are clear.

4.1.4 Level of Training

Pre-primary school Teachers were asked to state their level of training and Table 4.2 presents the findings.

Table 4.1: Preschool Teachers' Level of Training

<table>
<thead>
<tr>
<th>Level of Training</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untrained</td>
<td>6</td>
<td>7.4</td>
</tr>
<tr>
<td>Certificate</td>
<td>39</td>
<td>48.1</td>
</tr>
<tr>
<td>Diploma</td>
<td>26</td>
<td>32.1</td>
</tr>
<tr>
<td>Bachelors Degree</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>Declined</td>
<td>8</td>
<td>9.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>81</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
As presented in Table 4.1, majority 48.1% of the respondents had certificate level of training, 32.1% with diploma level and 7.4% without any training. The study further revealed that 2.5% had bachelor degree while 9.9% declined to respond. Teachers stimulating strategies, which is informed by ones level of training. To find out teachers' level of training was important for this study as it was one of the main independent variables in establishing the relationship between teachers training and stimulation of process skills in science instruction in pre-primary schools. Several researchers including, Harris and Sass (2007); Ladd (2008) and Sass (2007) in their studies concurs with these findings that level of teachers' experience differs between old and newly employed teachers Goldhaber (2000). In his study relating to teachers preparedness and effectiveness found that teachers who are prepared through teacher training programs are more effective in their fields than those teachers who did not have professional training while there are a number of studies that suggests certification makes a difference, this study found that teacher training has no practical value in terms of teacher ability to teach specific science process effectively.

4.1.5 Type of School

Pre-primary school teachers were asked to state the type of management of pre-primary schools they were teaching and Figure 4.3 presents the findings.
Figure 4.3: Type of school

Figure 4.3 shows that majority 65.4% were teaching in public schools while 34.6% of pre-primary school teachers taught in private primary schools. This was important to this study as teachers from private schools were likely to encounter fewer challenges in stimulation of process skills in science instructions compared to those from public schools as private schools are highly facilitated with instructional materials.

4.2 Relationship between Teachers Level of Training and the extent they stimulate Children's Observation Skill

Objective one of the study was to establish the relationship between teachers' level of training and the extent to which they stimulate preschool learners' observation skills. To answer this question, the correlation test was done on pre-primary school teachers' level of training against the extent to which they stimulate children's observation skills. The teachers' observation stimulation skills were categorized into high and low. Table 4.2 presents the findings.
Table 4.2: Proportion of teachers by Level of Training and extent they stimulate children Observation skills

<table>
<thead>
<tr>
<th>Level of Training</th>
<th>Observation skill Stimulation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Untrained</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Certificate</td>
<td>21</td>
<td>18</td>
</tr>
<tr>
<td>Diploma</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>Degree</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>35</td>
</tr>
</tbody>
</table>

As shown in Table 4.2, the teachers who had either certificate or diploma level of training had higher 21 (53.8%) and 17 (65.4%) ability of stimulating children's observation skills as compared to untrained teachers which did not show any difference (7). Observation skill is the most fundamental science process skill. This is because as preschool learners observe objects and events using all the five senses, they learn about the world around them. Observation is also one of the most important tools of science particularly in viewing the nature, conducting experiments in the laboratories, where observation is very useful. The ability to make good observation by pre-primary school learners also enables them to develop the other science process skills. Learners, especially younger children, need help in order to make good observations and this is mainly through the involvement of properly trained teachers. According to Harlen (2006), observation has a useful characterization of science including having information about many things around the world and using the senses as appropriate and safe: observation also involves the identity of similar and different things, establishing details and sequence, ordering observations.
In terms of hypothesis testing, the study hypothesized that there is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's observation skills. The chi-square test also called Pearson's chi-square test or the chi-square test was used to establish if there is a relationship between the two categorical variables. The Chi-Square test result was presented in Table 4.3.

**Table 4.3: Chi-Square Test results for relationship between teachers' level of training and the extent to which they stimulate children's observation skill**

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. C2-sided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>1.221</td>
<td>3</td>
<td>.748</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>1.234</td>
<td>3</td>
<td>.745</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>81</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Pearson Chi-Square value was 1.221 and p value of 0.748, which reveals that there was no statistically significant association between teachers' level of training and the extent to which they stimulate children's observation skill. This therefore means that the hypothesis that there is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's observation skills was rejected. This is because the p value of 0.748 was far above the minimum 0.05 alpha value for the result to have statistical significance. The findings of this study supports the findings in a study conducted by Miles (2010), it was reported that there was no significant relationships between stimulation of basic science process skills and how pre-service teachers stimulate the skills. This findings was supported by Mutisya et al. (2013) who emphasized that teachers should understand science process skills cognitively to make their learners gain these skills at the desired level.
4.3 Relationship between Teachers Training and extent to which they stimulate Children's Classification Skills

Objective two of the study was to establish the relationship between teachers' level of training and the extent to which they stimulate preschool learners' classification skills. To answer this question, the correlation test was done on pre-primary school teachers' level of training against the extent to which they stimulate children's classification skills by preschool learners and Table 4.4 presents the finding.

Table 4.4: Proportion of teachers by Level of Training and level of stimulation of children's classification

<table>
<thead>
<tr>
<th>Level of Training</th>
<th>Classification skill Stimulation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Untrained</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Certificate</td>
<td>30</td>
<td>9</td>
</tr>
<tr>
<td>Diploma</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>Degree</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>54</strong></td>
<td><strong>27</strong></td>
</tr>
</tbody>
</table>

Table 4.4 shows that majority of teachers with certificate 30 (76.9%) and Diploma 15 (57.7%) had high ability of stimulating children's classification skills as compared to untrained teachers which had very minimal difference of 8 (57.1 %) with high ability and 6 (42.9) with low ability.

The study also hypothesized that there is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's classification skills.
The chi-square test also called Pearson's chi-square test or the chi-square test was used to establish if there is a relationship between the two categorical variables. The Chi-Square test result is presented in Table 4.5.

**Table 4.5: Chi-square test results for relationship between teachers' level of training and extent to which they stimulate children's classification skills.**

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>3.610*</td>
<td>3</td>
<td>.307</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>3.660</td>
<td>3</td>
<td>.301</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>81</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Pearson Chi-Square value was 3.610 and p value of 0.307, which reveals that that there was no statistically significant association between teachers' level of training and the extent to which they stimulate children's classification skills. This therefore means that the hypothesis that there is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's classification skills was rejected. This is because the p value of 0.307 was far above the minimum 0.05 alpha value for the result to have statistical significance. Results for the relationship between the teachers' level of training and the extent to which teachers stimulate classification process skill was not significant (p-value=.307) statistically. In a study by Jack,G.,U(2013), On Determination of the relations between undergraduate student's Awareness levels Regarding Their scientific Process skills and Application potentials. It was detected from the findings obtained that there was no significant relationship on student-teachers average score in the skill of classification process skill in their awareness level and application potentials. The cause of
this situation in the students teachers may be the fact that the examination systems consists of definitions, memorization and rules that promote solving verbal and numerical problems speedily without understanding.

4.4 Relationship between Teachers Training and extent to which they stimulate

Children's Measurement Skills

The science process skill of measuring is just a special case of observing. Objective three of the study was to establish the relationship between teachers' level of training and the extent to which they stimulate preschool learners' measuring skills. To answer this question, the correlation test was done on pre-primary school teachers' level of training against the extent to which they stimulate children's measuring skills by pre-primary school learners and Table 4.6 presents the findings.

<table>
<thead>
<tr>
<th>Level of Training</th>
<th>Measurement skill Stimulation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Untrained</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Certificate</td>
<td>23</td>
<td>16</td>
</tr>
<tr>
<td>Diploma</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>Degree</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>36</td>
</tr>
</tbody>
</table>

The findings revealed that 9 (64.3%) of untrained teachers and 23 (60.0%) of teachers with certificate level of education had high ability of stimulating children's measurement skills as compared to 15 (57.7%) with Diploma level of education who had low ability of stimulating
children's measurement skills. According to Adetula (1981), there is importance in measuring, as it is applicable in nearly every aspect of scientific process and its application ranging from relatively simple to complex measurements, which also involves evaluation and value judgment.

In pre-primary schools, learners are expected to compare and order objects through weight, length, area, and volume, in measuring learners. On the other hand, there are also measuring properties of objects or events by using non-standardized and standardized units of measuring volume, mass, weight, temperature, area, length, and time, using appropriate units and appropriate measuring instruments. Teachers have undertaken the measurements themselves by use of inappropriate approaches that do not stimulate children's measurement skills.

The study further carried a Chi-Square test to find whether the hypothesis that there is a relationships between the level of teachers training and the extent to which they stimulate pre-primary school children's measurement skills. Table 4.7 presents the findings.

Table 4.7: Chi-Square Tests results for relationship between teachers' of Level of Training and the extent to which they stimulate children's Measurement skill

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>4.065^3</td>
<td>3</td>
<td>.255</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>4.811</td>
<td>3</td>
<td>.186</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>81</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
As shown in Table 4.7, the Pearson Chi-Square value was 4.065 and p value of 0.255, which reveals that there was no statistically significant association between teachers' level of training and the extent to which they stimulate children's measurement skills. This therefore means that the hypothesis that there is a relationship between the level of teacher's training and the extent to which they stimulate pre-primary schoolchildren's measurement skills was rejected. This is because the p value of 0.255 was far above the minimum 0.05 alpha value for the result to have statistical significance. Results for the relationship between the teachers' level of training and the extent to which teachers stimulate measurement skill was not significant (p-value=0.307) statistically. The findings of the study supports the findings of a study by Isik and Nakiboglu (2011) who reported that most of the pre-primary school teachers do not know how to develop science process skills of children in classroom environment. The obtained results showed that when Pre-primary school teachers understand measurement science process skill well, they feel more efficient to stimulate this skill.

4.5 Relationship between Teachers Training and the extent to which they stimulate Children's Communication Skills

Communication is the second basic science process skills. Objective four of the study was to establish the relationship between teachers' level of training and the extent to which they stimulate preschool learners' communication skills. To answer this question, the correlation test was done on pre-primary school teachers' level of training against the extent to which they stimulate children's communication skills by pre-primary school learners and Table 4.8 presents the findings.
Table 4.8: Proportion of teachers by Level of Training and stimulation of children's Communication skills

<table>
<thead>
<tr>
<th>Level of Training</th>
<th>Communication Skill</th>
<th>Stimulation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Untrained</td>
<td>4</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Certificate</td>
<td>20</td>
<td>19</td>
<td>39</td>
</tr>
<tr>
<td>Diploma</td>
<td>14</td>
<td>12</td>
<td>26</td>
</tr>
<tr>
<td>Degree</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>39</strong></td>
<td><strong>42</strong></td>
<td><strong>81</strong></td>
</tr>
</tbody>
</table>

As shown in Table 4.8, the findings revealed that 10 (71.4%) of untrained teachers had low ability of stimulating children's communication skills as compared to 20 (51.3%) of teachers with certificate level of education and 14 (53.8%) with Diploma level of education who had high ability of stimulating children's communication skills. Preschool learners have to communicate in order to share their observations with the teachers and the communication must be clear and effective if their teachers are to understand the information.

One pre-primary school teacher had this to say:

> Preschool learners can communicate their observations verbally, in writing, or by drawing pictures. Other methods of communication that are often used in science include graphs, charts, maps, diagrams, and visual demonstrations (Preschool Teacher, Roret Zone).

The study also carried a Chi-Square test to find whether the hypothesis that there is a relationship between the level of teachers training and the extent to which they stimulate...
pre-primary school children's communication skills could be accepted. Table 4.9 presents the findings.

**Table 4.9: Chi-Square Tests results for relationship between teachers' Level of Training and the extent to which they stimulate children's Communication Skills**

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>2.643</td>
<td>3</td>
<td>.450</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>2.725</td>
<td>3</td>
<td>.436</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>81</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In Table 4.9, the Pearson Chi-Square value was 2.643 and p value of 0.450, which reveals that there was no statistically significant association between teachers' level of training and the extent to which they stimulate children's communication skills. This therefore means that the hypothesis that there is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's communication skills was rejected. This is because the p value of 0.450 was far above the minimum 0.05 alpha value for the result to have statistical significance. The finding of this study supports the results of some of the previous studies conducted by Chan.2002: Padilla and okey, 1983. Which showed that pre-service teachers may use communication process skill in the classroom but may be not be aware of the use of communication into the science process skills and lack the knowledge of science terminology? This might be because of lack of content knowledge due to curriculum that emphasized theoretical work.

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4.6 Relationship between Teachers training level and extent which they stimulate

Children's Inferring Skills

In the context of this study, inferences are explanations or interpretations that follow from the observations. Objective five of the study was to establish the relationship between teachers' level of training and the extent to which they stimulate preschool learners' inferring skills. To answer this question, the correlation test was done on pre-primary school teachers' level of training against the extent to which they stimulate children's inferring skills by preschool learners and Table 4.10 presents the findings.

Table 4.10: Proportion of teachers by Level of Training and stimulation of children's Inferring Skills

<table>
<thead>
<tr>
<th>Level of Training</th>
<th>Inferring Skill Stimulation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Untrained</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Certificate</td>
<td>25</td>
<td>14</td>
</tr>
<tr>
<td>Diploma</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>Degree</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>37</td>
</tr>
</tbody>
</table>

Table 4.10 shows that 11 (78.6%) of untrained teachers had low ability of stimulating children's inferring skills as compared to 25 (64.1%) of teachers with certificate level of education and 14 (53.8%) with Diploma level of education who had high ability of stimulating children's inferring skills.

A Pre-primary school teacher made the following remark:
When preschool learners are able to make inferences, and interpret and explain events around them, then they have a better appreciation of the environment around them due to inference that is interpreting an observation (Preschool Teacher, Tebesonik Zone)

The study also carried a Chi-Square test to find whether the hypothesis that there is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's inferring skills could be accepted. Table 4.11 presents the findings.

Table 4.11: Chi-Square Test for Relationship between teachers' Level of Training and extent to which they stimulate Children's Inferring Skills

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Df</th>
<th>Asymp. Sig. (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>9.292</td>
<td>3</td>
<td>.026</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>10.326</td>
<td>3</td>
<td>.016</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>81</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pearson Chi-Square value was 9.292 and p value of 0.026, which reveals that that there was statistically significant association between teachers' level of training, and the extent to which they stimulate children's inferring skills. This therefore means that the hypothesis that there is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's inferring skills was accepted. This is because the p value of 0.026 was below the minimum 0.05 alpha value for the result to have statistical significance. The findings of this study agrees with the assertions by Burak (2009).
Afalobi (2002) and Commenyras (2003) who noticed positive significant relationships between teachers Training and the extent to which they stimulate inference process skills.

4.7 Relationship between Teachers level of training and the extent to which they stimulate Children's predicting Skills.

Making predictions by preschool learners entails making one to guess about the outcomes of future events. Objective six of the study was to establish the relationship between teachers' level of training and the extent to which they stimulate pre-primary school learners' predicting skills. To answer this question, the correlation test was done on pre-primary school teachers' level of training against the extent to which they stimulate children's predicting skills by preschool learners. Table 4.12 presents the findings.

Table 4.12: Proportion of teachers by Level of Training and the extent to which they stimulate children's Prediction Skills

<table>
<thead>
<tr>
<th>Level of Training</th>
<th>Prediction skill Stimulation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Untrained</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Certificate</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td>Diploma</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Degree</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
<td>38</td>
</tr>
</tbody>
</table>

Table 4.12 shows that 9 (64.3%) of untrained teachers had low ability of stimulating children's prediction skills as compared to 24 (61.5%) of teachers with certificate level of education and 13 (50.0%) with Diploma level of education who had high ability of stimulating children's prediction skills.
During classroom observation schedule, a pre-primary school teacher had this to say:

*The ability of preschool learner to make predictions about future events allows us teachers to interact successfully with them and makes them 10 interact with environment around them. Prediction is based on both good observation and inferences made about observed events (Pre-primary school Teacher, Roret Primary).*

The study also carried a Chi-Square test to find whether the hypothesis that there is a relationship between the level of teachers' training and the extent to which they stimulate pre-primary school children's prediction skills could be accepted. Table 4.13 presents the findings.

**Table 4.13: Chi-Square Test results for relationship between teachers’ Level of Training and extent to which they stimulate Children's Prediction Skills**

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>2.922</td>
<td>3</td>
<td>.404</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>2.946</td>
<td>3</td>
<td>.400</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>81</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As shown in Table 4.13, Pearson Chi-Square value was 2.922 and p value of 0.404, which reveals that there was no statistical significance between teachers' level of training and the extent to which they stimulate children's prediction skills. This therefore means that the hypothesis that there is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's prediction skills was rejected. This is
because the p value of 0.404 was above the minimum 0.05 alpha value for the result to have statistical significance. The findings of this study indicates that pre-primary school teachers focused a lot on children's' correct answers instead of allowing children to practice this important skill and learn through mistakes. Since most of Pri-primary school teachers focused on the correct answer children were also anxious to predict the correct answer. Pre judging an outcome of any prediction according to Ward et al (2008) is problematic because it promotes the idea that there is only one correct answer. Fullen (2007) in his study argued that governments cannot depend on individual teachers capacities to bring about change, the process has to be propelled with high quality teaching and training of teachers.

4.8 Relationship between Teachers level of training and overall stimulation of science process Skills.

Objective seven of the study was to establish the relationship between teachers' level of training and the extent to which they stimulate preschool learners' total simulation ski IIs. To answer this question, the correlation test was done on preschool teachers' level of training against the extent to which they stimulate overall children's science process skills and Table 4.14 presents the findings.

**Table 4.14: Proportion of Teachers' by Level of Training and the overall stimulation of science process Skills.**

<table>
<thead>
<tr>
<th>Level of Training</th>
<th>Total Stimulation</th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Low</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Untrained</td>
<td>7</td>
<td>7</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Certificate</td>
<td>27</td>
<td>12</td>
<td></td>
<td>39</td>
</tr>
<tr>
<td>Diploma</td>
<td>15</td>
<td>11</td>
<td></td>
<td>26</td>
</tr>
<tr>
<td>Degree</td>
<td>2</td>
<td>0</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>51</strong></td>
<td><strong>30</strong></td>
<td></td>
<td><strong>81</strong></td>
</tr>
</tbody>
</table>

48
Table 4.14 shows that 7 (50.0%) of untrained teachers had low ability and 7 (50.0%) had high ability of stimulating children's total simulation skills as compared to 27 (69.2%) of teachers with certificate level of education and 15 (57.7%) with Diploma level of education who had high ability of stimulating children's total stimulation skills.

To find whether the hypothesis that there is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's prediction skills could be accepted, the study also carried a Chi-Square test and Table 4.15 presents the findings.

**Table 4.15: Chi-Square Test on Relationship between Level of Training and stimulation of overall Children's process Skills**

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi -Square</td>
<td>3.152</td>
<td>3</td>
<td>.369</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>2.804</td>
<td>3</td>
<td>.283</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>81</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As shown in Table 4.15, Pearson Chi-Square value was 3.152 and p value of 0.369, which reveals that there was no statistical significance between teachers' level of training and the extent to which they stimulate children's total stimulation skills. This therefore means that the hypothesis that there is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's total stimulation skills was rejected. This is because the p value of 0.369 was above the minimum 0.05 alpha value for
the result to have statistical significance. The findings of this study support findings of a
similar study in South Africa done by Ambross (2011) on implementation of science process
skills for Grades 4 to 7 learners in Natural Science in South African school. It found out lack
of teacher ability to stimulate natural science process skills and how to go about teaching
these skills is a big obstacle in science learning. This concern was not only manifested in
South Africa. Murphy (2009) concluded that one of the major issues in primary science
teaching might be attributed to the teachers' lack of understanding on how to stimulate
science process skills. This could be because of severe lack of appropriate professional
development in this area of science process skills during training.
CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction
This chapter focuses on the summary of the findings, conclusion, as well as the recommendations based on the study objectives. The chapter also gives policy recommendations and suggestions for further research.

5.2 Summary
The results were presented in tables and figures. In terms of demographic information, the study focused on gender, type of school, training status, and level of experience. The questionnaire and classroom observation items were first analyzed descriptively and inferentially. Out of all the (86) questionnaires distributed and classroom observation, 81 questionnaires which is (94.2%) were properly filled and returned, 4 (5.8%) were not returned. Science process skills were categorized into observation, classification, communication, measuring, inferring, and predicting.

5.2.1 Teachers' Level of Training and the extent to which they stimulate Pre-Primary School Children's Observation Skills
From the study, teachers who had either certificate or diploma level of training had higher 21 (53.8%) and 17 (65.4%) ability of stimulating children's observation skills as compared to untrained teachers which did not show any difference (7). Observation skill is the most fundamental science process skill. This is because as pre-primary school learners observe objects and events using all the five senses, they learn about the world around them. In testing the hypothesis, the Pearson Chi-Square value was 1.221 and p value of 0.748, which
reveals that there was no significant relationship between teachers' level of training and the extent to which they stimulate children's observation skill. This therefore means that the hypothesis that there is a relationship between the level of teacher's training and the extent to which they stimulate pre-primary school children's observation skills was rejected. This is because the p value of 0.748 was far above the minimum 0.05 alpha value for the result to have statistical significance.

5.2.2 Teachers' Level of Training and the extent to which they stimulate Pre-Primary School Children's Classification Skills.

In summary, the Pearson Chi-Square value was 3.610 and p value of 0.307, which reveals that there was no statistically significant association between teachers' level of training and the extent to which they stimulate children's classification skills. This therefore means that the hypothesis that there is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's classification skills was rejected. This is because the p value of 0.307 was far above the minimum 0.05 alpha value for the result to have statistical significance. Results for the relationship between the teachers' level of training and the extent to which teachers stimulate classification process skill was not significant (p-value= .307) statistically.

5.2.3 Teachers' Level of Training and the extent to which they stimulate Pre-Primary School Children's- Measurement Skills.

The study revealed that 9 (64.3%) of untrained teachers and 23 (60.0%) of teachers with certificate level of education had high ability of stimulating children's measurement skills as compared to 15 (57.7%) with Diploma level of education who had low ability of stimulating
children's measurement skills. In the hypothesis testing, Pearson Chi-Square value was 4.065 and p value of 0.255, which reveals that there was no significant relationship between teachers' level of training and the extent to which they stimulate children's measurement skills. This therefore means that the hypothesis that there is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's measurement skills was rejected. This is because the p value of 0.255 was far above the minimum 0.05 alpha value for the result to have statistical significance. Results for the relationship between the teachers' level of training and the extent to which teachers stimulate measurement skill was not significant (p-value=.307) statistically.

### 5.2.4 Teachers Level of Training and extent to which they stimulate Pre-Primary School Children's Communication Skills.

In summary, 10 (71.4%) of untrained teachers had low ability of stimulating children's communication skills as compared to 20 (51.3%) of teachers with certificate level of education and 14 (53.8%) with Diploma level of education who had high ability of stimulating children's communication skills. In terms of hypothesis testing, the Pearson Chi-Square value was 2.643 and p value of 0.450, which reveals that there was no statistically significant association between teachers' level of training and the extent to which they stimulate children's communication skills. This therefore means that the hypothesis that there is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's communication skills was rejected. This is because the p value of 0.450 was far above the minimum 0.05 alpha value for the result to have statistical significance.
5.2.5 Teachers Level of Training and extent to which they stimulate Pre-primary School Children's Inferring Skills.

Results revealed that 1 (78.6%) of untrained teachers had low ability of stimulating children's inferring skills as compared to 25 (64.1%) of teachers with certificate level of education and 14 (53.8%) with Diploma level of education who had high ability of stimulating children's inferring skills. On hypothesis testing, Pearson Chi-Square value was 9.292 and p value of 0.026, which reveals that there was statistically significant association between teachers' level of training, and the extent to which they stimulate children's inferring skills. This therefore means that the hypothesis that there is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's inferring skills was accepted. This is because the p value of 0.026 was below the minimum 0.05 alpha value for the result to have significance relationship.

5.2.6 Teachers Level of Training and extent to which they stimulate Pre-Primary School Children's predicting Skill

The correlation test on preschool teachers' level of training against the extent to which they stimulate children's predicting skills by preschool learners revealed a Pearson Chi-Square value of 2.922 and p value of 0.404 which reveals that there was no statistical significance between teachers' level of training and the extent to which they stimulate children's prediction skills. This therefore means that the hypothesis that there is a
relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's prediction skills was rejected. This was because the p value of 0.44 was above the minimum 0.05 alpha value for the result to have statistical significance.

5.2.7 Teachers' Level of Training and the extent they stimulate overall Pre-primary school Children's science process Skills.

The findings revealed that 7 (50.0%) of untrained teachers had low ability and 7 (50.0%) had high ability of stimulating children's total simulation skills as compared to 27 (69.2%) of teachers with certificate level of education and 15 (57.7%) with Diploma level of education who had high ability of stimulating children's overall science process skills. On hypothesis testing, the Pearson Chi-Square value was 3.152 and p value of 0.369, which reveals that that there was no statistical significance between teachers' level of training and the extent to which they stimulate children's overall science process skills. This therefore means that the hypothesis that there is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's overall science process skills was rejected. This is because the p value of 0.369 was above the minimum 0.05 alpha value for the result to have significance relationship.

5.3 Conclusion

Science process skills are a necessary tool to produce and use scientific information, to perform scientific research, and solve problems. Physical and mental abilities through science process are needed for effective problem solving, individual and societal development. Science process skills are the competencies that empower pre-primary school children to gather and reason about information to make better sense of his World. One
evident implication of the findings concerns the teacher's training level in the science process skills, which was identified generally to be higher in stimulation of children's learning skills but was not statistically correlated to the same, as was evidence from Chi-Square tests. Pre-primary school teachers should have opportunities to learn about science process skills through some courses such as teaching method and research methods without teaching them under concept of science process skills.

Pre-primary school learners need to learn the difference between observations and inferences. They need to be able to differentiate for themselves the evidence they gather about the world as observations and the interpretations or inferences they make based on the observations. Observation is also one of the most important tools of science particularly in viewing the nature, conducting experiments in the laboratories, where observation is very useful. The ability to make good observation by pre-primary school learners also enables them to develop the other science process skills. Learners, especially younger children, need help in order to make good observations and this is mainly through the involvement of properly trained teachers. This study concludes that observation has a useful characterization of science including having information about many things around the world and using the senses as appropriate and safe: observation also involves the identity of similar and different things, establishing details and sequence, ordering observations. Specific studies on process skills in pre-primary schools are limited specifically on how teachers stimulate process skills.
On the relationship between teachers level of training and the extent to which they stimulate pre-primary school children's measuring skills. This study concludes from the findings that there is a lot of importance in measuring as it is applicable in nearly every aspect of learning and its application ranging from relatively simple to complex measurements that also involves evaluation and value judgment. However, there was no clear relationship between teachers' level of training and their ability to stimulate the children's measuring skills. In pre-primary schools, learners are expected to compare and order objects through weight, length, area, and volume, in measuring learners. On the other hand, there are also measuring properties of objects or events by using non-standardized and standardized units of measuring volume, mass, weight, temperature, area, length, and time, using appropriate units and appropriate measuring instruments. Teachers have undertaken the measurements themselves by use of inappropriate approaches that do not stimulate children's measurement skills.

Communication skills should be included in the early stages of teaching and studying science as it is a central aspect of scientific investigation. Communication is also necessary to be able to pass thought, ideas, research, findings learning, and instruction. This is through speech, writing, pictures, diagrams, graphs, and table. However, this study failed to establish a statistically significant association between teachers' level of training and the extent to which they stimulate children's communication skills. In terms of predicting skills, the children are able to identify a trend in a way that is tested. Children normally learn to do a comparison of what actually happens with what ought to have happened as per their wish, instead of accepting what happened without thinking about it. The study also failed to
establish a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's prediction.

Through inference, pre-primary school children can make conclusion based on reasoning or past experience including the process of concluding about the course of an observation. The process of direct object observation or events enables children to suggest something in interpreting and explaining things and activities. The skills of prediction and inferences indicated, the skill of inferences had been given preference while that of prediction had been ignored. This could happen especially where teachers felt incompetent to handle the prediction skill probably due to poor knowledge. This study bridged this gap by establishing a statistically significant association between teachers' level of training and the extent to which they stimulate children's inferring skills. The hypothesis test revealed that there is a relationship between the level of teachers training and the extent to which they stimulate pre-primary school children's inferring skills.

Despite the importance of science process skills in Kenya, there was no publication of any study regarding stimulation of science process skills in pre-primary schools despite numerous reports on acquisition of some science process skills at higher levels. This study therefore bridged this gap by establishing the importance of science process skill and the relationship between teacher's level of training and the extent to which they stimulate pre-primary school children's various science process skills.
5.4 Recommendations

5.4.1 Policy Recommendations

Based on the study findings, the following recommendations were made:

- Successfully integrating the science process skills with classroom activities and field investigations will make the learning experiences richer and more meaningful for pre-primary school learners.
- Pre-primary school teachers should have opportunities to learn about science process skills through some courses such as teaching method and research methods without teaching them under concept of science process skills.
- Based on the results it is strongly recommended that more attention is given to increasing the level of acquisition of science process skills of science pre-primary school teachers' through science teacher preparation programs and in service professional development programs.
- There is a need to review the ECD training to establish how effective it is in preparing skilled-trained science teachers. Early childhood training from universities to the certificate level is theoretical and examination focused preparing teachers for examination and not necessarily for skills appropriate for science instruction in pre-primary school classrooms.
- If anything is to be regarded as specific preparation for stimulation of science in Kenya's pre-primary schools priority must be given to teacher's strong foundation in process skills stimulation strategies.
5.4.2 Recommendations for Further Research

The following recommendations are made for further research:

- A study should be carried on mono culture pre-primary school learners to establish the way they respond to stimulation of process skills in science instruction as compared to multicultural school environment like the one this study obtained.

- A similar study should be carried in different Counties because this present study was completed using pre-primary schools within Bureti Sub County, further quantitative research is needed to verify the second findings and generalize to other pre-primary school teachers in other Counties.
REFERENCES

Nairobi: Institute of Policy Analysis and Research .


Appendix (I) Classroom Observation Schedule (COS)

The purpose of this classroom observation schedule is to collect data related to the stimulation of process skills in science teaching in pre-primary schools.

Please feel free and be honest as possible as they are no right or wrong answers in responding to this questionnaire.

Your responses will be treated with confidence and will only be used for the purpose of this study.

Respondent No .............

School

Section (A) Background Information

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<thead>
<tr>
<th>Gender: Male</th>
<th>Female</th>
</tr>
</thead>
</table>

<table>
<thead>
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<th>Diploma</th>
<th>Certificate</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level of education:</th>
<th>Degree</th>
<th>Diploma</th>
<th>Certificate</th>
</tr>
</thead>
<tbody>
<tr>
<td>KCSE</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Not completed Primary school</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of years served as a pre-primary school teacher

<table>
<thead>
<tr>
<th>1-5</th>
<th>6-11</th>
<th>11-15</th>
<th>16-20</th>
<th>20 andOver</th>
</tr>
</thead>
</table>

67
SECTION (B) Science process skills classroom observation schedule (COS)

To what extent do the teachers stimulate the use and development of science process skills during the lesson?

Place a (tick) in the box indicating how often you will observe each of the following

<table>
<thead>
<tr>
<th>NO</th>
<th>Items on basic science process skills</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Observation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Encourage children to use one or more of the senses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Encourage children to identify properties of an object I.e. shape, color, size and texture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Encourage use of indirect methods I.e. hand lenses thermometers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Encourage children to count, compare and measure.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Classifying</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Encourage children to identify properties useful for classifying Objects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Encourage children to groups’ objects by their properties/similarities.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Encouraging children to construct and use classification systems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Encouraging children to group objects by their differences.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Inferring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Encouraging children to suggest explanations for the events based on an observation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Encouraging children to distinguish properties of objects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Identify and specify observations to make generalizations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Identify relationships between objects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Measuring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Enable children to compare objects by length, area, weight, and volume.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Enable children to measure properties of objects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Enable children to measure events by using standardized units of measure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Enable children to measure volume, mass, weight, temperature, area, length using appropriate units and measuring instruments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Communicating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Encouraging children to construct charts, tables to transmit information.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Encouraging children to verbally ask questions and report observation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

68
3. Encouraging children to report results using tables and graphs

4. Encouraging children to learn from their experiences.

<table>
<thead>
<tr>
<th></th>
<th>Predicting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Encouraging children to forecast a future event based on experiences</td>
</tr>
<tr>
<td>2.</td>
<td>Encouraging children to make observations and communicate their experiences</td>
</tr>
<tr>
<td>3.</td>
<td>Encouraging children to state the outcome of a future event based on a pattern of evidence</td>
</tr>
<tr>
<td>4.</td>
<td>Encouraging children to use pattern in evidence to make conclusions</td>
</tr>
</tbody>
</table>
## Appendix (II) Questionnaire for Pre-Primary School Teacher

<table>
<thead>
<tr>
<th>NO</th>
<th>Questionnaire items science process skills</th>
<th>Never</th>
<th>sometimes</th>
<th>often</th>
<th>always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I organize classroom activities in which learners classify the observed science event</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I encourage learners to use communication learned information i.e to draw charts, symbols, graphs and diagrams</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>I organize activities in which my learners compare objects using standardized units of measure and suitable measuring instrument.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>I encourage my learners to predict future scientific events based upon their observation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>I give my learners many opportunities to observe scientific problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>I encourage my learners to give evidence and conclusion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## FREQUENCY OF STIMULATING PROCESS SKILLS

<table>
<thead>
<tr>
<th>SCIENCE PROCESS SKILLS</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NEVER</td>
</tr>
<tr>
<td><strong>OBSERVATION</strong></td>
<td></td>
</tr>
<tr>
<td>1. Identifying properties of an object i.e. shape, color, size and texture</td>
<td></td>
</tr>
<tr>
<td>2. Counting companions and measuring</td>
<td></td>
</tr>
<tr>
<td>3. Asks or draws the child’s attention to make observation</td>
<td></td>
</tr>
<tr>
<td>4. Prompts the child to observe</td>
<td></td>
</tr>
<tr>
<td><strong>CLASSIFICATION</strong></td>
<td></td>
</tr>
<tr>
<td>1. Encourages the child to group</td>
<td></td>
</tr>
<tr>
<td>2. Grouping objects by properties</td>
<td></td>
</tr>
<tr>
<td>3. Grouping objects by difference</td>
<td></td>
</tr>
<tr>
<td>4. Assists the child to sort or group</td>
<td></td>
</tr>
<tr>
<td><strong>INFERRENCE</strong></td>
<td></td>
</tr>
<tr>
<td>1. Suggesting explanation for areas based on observation</td>
<td></td>
</tr>
<tr>
<td>2. Identifying relationships between objects</td>
<td></td>
</tr>
<tr>
<td><strong>COMMUNICATION</strong></td>
<td></td>
</tr>
<tr>
<td>1. Encourages the child to talk about what they have seen</td>
<td></td>
</tr>
<tr>
<td>2. Use of charts</td>
<td></td>
</tr>
<tr>
<td>3. Reports results using tables and graphs</td>
<td></td>
</tr>
<tr>
<td>4. Displays the child’s work</td>
<td></td>
</tr>
<tr>
<td>5. Asks the child to say or report what they have observed</td>
<td></td>
</tr>
<tr>
<td><strong>PREDICTION</strong></td>
<td></td>
</tr>
<tr>
<td>1. Forecast a future event based on past experiences</td>
<td></td>
</tr>
<tr>
<td>2. Encourages the child to suggest what will happen</td>
<td></td>
</tr>
<tr>
<td>3. Children make observation and communicate their experiences</td>
<td></td>
</tr>
<tr>
<td><strong>MEASURING</strong></td>
<td></td>
</tr>
<tr>
<td>1. Compare objects by length, area, height</td>
<td></td>
</tr>
<tr>
<td>2. Measuring properties of objects</td>
<td></td>
</tr>
<tr>
<td>3. Encourages the child to measure</td>
<td></td>
</tr>
<tr>
<td>4. Shows the child how to measure</td>
<td></td>
</tr>
<tr>
<td>5. Prompts the child to measure</td>
<td></td>
</tr>
</tbody>
</table>
Appendix (III) Consent Form

My name is Kirui Kipronoh. I am a postgraduate student from Kenyatta university department of early childhood studies.

I am conducting a study on "Teachers training and stimulation of Science process skills in pre-primary school centers in Roret Division Kenya. The information is for academic purposes only

Procedures

If you agree to participate in the study I will ask you to fill out a questionnaire, secondly I will ask you to participate in a classroom observation schedule during your teaching sessions that will provide information on stimulation of process skills in science lesson. Your participation will take about 30 minutes.

Discomfort and risks

I do not anticipate any risks to study participants but you will be asked to fill a questionnaire and participate in a classroom observation schedule. If at any point you are uncomfortable with my observation, please let me know as soon as possible so that I can change what I am doing. Your participation in this study is voluntary if you choose not to participate or withdraw from the study at any time there will be no penalty and the relationship between you and the researcher will not be affected in any way.

Benefits

Although this study may have no direct benefit to you the possible benefit of your participation is your contribution to the researchers master's project and future recommendations in training pre-primary school teachers on stimulation of process skills at pre-primary school instruction.

Reward

If you agree to participate in this study, no reward will be provided.
Confidentiality

If you participate in this study your name will **not** be written down or recorded. Your initials will be written on the questionnaire and observation schedules. Neither your name nor the initials is be used in the presentation of this research to the others. Your name will not be used in this report. The report will talk about groups of teachers not about one person. The questionnaire and the observation schedules will be destroyed such that no information will link back to your questionnaire and observation schedules.

Contact information

If you have any question (s) about your rights as a participant in this research or if you feel you have been placed at a discomfort, you may contact the researcher on phone 0723-864-8270r **email:** kiruikipronoh@yahoo.com

Participant's statement

The above information regarding my participation in the study is clear to me. I have been given a chance to ask questions and my questions have been answered to my satisfaction.

Name of the Participant  Signature  Date

Name of the researcher  signature  Date
Appendix (IV) Research Permit

CONDITIONS

1. You must contact the County Education Office before embarking on your research.

2. Government Officers will not be interviewed.

3. No exceptions

4. Excavation, filling, and dumping of excavation material are subject to the approval of relevant Government Ministries.

5. You are required to submit at least four (4) copies of the research report.

RESEARCHER Signature

National Commission for Science, Technology & Innovation

Republic of Kenya