IMPACT OF INQUIRY METHOD ON PRE-SCHOOL CHILDREN'S ACHIEVEMENT IN SCIENCE ACTIVITIES IN IVETI DIVISION, KATHIANI SUB – COUNTY, MACHAKOS COUNTY, KENYA.

BY:

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A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF EDUCATION IN EARLY CHILDHOOD EDUCATION IN THE DEPARTMENT OF EDUCATIONAL COMMUNICATION AND TECHNOLOGY OF UNIVERSITY OF NAIROBI.

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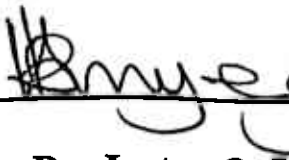
DECLARATION

This research project is my original work and has not been submitted for an award of degree in any other institution

Musembi Mutuku Kavoi

This research project has been submitted for examination with the approval of the Supervisor.



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DEDICATION

This document is dedicated to my dear and beloved wife, Collettah N. T. Musembi and my children; Faith, Gracious and Mercy for their constant prayers, encouragement, moral and financial support which kept me going.

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My sincere appreciation goes to my Supervisor Dr. Justus O. Inyega for his encouragement, scholarly guidance and constructive criticism from the beginning to the completion of the study. I also owe my gratitude to Mr. Odul Argwings the Kathiani District Education officer (D.E.O) and other education officers for allowing me to conduct this research in their area of jurisdiction. I thank all head teachers, pre-school teachers and parents of all Early Childhood Development Centres Iveti Division and whom I worked with during data collection. The success of this work is partly due to their co-operation and understanding. I also record appreciation to Mrs. Mulinge the Principal Kaewa secondary school for her patience and encouragement which gave me the strength to move on. Finally I acknowledge the support accorded to me by my colleague Mrs. Mirriam Mwanzia. May God bless you all.

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ACRONYMS AND ABBREVIATION

C.D.F.	Constituency Development Fund.
D.E.B	District Education Board
D.E.O	District Education Officer
E.C.E	Early Childhood Education
K.I.E	Kenya Institute of Education
F.B.O	Faith Based Organizations
K.C.P.E	Kenya Certificate of Primary Education
MOE	Ministry of Education
S.P.S.S.	Statistical Package for Social Sciences.

ABSTRACT

The purpose of this study was to investigate the impact of inquiry method on pre-schools children's achievement in science activities in Iveti Division, Machakos County. A quasi experimental research design was used to conduct the study. Eight pre-schools in Iveti Division, were sampled out of which four (4) were in the experimental group of pre-schools and four (4) in the control group. All the children, aged 5 – 6 years in both experimental group and control group of pre-schools were sampled. Pre-school science activities assessment was administered to the children in both groups of pre-schools, questionnaire for both head teachers and pre-school teachers and observation schedule for class activities were administered. The collected data was analyzed using frequencies, percentages, mean scores and standard deviations. Standard deviations, mean scores, t-scores and p-values were computed using statistical package for social sciences (SPSS) software. A two sample independent t-test was done to find out whether there was any statistical significant difference in children's achievement between the two groups. The findings revealed that the difference in achievement in science activities between children in control group and those in the experimental group was statistically significant $t_{(6)} = -7.879$, $P = .000$, two tailed). These findings suggests that the children who were taught science activities using both traditional methods and inquiry method perform better than children taught science activities using traditional methods only. The difference in achievement in science activities was due to the treatment (interventions) done to the experimental group of pre-schools. Inquiry method should therefore be used to compliment traditional methods in teaching science activities in pre-school.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Science is an area of study in which exact measurements, observations and calculations are used in attempt to understand the natural environment and solve societal questions and problems. In school, science prepares children to go out and explore various areas of study like pursuing Engineering courses and also in technology advancements. This helps them to have general appreciation of nature in the scientific aspect.

In 1996, the National Research Council defined science as a particular way of knowing about the world. They conceptualize science explanations as limited to those based on observations and experiments that other scientists can prove. Oguninyi (1992), view science as an organized body of knowledge and processes by which that knowledge is collected, analyzed, synthesized and disseminated.

Esther and Insler (2001), describe science as way of thinking as containing beliefs, curiosity, imaginations, reasoning and open mindedness. Science as a way of investigating involves experiments, observations and reasoning. According to him, it is better the process of obtaining information, testing and validating other than knowing the products of science. This therefore, explains why pre-school children should be included in the processes leading to acquisition of process skills. They need to learn how to observe, collect data, formulate hypothesis, conduct experiments and draw conclusions.

Teaching and learning should be based on constructing ideas that children do think about how their investigations relate to the ideas they are developing (Driver R et al 1986), learning science should be based on relating ideas, discovering new ideas and thinking of ways to put those ideas to use so as to benefit the environment.

According to Dewey (1966), children should develop intellectual tact and sensitivity to solve problems enquiring constantly in the classroom. This involves investigating, defining a problem, formulating hypothesis, and gathering data, interpreting data and arriving at a conclusion. He asserts that children learn concepts, principles, self direction, responsibility and social communication. It allows children to assimilate and retain information.

According to Chiapetta and Koballa (2006), inquiry learning helps children experience the excitement of finding out and not to memorize large vocabulary words. Mukachi (2006), concurs with him and notes that pre-school children can learn well, when instructional method used give them a chance to actively get involved in construction of knowledge and understand the content.

According to Colburn (2004), the expository methods of teaching used in schools is teacher centred, leaving little room for children's activities. This limits their participation in class and hinders critical thinking and creative problem solving in children at an early stage, projects, field trips, role play, group work and demonstration are also used to teach science in pre-school.

According to Chiapetta and Koballa (2006), project work is any unit of study or activity that involves investigation and solutions to problems that are carried out by children in school. It provides children with experimental opportunities resulting in active development of knowledge. Engagement in project work exposes children to a wide range of skills and competences such as collaboration, time management and planning (Chiapetta and Koballa 2006).

Research conducted by Changeywo (2000) indicated that science in primary schools is taught in overcrowded classrooms without adequate resources thus limiting the learning experiences. The research also noted the same scenario in public pre-schools. This situation encourages traditional method of teaching for example "talk and chalk" method, memorization and note – taking. This method reduces children to passive recipients of knowledge thus making science uninteresting, demotivating and uninspiring . Supporting this views Mukachi (2006) felt strongly that this makes science irrelevant and boring because pre-school children may not understand the process. Teachers should therefore, be concerned with the use of a variety of methods and resources which make teaching and learning interesting.

According to Otieno-Alego (1991), learners in junior schools displayed low competence in observations and prediction skills. This was attributed to the fact that the teachers who used traditional methods treat learners as passive recipients of knowledge hence denying them a chance to practice use of the process skills. The above views were supported by Asiago,

(2010), who felt that children in pre-schools are not given opportunities to develop science process skills when taught science activities using traditional methods.

Ongosi, 2007, further argued that use of less effective teaching methods by teachers led to children leaving school not having understood scientific concepts and not well prepared for other levels of learning. For example statistics from the D.E.O's office Kathiani District indicate that science in the District is not performed well at KCPE level. The results have remained at a mean score of 50 percent and below for the last six years. (2006 – 2011) as indicated in Table 1.1. shows the analysis of Primary School performance in National Science Examination.

Table 1.1: Analysis of Primary School Performance in National Science Examination in Iveti Division, Machakos County

	Schools /Years	2006	2007	2008	2009	2010	2011
1.	A	44.98	43.75	42.13	45.08	47.02	44.48
2.	B	41.96	49.95	49.06	49.52	50.22	49.97
3.	C	50.27	46.06	50.39	50.18	50.48	45.10
4.	D	50.32	48.86	49.34	44.21	49.43	47.45
5.	E	47.96	50.03	46.59	41.68	50.94	46.15
6.	F	42.30	38.06	30.24	34.05	46.64	48.67
7.	G	48.77	50.27	50.17	47.18	50.29	47.23
8.	H	50.39	44.69	46.36	49.84	46.09	50.53

Source: D.E.O's office Kathiani sub-county (2011)

From Table 1.1, it is evident that science in Iveti Division is generally not done well. It's mean score has been fifty percent (50%) and below for the last six years (2006-2011). This is a worrying trend which requires urgent intervention. It is worth noting that Pre-school

science activities lay a foundation for science taught in primary schools. However, there is no formal examinations that are conducted to determine how children transit from pre-schools to primary school. Children's performance in primary school science is likely to be influenced by the way children are prepared in pre-school science activities. It is worth noting that, what happens in preschool science activities may affect learning of science at higher levels. Children in pre-school do not sit for National Examinations as they transit to primary schools and yet there were no studies that have been conducted to determine children's achievement in pre-school science activities especially in Iveti Division, Machakos County. As a result this study was carried out to investigate the impact of inquiry method on children's achievement in science activities in pre-schools in Iveti Division, Machakos County.

1.2 Statement of the Problem

This study investigated the impact of inquiry method on children's achievement in science activities in pre-schools in Iveti Division, Machakos County.

1.3 Purpose of the the Study

The purpose of the study was to investigate the impact of inquiry method on pre-school children's achievement in science activities in pre-schools in Iveti division, Machakos county, Kenya.

1.4 Objectives of the Study

The study used the following objectives:-

a) To establish the influence of traditional methods on pre-school children's achievement in science activities.

b) To establish the impact of inquiry method on pre-school children's achievement in science activities.

c) To determine pre-school children's achievement in science activities when taught using traditional and inquiry methods.

1.5 Research Questions

This study would attempt to answer the following questions:-

a) How did traditional methods of teaching influence pre-school children's achievement in science activities?

b) How did inquiry teaching method impact on pre-school children's achievement in science activities?

c) To what extent did children taught using inquiry-based teaching method and those taught using the traditional methods of teaching perform in science activities.

1.6 Significance of the Study

The findings of this study may be used by curriculum planners and implementers to formulate strategies that would improve performance in pre-school science activities as well as in other levels. It may also help to mobilize parents and other stakeholders to participate in pre-school science activities. The findings may also be used by the ECE trainers and other officers for training for instructional strategies in science activities in pre-school especially planning for science activities. Lastly it can be used as a basis for further research, for other researchers interested in pedagogical issues in implementation of science curriculum in ECE.

1.7 Limitations of the Study

The study investigated the effect of inquiry method on pre-school children's achievement in science activities. There are other extraneous variables which may influence performance but were not investigated for example motivation as a result of incentives from either the parents or teachers may add interest to the learner, thus influence their performance (Emmer, Everson& Anderson 2000). Children from educated and high socio economical status are more adequately prepared for school and their parents impart a positive view of schooling which may positively influence their achievement (Ezewu 1990). The study was conducted in public pre-schools in rural set-up, therefore generalization of the findings is limited in that they cannot be generalized to all pre-schools in Kenya.

1.8 Delimitations of the Study

The study was carried out in eight pre-schools in Iveti Division of Kathiani sub-county, Machakos County, Kenya. The target population was eight pre-school teachers, eight head teachers, and two hundred and forty eight pre-scholars from selected pre-schools. The topics that were covered in this study were floating and sinking and filling and emptying. The study focused on the effect of inquiry method on pre-school children achievement on science activities.

1.9 Basic Assumptions of the Study

In this study, the following assumptions were made:-

a) The selected pre-schools had appropriate teaching and learning resources.

b) The ECE teachers were academically and professionally qualified to teach pre-school science.

c) All the sampled pre-schools had covered syllabus at the same level by the time the study started.

1.1.0 Definition of key terms

Achievement	Refers to outcome of learning
Children	Refers to pre-school children.
Constructivism	As to a way of knowing where children construct knowledge from the immediate environment.
Inquiry- Method	Refer to a method of teaching where the teacher allows learners to study science through observation, hypothesis formulation designing their own experiment, discussing their finds and communicating their findings.
Performance	Outcome of learning
Pre- School	Education setting serving children aged 3-6 years before joining primary school.
Science	Organized knowledge obtained by observing and testing of facts about physical world, natural laws and society.
Traditional Method	Obtaining knowledge through memorization, note taking and "talk and chalk".

1.5.1 Organization of the Study

The presentation of this study is organized into five Chapters:

Chapter one deals with introduction, background of the study. Statement of the problem, purpose and objectives of the study. There was also research questions, significance of the study, delimitations of the study, limitations of the study, assumptions of the study and definition of key terms.

Chapter two deals with literature review. In this there was introduction, science education, inquiry – based learning of science in pre-schools, science teaching in pre-schools, assessing children's achievement in science, theoretical framework and conceptual framework.

Chapter three was on methodology. This chapter contains introduction, research design, sample size and sampling procedure, research instruments (assessment schedule, observations check-list and questionnaire), validity and reliability of instrument, Data collection and analysis procedures.

Chapter four comprises of data analysis of the study findings as per the objectives. It forms the core of the study as it enables the researcher achieve the objectives of the study.

Chapter five, comprises of summary of findings, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter discusses a review of related literature. Its focus was on science education, learning pre-school science using inquiry approach, science teaching in pre-schools, assessment of children achievement in science activities, theoretical and conceptual frame works of the study.

Science is an area of study in which exact measurements, observations and calculations are used in an attempt to understand the natural environment and solve societal questions and problems. In school, science prepares children to go out and explore various areas of study like pursuing Engineering courses and also in technology advancements. This helps them to have a general appreciation of nature in its scientific aspect.

For the teaching of preschool science to be successful, proper pedagogical approaches need to be used to encourage children to learn science that was similar to what practicing scientist work (Mukachi 2006). A scientist works by raising questions on his area of study and make references on investigative strategies, tools to use in the study and identifies analysis procedures to use. The use of inquiry based method of instruction helps children to learn the science activities mentioned above.

2.1 Science Education

In 1996 the National Research Council defined science as a particular way of knowing about the world. They conceptualize science explanations as limited to those based on observations and experiments that other scientists can prove. Oguninyi (1992) views science as an organized body of knowledge and processes by which that knowledge is collected, analyzed, synthesized and disseminated. This means that other than the knowledge of science, the process skills and the methods used to derive are of tantamount importance. The above definitions outlines three components of scientific enterprise; knowledge of science theories, principles and explanations about the natural phenomena and the skills used to acquire scientific facts, gather data and pass the information to school children.

Chiapetta and Koballa (2006) view science as the study of nature in an attempt to understand it and form an organized body of knowledge that has predictive power and application in society. They outlined the four dimensions of science recognized by scientists as science as a body of knowledge, science as a way of thinking, science as a way of investigating and science and its interaction with technology and society. Ongosi (2007) defines science as a body of knowledge as consisting of facts, concepts, principles and laws, theories and explanatory models for natural phenomena.

Esler and Esler (2001) describe science as away of thinking as containing beliefs, curiosity, imagination, reasoning and open mindedness. Science as a way of investigating involves experiments, observation and reasoning. According to them its better to understand the process of obtaining information testing and validating other than knowing the product of

science. This therefore explains why pre-school children should be included in the processes leading to acquisition of process skills. They need to learn how to observe, collect data, formulate hypothesis, conduct experiments and draw conclusions. They also indicate that through experimentation, ideas can be confirmed and wrong beliefs discarded.

KIE (2003), indicated in their guidelines to preschool leaders that the processes associated with science and inquiry are observing, inferring, hypothesizing, predicting, measuring and experimenting. Critical thinking skills require children to apply information to the new situation. Through observation, data and information are gathered and organized to make sense. The knowledge formed by scientists is the result of wide observations that head to concepts, principles and theories, (Chiappetta and Koballa 2006).

KIE (2003) put the preschool science curriculum into three dimensions; body of knowledge associated with science, process and procedures used to develop the body of knowledge and the attitude and ideas which guide scientists in the work.

Teaching and learning should be based on constructing ideas that children do think about, how their investigations relate to the ideas they are developing. (Driver R et al 1986) learning science should be based on relating ideas, discovering new ideas and thinking of ways to put those ideas to use so as to benefit the environment.

In concluding the above discussion one can say that knowledge without process is mere cramming or memorization which is easily forgotten and process without knowledge

becomes skills acquired with no purpose. It is therefore important to embrace a curriculum that embraces on all the dimensions of teaching science in preschool.

2.2 Learning Pre-schools Science using Inquiry Method

The inquiry method and problem solving teaching was traced back to Dewey (1966). The Learner should develop intellectual tact and sensitivity to solve problems enquiring constantly in the classroom. According to (Dewey) inquiry method involves investigating, defining a problem, formulating hypothesis and gathering, interpreting data and arriving at a conclusion. He asserts that children learn concepts, principles, self direction, responsibility and social communication. It allows learners to assimilate and retain information.

Chiapetta and Koballa (2006) defined inquiry method as the active process involved in scientific thinking, investigating and the instruction of knowledge inquiry. Oriented instruction will scientifically engage children in investigating aspects of science. According to Esler and Esler (2001) suggested that, inquiry was a set of behaviours involved in the struggle for human beings for reasonable explanations of occurrences about which they are curious. Inquiry therefore involves activity and skills in the active search for knowledge to satisfy this curiosity. German (1991) explained inquiry based learning as allowing questions and natural curiosity to guide instruction and learning. Children will learn by conducting own investigations on their areas of interest according to German.

On the other hand Kauchak and Eggn (1998) view inquiry as a process that gathers facts through observations and uses them to solve problems. It gives children ability to define problems, gather data to solve problems and develop their order and critical thinking ability.

Vygotsky (1962) explains that, inquiry approach involves a zone of proximal development in which the teacher initiates and leads children to work around structured projects that require solutions. This portrays the teacher as a facilitator. According to Kerero (2002) in his research on acquisition of science concepts and skills by Kenyan primary school children, inquiry based learning is an open learning strategy where the teacher facilitates without prescribing the outcome. This gave the children a chance to think of the results and gave meaning.

Having been developed in 1960's, inquiry method was due to a perceived failure of the traditional forms of instruction. Chiappetta and Koballa (2006) defined it as an active learning where progress of learners is assessed by how well they develop experimental analytical skills rather than how much they know in terms of knowledge. According to the National Research Council (1996) inquiry method gives children an opportunity to understand better the process used and resulting new knowledge in support of the view. The most authentic and powerful pedagogy Colburn (2004) is one that focuses on the identification, analysis and resolution of immediate problems in the children's world. This was linked to inquiry based learning where children identify problems collect data analyze it and come up with a conclusion which was a solution to the problem.

2.3 Science Teaching in Pre-school

The fundamental goal of education is to prepare and equip children to be happy and useful members of Kenya. This is through acquiring the necessary knowledge and skills required for national development as well as facilitating acquisition of positive attitudes towards

science. (Ministry of Education, 2003). The Kenya preschool science syllabus by KIE 2003 refers to the basic concepts and content like weighing measurements, force, solubility, sinking and floating which enhance children's understanding of natural environment. The curriculum puts emphasis on inquiry method which includes experiments and observations of phenomena, event and properties of things they meet in life.

This approach empowers children to actively participate in their learning and enhance their attitude towards science (Jenkins 1989). For science education to be effective it is therefore worthy noting that the science process skills must be used in teaching.

The enquiry method of teaching science puts emphasis to active and meaningful learning and de-emphasizes the rote learning of the content. According to Mcclelland (1985) rote learning forms no links with the content but with itself and has no ability to help further since it is learnt by heart. Meaningful learning means extending what is already known to what can be learned. Chiapetta and Koballa (2006) asserted that inquiry learning helps children experience the excitement of finding out and not have to memorize large vocabulary words.

Mukachi (2006) concurs with her and notes that pre-school children can learn well when instructional methods used give them a chance to actively get involved in construction of knowledge and understand the content. This is the best way of learning and developing science process skills.

According to colburn (2004), the expository methods of teaching used in schools are teacher centered leaving little room for children's activities. This limits their participation in class and hinders critical thinking and creative problem solving in children at an early stage. Projects, field trips, role play group work and demonstration are also used to teach science in pre-school.

Chiapetta and Koballa (2006), define project work as any unit of study or activity that involves investigation and solutions to problems that are carried out by children in pre-school. It provides children with experimental opportunities resulting in active development of knowledge. Engagement in project work exposes children to a wide range of skills and competencies such as collaboration, time management and planning (Chiapetta and Koballa 2006).

Pestalozzi, Maria montessori and Dewey, Psychologists cum educators cited field trips as providing children with opportunities to observe directly and to have a personal experience of places visited. The method encourages development of the observations and inquiry mind. It also enables children to employ various senses in their learning for instance sight, touch and smell among others. Group work encourages sharing of instructional materials and gave children an opportunity to participate actively to enhance their interest in subjects and promote a sense of responsibility. It promotes both collaborative and cooperative learning.

As per Changeiywo (2000), science in primary schools is taught in over crowded classrooms without adequate resources thus limiting the learning experience. The researcher also noted the same scenario in public pre-schools. He noted these encouraged traditional methods of teaching like lectures, memorizations, note taking and demonstration.

Stuart and Henry (2002), explain lecture method as a process of delivering verbally a body of knowledge according to pre-learned skills. It is used in showing the connection between theories and practice and re-emphasizing main points. This methods requires a high attention span which pre-school children did not have. Kathure (2011) argue that, in addition to teaching pre-school children science activities using traditional teaching methods, the children should also be involved in conducting their own investigation during the learning process of science activities in pre-schools.

Demonstration is presenting materials visually and audibly to children. It involved theories that seeing and hearing only impresses learners but a combination of the two makes a lasting impression. Practical work experience is essential for effective mastery of skills and concepts in science. (Esler and Esler, 2001). This makes the demonstration method in appropriate for teaching science in pre-school.

2.4 Assessing Children's Achievements in Science Activities

Every school aims at promoting children's achievements in all activities. (KIE 2003). As per Wiggins (1993) assessment is the direct measure of children's achievement. Teachers are supposed to regularly find out their children's progress in learning and how well objectives

are met. Chiapata and Kobaila (2006) say that, assessment is more than testing and giving grades. For them assessment is the guide to what is taught and learnt.

National research council 1996 asserted that, assessment must provide children with ability to inquire and reason scientifically, to use science, make decisions that are both personal and societal related to communicate effectively about science matters. For them children are active participants in the assessment.

Haggert(2000) said traditional methods of assessment involving paper and pen tests are not adequate since they provided information about what children did not know rather than what they knew. Effective science teachers know that well constructed assessments would serve many purposes. They could improve instructional practices, reinforce learning outcomes to determine if standards had been achieved and assessing learner understanding of knowledge and skills Mukangu (2008) explained two broad types of assessment. These were formative and the summative. Formative was whereby formal and informal observations are used by way of performance tasks, checklists, interviews, drawings and portfolios. Another school of thought Okieth and Asiachi (1992) explains formative assessment as the course of learning process, while cumulative comes at the end of the course program. To make observation as an effective assessment tool, science teachers needed to have criteria to set a determinant to find out if children work has met all set objectives. Mostly teachers use a checklist for this purpose.

According to (Chiapetta and Kabalia, 2006) the outcomes of science learning is assessed using performance task. This is the process in which child's conceptual understanding may

be tested by observing him or her perform a task. For instance to determine what happens when air is introduced in soapy water. The teacher was to develop a rubric a head of time based on the teachers objectives. The teacher should prove that children have expressed the newly acquired knowledge and not just what they already knew.

An interview is an effective way of finding out what the children are thinking and learning in a science classroom Martin et al (1999). He also noted that, the teacher can ask oral open ended questions before and after instructions. The children response will tell the teacher what they are thinking and the understanding of the concept they are dealing with. The teacher is then able to determine if remedial is needed or if there is need to change the method.

In drawing, they can be told to draw what they have leant. Drawing were pre and post unit to show different concepts acquisition. For example uses of water before and after the lesson. Chiapeta and Kobalia (2006), explain that portfolio is a useful cumulative assessment tool. It is basically a collection of children's work throughout the term. It involves children in the process of assessment and permute assessment of the whole child rather than specific test scores and assignments.

In conclusion the assessment tools discussed provide a broad spectrum of information on a wide range of outcomes that is not used on a traditional paper and a pencil tests. The research has shown that the use of these methods highlights the role played by formative assessment in providing feedback that will improve the effectiveness of learning. Preschool teachers need therefore to employ a variety of assessment tools in the science teaching

since traditional paper and pencil methods alone was are not adequate. Parents are also communicated to about the assessment carried out.

2.5 Theoretical Framework of the Study

The theoretical frame work of this study was based on constructivists theory which was active learner participation. This theory was brought up by John Dewey's and Derome Brunners philosophies. Constructivism emphasized that learners must be engaged in meaningful activities. Dewey's Philosophy is ideal in the inquiry based learning in that children are given or come up with problems of investigation to get a solution. Learning is an active process in which the learners have to actively construct meaning from their experiences to build unique representations of content. Brooks & brooks (2001) argue that in the constructivism view, teachers should not pour information to children minds but encourage them to explore their world.

Constructivists theory put the learners as active purposive and adaptive in that he is able to adapt new knowledge to what was already known. Piaget explains how children actively construct their world using schemas to assimilate knowledge by referring to existing knowledge. Learning is only possible when there is active assimilation. Assimilation according to Piaget is the integration of any sort of reality into the structure. Learning is not only the outcome but also the attitudes. Feelings and intellectual processes which are here referred to as science process skills – (Hamachek, 1995) inquiry based instruction fits well in this theory in that it engages children in constructing new meaning from the activities they undertake.

Children at preschool level generally manipulate things, explore the environment by asking questions, finding out by themselves and constructing things. They are unable to concentrate for long periods thus the need to increase their concentration through inquiry-based instruction since it gives them opportunities to experiment, make observations, ask questions and manipulate things.

Johnson and Johnson (1991), puts social constructivist theory to inquiry-based instruction, because of its emphasis on social contexts of learning and that knowledge is mutually constructed. Learning should be a social process where children carry out instigations in groups and interact with each other to construct knowledge. Inquiry – based instructions provides experiences and promote learning through interaction. Active participation in the investigations help children develop science process skills and modify their misconceptions. Bloom (1971), describes science process skills as behavior children engage in during inquiry and the behavior is similar to the processes the scientists employ in investigating the real world in order to construct new ideas. (Guavian 2011), asserts that a teacher who use inquiry – based learning will not have children memorize irrelevant information but gave them opportunities to construct knowledge and understand the material meaningfully.

2.6. Conceptual Framework of the Study

There are various teaching methods used in pre-school and each varies in level of learner's involvement. This study sought to investigate effect of inquiry method on pre-school children's achievement in science activities. The method used by the teacher influenced children achievement.

Fig .2.1 shows that in the traditional method of teaching science, children are passive participants in learning. The learner play a role of listening and observing and this will translate to low achievement in science activities in pre-schools. Learners in the inquiry method of teaching are active participants. The teacher facilitates the learning process. The teacher organizes the learner into groups, selects suitable teaching and learning resources for learning science activities. Finally the teacher discusses the children activities as well as scaffolding where learners reach a zone of proxima development. As a result, learners acquire more science skills and perform well in science activities. The head teachers provided the teaching and learning resources as well as supervising the implementation of curriculum. Finally the parents take their children to school and pay fees which was used to pay teachers.

2.1: Conceptual Framework of the Study

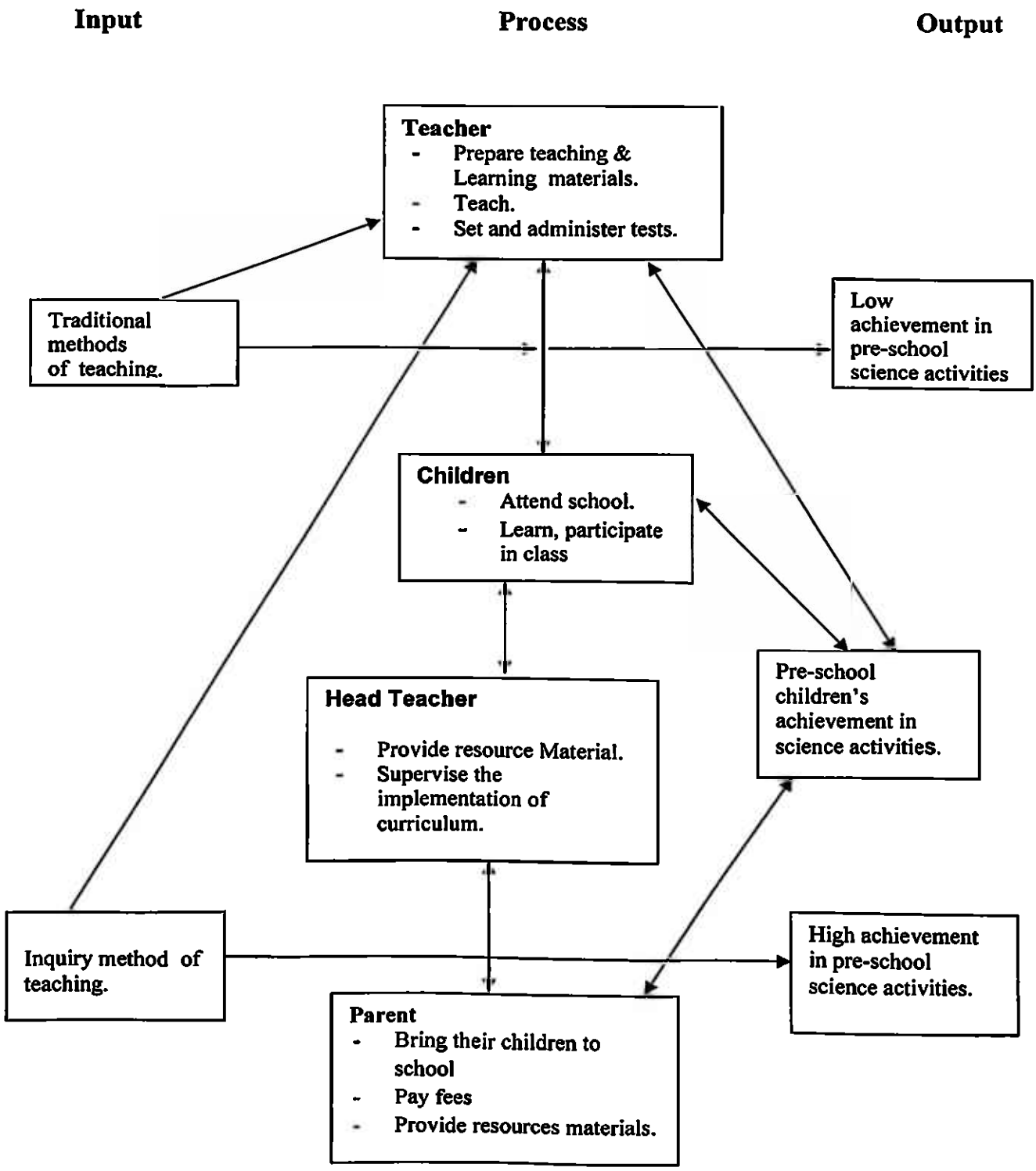

Fig. 2.1. Illustrates the conceptual framework of the study and shows how variables (independent and dependent variables) are interrelated.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter focused on research design, the target population, sample size and sampling procedure, research instruments, validity and reliability of the instruments and data collection and data analysis procedures.

3.2 Research Design

The researcher used a quasi-experimental design. This involved random selection of two groups of pre-schools. One group formed the experimental group i.e. group I and group II, the control group (pre-schools). The researcher and the pre-school teachers developed same schemes of work and lesson plans which were used for the two groups. Group I (experimental group) was taught science activities using inquiry method while the other group (control group) was taught using traditional method. The two groups were taught for the same length of time. The researcher developed a test which was administered to schools in both groups after two weeks of teaching. The results of the two groups were analyzed and this enabled the researcher to compare the performance of science for the two groups.

3.3 Target Population

According to Mugenda and Mugenda (2003) a target population is defined as all the members real or hypothetical set of people, events or object to which a researcher wishes to generalize the results of the study. Iveti Division has 26 registered pre-schools. The study included children and teachers from all pre-schools in Iveti Division.

3.4 Sample Size and Sampling Procedures

The study involved two hundred and forty eight pre-scholars, from eight pre-schools selected from Iveti division to assess and compare effectiveness of the two methods of teaching and eight pre-school teachers. Four pre-schools served as the control group while the other four were the experimental group. The two groups were selected using simple random procedure. This ensured that every pre-school has equal chance of being selected. In this study only children teachers and head teachers of the selected pre-schools were included. The sampled pre-schools were listed in Table 3.1

Table 3.1: List of Sampled of Pre-school in Iveti Division, Machakos County

Control Schools	**Pre-school population**
A	25
B	28
C	38
D	41

Experimental schools	**Pre-school population**
E	33
F	24
G	34
H	34

3.5 Research Instruments

The researcher used three research instruments; observation checklist, - test and questionnaire. Test was the main instrument for this study. The researcher administered the same test for both the control group and experimental group. The results of the test were used by the researcher to compare the performance of children in science activities in the experimental and control groups.

3.5.1 Observation Check-list

The research used observation checklist to determine the facilities available for teaching and learning of science activities in the selected pre-schools. The researcher also observed the children's activities while learning science activities.

3.5.2 Questionnaire

Questionnaires were used in this study. There were questionnaires for both the head teachers and pre-school teachers. The head teachers questionnaires collected information on the facilities in the pre-schools, teaching and learning resources as well as funding of the pre-schools. The pre-school teachers questionnaire consisted; their qualification, attitudes towards science activities, methods they use in teaching science in pre-schools, availability and use of teaching and learning resources and challenges they face while teaching science in pre-school.

3.6 Validity of the Instruments

Validity is concerned with establishing whether the instruments measure what they are intended to measure (Orodho, 2004). The research instruments were developed focusing on the research questions. To ensure validity of the instrument, the researcher consulted with the Supervisor. The researcher carried out pre-testing of the instruments. The researcher then did the necessary correction before using the instrument in the actual research.

3.7 Reliability of the Instruments

Reliability is a measure of the degree to which research instrument yields constant results or data after repeated trial (Mugenda and Mugenda, 2003). A test re-test method was used to test the reliability of the instruments. This was done by administering the same instrument twice on the same group of subjects. The subjects to be assessed were picked from non-participating pre-schools in Iveti division. The second assessment was done after two weeks without changing the initial conditions. The correlation of co-efficiency(r) was calculated using the Pearson correlation formula to determine the nature of relationship between the two sets of test scores. The value of r was found to be 0.895 which is a very strong correlation. Therefore the correlation was significant at 0.01 level. Hence the instruments were reliable.

3.8 Data Collection Procedures

A researcher authorization letter was secured. The researcher visited the selected pre-schools to seek permission from the head teachers to use their schools for the study. The children were taught for a period of two weeks before administering the same assessment to both control group and experimental group.

The teaching consisted of two topics that is floating and sinking and filling and emptying. Children in the experimental group were exposed to both traditional and inquiry method. The children in this group were further sub-divided into smaller groups and they were allowed to conduct investigations on floating and sinking as well as filling and emptying. The other group (control group) were taught the same topics using the traditional methods of teaching.

The two groups (experimental and control) were given the same assessment on the two topics. The test was marked out of 100% and the scores recorded. The researcher used the observation checklist to check the facilities and resources available in the pre-schools – used in science lessons. Questionnaires were given to head teachers and teachers who filled them and the researcher collected them later.

3.9 Data Analysis Procedures

According to Orodho (2005) data analysis is the process of systematically searching and arranging interview scripts field notes, data and other materials from the field with aim of obtaining answers to research questions. After the completion of data collection, the researcher grouped the data according to their category. The mean score and standard deviations for all the pre-schools in both control experimental groups was computed. Data from questionnaires was tabulated and analyzed using frequencies and percentages, t-scores and p-values were computed using SPSS software.

CHAPTER FOUR

FINDINGS AND DISCUSSIONS

4.0 Introduction

This chapter contains the findings of this study. It is presented in tabulated form as well as recording of relevant observations made during the study. Frequencies and percentages were used to analyze data. Means, standard deviations, t- scores and p-values were computed using SPSS software and were used to compare the children's achievement in science activities in pre-schools.

4.1 Background Information

The study gathered information on pre-school teachers' professional qualifications. The analyzed information results are shown in Table 4.1

Table 4.1: Academic and Professional qualification for teachers in Iveti Division, Machakos County

Qualification	Frequency	Percentage
Certificate	6	75
Diploma	2	25
Degree	0	0
Total	**8**	**100**

From Table 4.1, it can be seen that 75% of the teachers are trained upto certificate level while 25% of the teachers trained up to diploma level and none of the teachers trained up to

degree level. The study shows that majority of the teachers have necessary skills required to teach effectively at pre-school level.

The study sought to establish the type of physical facilities available for pre-schools in Iveti Division, Kathiani sub-county, Machakos County. The analyzed information is shown in Table 4.2.

Table 4.2: Pre-Schools Physical facilities in Iveti Division, Machakos County.

Type of building	Frequency	Percentage
Permanent buildings	7	87.5
Temporary buildings	1	12.5
Total	**8**	**100**

The research revealed that 87.5% of the buildings in preschools are permanent structures while only 12.5% of the pre-school buildings are of temporary structures. It was evident that majority of the buildings are furnished and in good conditions. This shows that the pre-schools had basic infrastructures to enhance learning of science activities.

The study also collected information on the availability of science text books and the analyzed information is shown on Table 4.3.

Table 4.3: Availability of Pre-school Text books in Iveti Division, Machakos County

Text books	Frequency	Percentage
Adequate	5	62.5
In adequate	3	37.5
Total	**8**	**100**

From Table 4.3, it can be seen that 62.5% of pre-schools had adequate science text books while 37.5% had in adequate science textbooks. This shows that most of the pre-school teachers can teach science activities effectively. Text books are important and should be provided for effective teaching and learning of science activities at pre-schools.

The study investigated the availability of teachers' activity guides. The results are analyzed in Table 4.4.

Table 4.4: Pre-Schools Teachers' activity Guide in Iveti Division, Machakos Country

Teachers' activity guide	Frequency	Percentage
Available	7	87.5
Not available	1	12.5
Total	**8**	**100**

From Table 4.4, it can be seen that 87.5% of pre-school teachers had teachers' activity guides and only 12.5% had no activity guides. This shows that most of the pre-school teachers are aware of the suggested activities that can enhance learning of science activities through inquiry method as a method of teaching.

Funds are important for pre-schools. Funds are used to pay teachers, buying resource material for learning and also used for general development of the pre-schools. All the head teachers in this study strongly felt that teaching and learning resources had an impact on pre-school children's achievement in science activities. Data on provision of funds is shown on Table 4.5.

Table 4.5: Funding Sources for Pre-Schools in Iveti Division, Machakos County

Resource	Frequency	Percentage
Government	6	75
Parents	1	12.5
F.B.O	1	12.5
Total	**8**	**100**

From Table 4.5, government provides 75% of pre-school funds, parents 12.5% and sponsor 12.5%. This is evident that government provides funds to most of the pre-schools. Funds are important in the acquisition of teaching and learning resources for effective of science activities. The community gets support grants from the government to run the pre-schools. Parents and teachers prepare teaching and learning resource materials. Teachers engage children in collecting local available materials to be used in teaching and learning science activities. This is normally done where the resources are not available.

The study also established whether pre-school teachers use resource materials in teaching science activities and the analyzed results are shown on Table 4.6.

Table 4.6: Use of Pre-School Teaching and Learning resources in Iveti Division, Machakos County

Use of resources	Frequency	Percentage
Always	6	75
Sometimes	2	25
Total	**8**	**100%**

From Table 4.6, 75% of the pre-school teachers always use resources to teach science activities and 25% use resources sometimes. The results shows that most of the pre-school teachers use resource materials in teaching pre - school science activities. Resource materials are important in teaching and learning science especially in inquiry approaches a method of teaching. Pre-school teachers should therefore ensure that resources are used in teaching science activities in pre-schools.

The study also asked the pre-school teachers to rate different teaching methods used in pre-schools to teach science activities. The responses are analyzed as shown on Table 4.7

Table 4.7: Teachers Rating of Teaching Methods in Pre-schools in Iveti Division, Machakos County

Discussion	Frequency	Percentage
Lecture	4	50
Demonstration	2	25
Project	1	12.5
Field trips	1	12.5
Total	**8**	**100**

From Table 4.7, it can be seen that 50% of the teachers used lecture method. The teachers argued that the teaching aids were not readily available. They also complained that materials preparation and improvisation would consume a lot of their teaching time. This method is teacher centred and the children are not given an opportunity to interact with concrete materials. The teachers suggested that the government should take responsibility of providing teaching and learning materials in all pre-schools in the country.

From Table 4.7, it was evident that 25% of the pre-school teachers used demonstration method of teaching. This method required learners to use senses of sight and hearing. In this method learners were not given an opportunity to interact with concrete material. Hence, the method was in appropriate for teaching science in pre-schools. Esler and Esler (2001) indicated that, practical experience is essential for effective mastery of skills and concept in science.

From Table 4.7, it was established that 12.5% of pre-school teachers used project method. In this method children were provided with experimental opportunities resulting in active

development of knowledge. However, project work is a recipe type of pre-school science activity experiment, where learners follow the laid down procedure and they lack an opportunity to explore, investigate, make discoveries and constructing their own ideas as is with the constructivists. Thus this method was in appropriate for teaching science in pre-schools. It was noted that 12.5% of the pre-school teachers used field trips. A small percentage of the teachers used this method because they argued that field trips are expensive and consumes a lot of their teaching. They also complained that, most of the parents cannot afford field trips. This denied the children opportunities to observe directly. This method enabled children to employ various senses in their learning for instance; touch, smell and sight among others. Despite the fact that this method is hardly used in pre-schools, it is unfortunate because observational skill is important in teaching and learning of science.

The study also established whether pre-school teachers use inquiry method to teach science activities. The responses are shown on Figure 4.1.

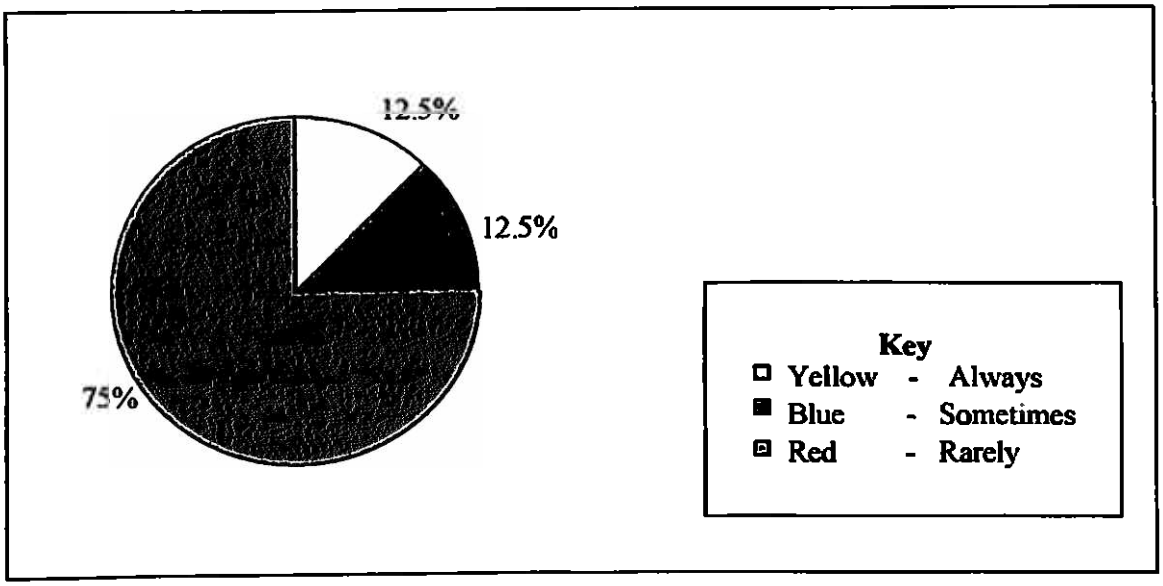

Figure 4.1 Use of Inquiry Method in Pre-Schools in Iveti Division, Machakos County

From Figure 4.1, it can be seen that 12.5% of the pre-school teachers use inquiry method to teach science activities always, 12.5% use it sometimes and 75% rarely use the method. Children who were taught science activities using inquiry method were more involved in learning activities, since they formulate hypothesis, designed their own experiments, carried out investigations made observations and came up with conclusions. This implies that, in an inquiry method, learners are active participants in their learning. From Figure 4.1, it is evident that 75% of pre-school teachers rarely use inquiry method to teach science. Teachers cited lack of teaching and learning materials and equipment as well as time to collect and assemble them as some of the difficulties that hinder them. They suggested that the government should take responsibility of providing teaching and learning materials to pre-schools to enhance learning of science.

Table 4.8: Children's Achievement in Science Activities in Iveti Division, Machakos County

Children's achievement	Control group		Experiment group	
	Frequency	%	Frequency	%
Above 50%	0	0	4	100
50%	2	50	0	0
Below 50%	2	50	0	0
Total	**4**	**100%**	**4**	**100%**

From Table 4.8, it can be seen that 100% of the pre-schools in experimental schools scored scores above average. None scored average or below average. In control group of pre-schools, no pre –school scored above average. 50% of the control group of the pre-schools scored average and 50% scored below average. These results suggest that inquiry approach as a method of teaching had an impact on children's achievement in science activities in pre-schools. Therefore inquiry method should be used by teachers to compliment traditional methods of teaching. A child learns better by carrying out activities related to what is being learnt. Teaching approaches should therefore be Participatory to ensure that a child acquires process skills, enjoys learning and applies what is learnt to situations outside school. Retention of knowledge that is actively acquired through activities carried out by the learner is much higher than that learnt passively.

4.2 Research Findings

The total number of pre-schools in Iveti Division , Kathiani sub-county, Machakos is 26. Eight (8) Pre-schools were sampled for the study. Four (4) pre-schools were in the experimental group while the other four (4) were in the control group. This is 30.77% of the target population. The researcher chose this sample size on the grounds that a larger one would give more data for better comparison of the assessment scores of pre-school children's achievement in science activities. Questionnaires were administered for both head teachers and pre-school teachers. All the questionnaires were filled by the respondents and collected by the researcher. The total number of pre-school children assessed were 248. All the pre-schools were day schools. Resources in the pre-schools were not adequate. The situation is complicated by the fact that the communities continue to maintain pre-schools, including paying the teachers' salaries as well as buying resource materials. Parents pay high fees especially in private pre-schools. This has resulted to poor parents taking their children to public pre-school which lack facilities such as classrooms, playing materials and other learning materials.

4.3 Findings on Research Question One: How do Traditional Methods of Teaching influence Pre-school Children's Achievement in Science Activities?

The study sought to investigate the achievement of a pre-school child in science activities when taught using traditional methods. During the study, A set of pre schools (control group of pre-schools) were taught science activities i.e floating and sinking , filling and emptying using traditional methods. In these methods, the teacher talked and demonstrated, giving the child little chance to participate in learning pre-school science activities on his or her own. At the end of the teaching exercise (after two weeks), a common assessment was

administered to the children and it was given out of 100%. The results were analyzed as shown on Table 4.9.

Table 4.9: Children's Achievements Scores in the Control Group of Pre-schools in Iveti Division, Machakos County

Schools	N	Total score	μ	σ
A	25	1245	49.81	7.54
B	41	2061	50.27	6.54
C	38	1952	51.36	8.36
D	28	1374	49.09	12.00
Total	**132**	**6632**	**50.13**	**8.61**

From Table 4.9, it can be seen that total enrolment in the control group pre-schools was 132 with total score of 6632, mean score of 50.13% and standard deviation of 8.61 The mean scores and standard deviation for the control pre-schools were as follows 49.81, 50.27, 51.36 and 49.09 and 7.54, 6.54, 8.36 and 12.00 respectively. The mean scores and standard deviations in Table 4.9, shows that, pre-school children's achievement in science activities when taught science activities using traditional method is average i.e 50%.

A two sample independent t-test was done to find out whether there was any statistical significant difference in pre-school children's achievement in science activities in the control group. The analyzed results are shown in table 4.10.

Table 4.10: Comparison of Mean Scores Between Pre-schools in the Control Group in Iveti Division, Machakos County

Pre-school	μ	σ	df	t	p (2-tailed)
A	49.81	7.54	10	-.119	.908
B	50.27	6.54			
A	49.81	7.54	10	.372	.718
C	51.36	8.68			
A	49.81	7.54	10	.225	.827
D	49.09	12.00			
B	50.27	6.54	10	.285	.782
C	49.09	12.00			
B	50.27	6.54	10	.284	.782
D	49.09	12.00			
C	51.36	8.68	10	.441	.668
D	49.09	12.00			

The results in Table 4.10, shows that, the difference between the mean score for the Pre-schools in the control group: A and B, A, and C, A and D, B and C, B and D, and C and D, were not statistically significant ($t_{(10)} = .119$, P=.908 2-tailed), ($t_{(10)} = -.372$, P =.718 – 2 tailed), ($t_{(10)} = .225$, P=.827, 2 – tailed), $t_{(10)} = -.442$, P=.668, 2-tailed), ($t_{(10)} = .284$, P=.782, 2 – tailed) and $t_{(10)} = .441$, P=.668 , 2 – tailed) respectively.

4.4 Findings on Research Question two: How does inquiry Teaching method as a method of teaching impact on Pre-school children's Achievement in Science Activities?

The study sought to investigate pre-school children's achievement when children are taught using inquiry approach. During the study, experimental group of pre-schools were taught using this method. In this method, the teacher gave the children a task then the learners formulated their own hypothesis, after which they designed their own experiments to test the formulated hypothesis. They analyzed data and finally made conclusion. In this method the children were given opportunities to participate in learning fully. The Teacher acted as facilitator only. Assessment was administered after the teaching session. The assessment was done out of 100% and scores recorded. The scores were computed and results tabulated in Table 4.11

Table 4.11: Experimental Group Children's Achievement Scores in Iveti Division, Machakos County

School	N	Total score	μ	σ
E	33	2880	87.27	16.18
F	24	2083	86.81	12.50
G	34	3026	89.00	8.54
H	34	2936	86.36	10.26
Total	**125**	**10925**	**87.36**	**11.87**

From Table 4.11, it can be seen that the total enrolment was 125, total score was 10,925 total mean score was 87.36% and total standard deviation was 11.87. The following mean scores and standard deviation were as follows : 87.27, 86.81, 89.00 and 86.36 and 16.18, 12.50, 8.54 and 10.26 respectively. From the result in Table 4.11, it is evident that, Pre-schools in the experimental group score a mean of 80% and above. This is evident that inquiry approach as a method of teaching had an impact on pre-school children's

achievement in science activities. Therefore pre-school teachers should use inquiry method to teach science activities so as to enhance children's achievement.

A two sample independent t-test was done to find out whether there was any statistical significant difference in children's achievement in Pre-school science activities in the experimental group. The analyzed results are show in Table 4.12

Table 4.12: Comparison of Mean Scores Between Pre-schools in the Experimental Groups in Iveti Division, Machakos County

Pre-school	μ	σ	df	t	p (2-tailed)
E	87.18	16.18	10	-.279	.786
F	86.81	12.50			
E	87.27	16.18	10	.191	.852
G	89.00	8.54			
E	87.27	16.18	10	-.431	.676
H	86.36	10.26			
F	86.81	12.50	10	.074	.943
G	89.00	8.54			
F	86.81	12.50	10	.079	.939
H	86.36	10.26			
G	89.00	8.54	10	.662	.523
H	86.36	10.26			

The results in Table 4.12, shows that, the difference between the mean scores for the pre-schools in the experimental group; E and F, E and G, E and H, F and G, F and H, and G and

H, were not statistically significant ($t_{(10)} = -.279$, P =.786 2 – tailed), $t_{(10)}$=.191, P=.852, (2- tailed), ($t_{(10)} = -.431$, P= .676, 2 – tailed), ($t_{(10)}$ =.074, P=.943, 2-tailed), $t_{(10)}$ =.079, P=.939, 2-tailed) and ($t_{(10)}$ .662, P=.523, 2 – tailed) respectively.

4.5 Findings on Research Question THREE: To what extent do Children taught using Inquiry Based Teaching Method and those taught using the Traditional Methods of teaching perform in Science Activities?

This question sought to compare the two approaches of teaching and their impact on pre-school children's achievement in pre-schools. In this study there were two groups of pre-schools that is the control group of pre-schools and the experimental group. The control group of pre-schools were taught science activities using traditional methods while the experimental group of pre-schools were taught science activities using both traditional methods and inquiry method. The researcher and the pre-school teachers developed same schemes of work, lesson plans as well as constructing a test and a marking scheme based on the schemes of work. Same assessment was administered to the two groups (experimental and control groups)after the teaching session. Marking was done by the researcher out of 100%. and scores recorded. Mean scores standard deviation, t- scores and p-values were computed using SPSS software.

A two sample independent t-test was used to measure statistical significant difference in achievement between all the control schools and experimental schools. The analyzed results are shown in Table 4.14

Table 4.13: Comparison of Mean Scores Between the Control Group and Experimental Group Iveti Division, Machakos County

Group	μ	σ	df	t	p
Control group	50.13	8.61	6	-7.879	.000
Experimental	87.36	11.87			

From Table 4.13, it is evident that the control group had mean and standard deviation of 50.13% and 8.61, respectively while the experimental group of pre-schools had a mean and standard deviation of 87.36% and 11.87, respectively. The difference in children's achievement in control group of pre-schools and the experimental group of pre-schools was found to be statistically significant ($t(_6)$ = -7.879, P= .000, two tailed). The results suggest that, children who are taught science activities using inquiry approach in addition to traditional methods of teaching performed better in science activities compared to those who are only taught science activities using traditional methods of teaching. The difference in achievement may be attributed to interventions of inquiry approach in teaching science activities done to the experiment group of pre-schools.

These findings suggest that in addition to teaching science activities using traditional methods, teachers should allow children to conduct their own investigations and use inquiry methods in teaching science activities. Teachers should give a task and allow the children to formulate their own hypothesis and design own experiments to investigate their hypothesis, discuss their results and draw conclusions. The above findings implies that inquiry method should be used to compliment traditional methods of teaching science activities in pre-

school. It can therefore be concluded that there is a significant difference in achievement between children taught science activities using traditional methods and children taught using inquiry methods and inquiry method of teaching on topics water, floating and sinking filling and emptying as shown in Table 4.13.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. Introduction

This chapter contains the summary of the study, conclusion from the findings and recommendations for possible action and further research.

5.2. Summary of the Study

The study was set up to investigate the impact of inquiry method on pre-school children's achievement in science activities. To establish the impact of the method, the following research questions were addressed: How does inquiry approach as a method of teaching affect pre-school children's achievement in science activities? How does traditional method of teaching affect pre-school children's achievement in science activities? And to what extent is the difference in achievement between a child taught science activities using traditional methods and a child taught science activities using inquiry approach in a pre-school? Literature was reviewed on science and science education.

Science teaching in pre-schools inquiry based learning of science in pre-school, process skills in science and assessment of children's achievement in science activities. The study use a quasi – experiment research design to carry out the investigations. Two groups of pre-schools were used one group was experimental group of pre-schools while the other was control group of pre-schools. The target population comprised of pre-school children age 5 – 6 years, pre-school teachers and Head teachers in Iveti Division, Machakos County.

The pre-schools to be used in the study were selected using simple random procedure. The study used eight (8) pre-schools of which four (4) were control group of pre-schools and four (4) were experimental group of pre-schools, eight (8) head teachers. A scheme of work and a lesson plan were developed by both the researcher and the pre-school teachers. The study also used questionnaires for sampled pre-school teachers and head teachers. An observation checklist was also used to establish some facts on the ground. An assessment was administered for the two groups and results analyzed. The reliability and validity of the tools were ensured by involving the supervisor in examining them. Data collected by the tools were analyzed using descriptive statistics: i.e. frequencies, percentages and mean scores were computed for different variable so as to enable data interpretation. Standard deviations, t- test and p - values were also computed using SPSS software. The research findings are discussed below:

The mean scores and standard deviations of the control group of preschools were 50.13 and 8.61 respectively. While those of the experimental group of pre-schools were 87.36 and 11.87 respectively. The difference in children's achievement in control group of pre-schools and those in experimental group of pre-schools was found to be statistically significant ($t_{(6)}$ = -7.879, P = .000, two tailed). Children learn better through senses especially when they are learning science activities. Leaning involves all things they touch, see, smell, taste and experience within the surroundings. The child understands ideas and concepts when presented inform of real objects, actions and situations. They experiment with different things, therefore making discoveries and this increases their knowledge and concepts. They learn by hand on experiences with real materials and meaningful activities. They also learn

through practice, observation, imitation, exploration and problem solving. As they engage in different activities, they develop strategies for different ways of acquiring information and solving problems. The pre-school teachers have therefore to facilitate learning by ensuring that the child is the key participant in what is happening during the learning process.

They have to be active in terms of constructing knowledge and in problem solving. The Teacher facilitates and motivates the child to formulate hypothesis, design own experiments and perform them in discussing the results and drawing of conclusion (inquiry approach of learning). According to the analysis obtained, children in the experimental group of pre-schools had higher mean score as compared to children in the control group of pre-schools which had a low mean score. In the experimental group of pre-schools children had higher mean score as compared to children in the control group of pre-schools which had a low mean score. In the experimental group 200% of the pre-school had a mean of above 70% with the highest at 88% and the lowest 79%. Inquiry method proved to be of much help to average and below average children because they learnt practically. In traditional methods, children did not participate fully in the learning process and therefore had low mean scores with the lowest at 45%. This is because science is a doing subject. This suggests that children who were taught using traditional and inquiry approach combined performed better than those taught science activities using traditional methods only. The difference in achievement can be attributed to the treatment or interventions done to the experimental group of pre-schools. Inquiry approach of teaching and learning science is more appealing to children. Low achievement by the control group of pre-schools point out that children should be guided to learn through inquiry approach in learning science activities.

5.3. Conclusions

The study intended to investigate the impact of inquiry method on pre-school children's achievement in science activities. The following conclusions could be drawn from the study. It established that inquiry method had an impact on pre-school children's achievement in science activities. Children's achievement in the experimental group of pre-schools was better than in control group of pre-schools. This was because in experimental group, the children were active during the learning process while in the control group they were passive. The control group of pre-schools had a lower mean score and a lower standard deviation of 50.13% and 8.61 respectively. Schools in the experimental group had a higher mean score and a higher standard deviation of 87.36% and 11.87 respectively. The statistically significance difference between the two groups of pre-schools $t(_6) = -7.879$, P= .000, two tailed) suggest that pre-school children's achievement in science activities in experimental groups was better than those in the control group of pre-schools where only traditional methods were used to teach science activities. This in addition to teaching science using traditional methods, inquiry method should be incorporated in teaching science activities in pre-schools. Science is largely a doing subject and children learn more by what they do while learning science activities than what they learn. They need to see, touch, smell and do as much as possible when learning science activities. Children are unable to think through ideas and therefore hands on activities and first hand experiences make learning better for them. The teachers enhance to participate in learning.

5.4 Recommendations

The study made the following recommendations. In addition to teaching children using only traditional methods in pre-schools. Pre-school, teachers should use inquiry method so as to better pre-school children achievement in science activities. Learning of science should be made more practical than theoretical. Teachers should prepare science activity lessons in advance so as to get the necessary materials for the lesson. Activity guides are essential and suggested activities are important. Schools and communities should be encouraged to participate more in the provision of learning resources in pre-schools. Production and use of localized curriculum support materials should be strengthened to address the problem of shortages. The study also recommends that cost of training of pre-school teachers should also be reduced so that all teachers can be trained. Cost of learning should also be reduced. The government should make early childhood education free and compulsory. Increase of government allocations in maintaining pre-schools will go a long way in providing resources among other things hence improving children's achievement in science activities at this level. District education boards (DEB) and Constituency Development funds (CDF) should prioritize early childhood education in all allocations for development of projects so as to provide necessary resources and facilities to teach science activities and make pre-schools children friendly. This will improve children's achievement not only in science activities but also in other areas. Extension of quality assurance services to pre-schools will help to monitor and improve children's achievement in science as well as in other activity areas.

5.5 Recommendations for Further Research

This study recommends that more studies need to be done in other areas apart from teaching methods. This may include studies in tackling challenges facing teaching of pre-school science activities. Studies on how school head teachers and other teachers attitudes including those of pre-schools affect children's achievement in science activities are worthwhile. A similar study should be done in teachers' classroom practice during the learning science activities as well. A study may be done also on how type of instructional materials used during inquiry method influence children's achievement in science activities in pre-schools.

REFERENCES

Asiago, M. O (2010). Effects of inquiry – based instruction on pre-schools children's achievement in science in Dagoetti Division, Nairobi, Kenya unpublished masters research thesis university of Nairobi.

Bloom, B. (1971). Handbook o formative summative evaluation of students learning. MC Graw- Hill book Co.

Brooks, J.G. & Brooks, M.G. (2001). In search of understanding: The case for constructivist classrooms. Upper Saddle River.

Brunner, J.S. (1961). The Act of Discovery: Havard Educational review 3101:21-32.

Changeiywo, J. M. (J.M. (2000). Student images of science in Kenya. A comparison by gendre differences, level of schooling and regional disparities. Unpublished PhD thesis: Egerton University.

Chiapetta, E. L, & Koballa, T. R. (2006). Science instruction in the middle and secondary school (2nd edition). Upper saddle Reives; New Jersey, Columbus.

Colburn, A. (2004). Inquiring scientists want to know educational leadership, 62, 63-66.

Dewey, J. (1966). How we think. New York: contimum publishing company.

Driver, R & Bell, B. (1986). Students' thinking and learning science. a constructivist view school science review vol. 67 N246.

Esler, W.K. & Esler, M.K. (2001). Teaching elementary science: A full spectrum science instruction. 8th edition, U.S.A.

Emmer, E.T., Evertson, C.M., Anderson, L.M. (1980). Effective classroom management at the beginning of the school year. Elementary school journal, 80, 219-231

Ezewu, E. (1990). Sociology of education, longman. Prentice Hall London.

Germann, P.J. (1991). Developing science process skills through directed inquiry American Biology Teachers, 53(4) 243-247.

Guavian, M(2001). The social context of cognitive development New York Gulford.

Haggerty, D. L. (2000). Engaging adult learners in self-directed learning and it's impact on learning styles.

Hamacheck, D. (1995). Psychology in teaching/learning and growth. Boston: Allyn and Bacon publishers.

Johnson, D.W; & Johnson, R.T. (1991). Learning together and alone. Englewood liffs: prentice hall publishers.

Jenkins, E. W; (1989). Process in science education. A historical perspective in wellington, J (Ed) skills process in science education. A critical analysis Routledge: London New York.

Kanchak, D.P. & Eggen, P.D. (1998). Learning and teaching research-based methods. Allyn and Bacon: M.A.

Karaka, J Nyangusi, L. & Guthii M (2004): Understanding science Teachers guide Nairobi: Longhorn.

Kerero, F. N. (2002). Acquisition of science concepts and skills by Kenya primary school pupils: the influence of culture and learning opportunities. Unpublished PHD Thesis Egerton University.

Kenya Institute of Education (2003). Mathematics and environmental activities: Kenya pre-school teachers Activities Guide series. Nairobi: Kenya Literature Bureau.

KIE (2003): primary science guide; Nairobi, Kenya Literature Bureau.

KIE (2003): School teachers; guide: Nairobi, Kenya Literature Bureau

Kathure, J.R. Impact of children's own investigations on performance in pre-school science

Activities in East Division of Isiolo District, Kenya. Unpublished Masters of Education research project University of Nairobi.

Martin, R.,Sexton, C., Gerlovich, J. (1999). Science for all children: lessons for constructing understanding: Boston: allyn and Bacon.

Mc Clelland, J.A. G. (1985) Ausubei's theory of learning and it's applications to ntroductory science. In Hudson, B.S. scalon, E. (Eds). Approaching primary science London: Hamper and row publishers.

Ministry of Education (2006). National Early childhood Development policy framework. Government printers, Nairobi.

Ministry of Education (2006). Guide lines for early childhood Development in Kenya. Nairobi Government press.

Mugenda, M. O; & Mugenda, A.G. (2003). Research methods: quantitative and Qualitative approaches. Nairobi, African centre for Technology, ACTS, press.

Mukachi, W.M. (2006). The extend to which the science process skills of investigating is used in Biology practical work. Unpublished Master Thesis: Egerton University.

Ogunniyi B.M. (1992) understanding Research in social sciences, Ibadan University press PIC.

Oketch, J. G., & Asiachi, A.J. (1992) Curriculum development for schools. Nairobi: research and publications Limited.

Ongosi, J. (2007). Instructional strategies and students acquisition of science process Skills in Secondary schools in Kisii Central District of Nyanza province Kenya. Unpublished Masters of Education Thesis: Kenyatta University.

Orodho, J. A. (2005). Techniques of writing research proposals and reports in educational

and social sciences. Nairobi. Masola publishers.

Otieno - Alego (1991). The competencies of junior secondary schools pupils in some selected process skills. Kenya Junior of Education 5(1) 84-105), unpublished Bureau of Education Research, Kenya University.

Piaget, J. (1972). Intellectual Evolution from adolescence to adulthood: in Human development Vol. 15.

Rai, B & Richadson, J.A (2003). Improve your science. Nairobi Dhillon publisher.

Stuart M. D., & Henry R. W. (2002) palatinate specimens can improve the conceptual quality of Biology labs. The American Biology Teachers.

Vygotsky, L.S. (1962). Thought and Language: Cambridge, M.A. MIT press.

APPENDICES (I)

Introduction Letter

UNIVERSITY OF NAIROBI

COLLEGE OF EDUCATION & EXTERNAL STUDIES

DEPARTMENT OF EDUCATIONAL COMMUNICATION AND TECHNOLOGY

Telephone: 020 – 2500760

020 – 2500762, 020 – 2460056

P .O.Box 30197 – 00100
Nairobi
P.O. Box 92, 00902 Kikuyu

05/05/2012

TO WHOM IT MAY CONCERN

SUBJECT: MUSEMBI MUTUKU KAVOI REG: E57/62523/2010

This is to certify that Musembi Mutuku Kavoi is bonafide student of the University of Nairobi, Department of Educational Communication and Technology. He is pursuing M.Ed (ECE) and has completed his course work. Currently he is working on his Project Title: "IMPACT OF INQUIRY METHOD ON PRESCHOOL CHILDRENS ACHIEVEMENT IN SCIENCE ACTIVITIES IN IVETI DIVISION KATHIANI DISTRICT MACHACKOS COUNTY, KENYA".

Any assistance accorded to him will be highly appreciated.

5 JUN 2012

Prof. P.O.O Digolo
Chairman
Department of Educational Communication and Technology

APPENDIX II

Headteachers' Questionnaire

1. Name of school .....
2. Location .....
3. How big is ECE centre in terms of space?.....

   .....
4. How many and how big are the classrooms.....

   .....
5. What is the type of buildings? Permanent ( ) Temporary ( )
6. What is the general condition of the building (s) Good condition ( ) Need repair ( )
7. Do you have ground Yes ( ) No. ( )
8. What were sources of funds for running and maintaining the ECE centre?

   .....
9. What are sources of water in the school?

   Piped ( ) Rain ( ) Well ( )

   River ( ) No water ( )
10. How do you acquire teaching and learning resources? .....

    .....

    .....
11. Do you consider them adequate: Yes ( ) No. ( )
12. How do you improvise for resources in science? .....

    .....

    .....
13. Do you think the learning resources have an effect on learning science:

    Yes ( ) No. ( )

APPENDIX III

Questionnaires for Pre-school Teachers

This questionnaire is for the purpose of research only. Do not write your name. The responses will be treated confidentially.

Tick in the appropriate bracket

1. Name of the Pre-school .....

   Zone .....

   Division .....

2. Gender male ( ) Female ( )

3. How old are you?

   18 – 24 ( )

   25 – 34 ( )

   35 – 40 ( )

   41 – 44 ( )

   45 and above ( )

4. What are your academic qualifications?

   K.C.P.E ( )

   K.C.S.E ( )

   Other (specify) .....

5. What are your professional qualifications?

   Certificate ( )

   Diploma ( )

   Degree ( )

   Other (specify) .....

6. In your own opinion how is science?

   a) Easy ( )

   b) Hard ( )

   c) Enjoyable ( )

7. What methods do teachers use to teach science activities in pre-schools?

   a) Lecture ( )

   b) Demonstration ( )

   c) Project ( )

   d) Field Trips ( )

8. How often do teachers use teaching and learning resources in science lessons?

   a) Some times ( )

   b) Rarely ( )

   c) Always ( )

9. Who provides these resources

   a) Teacher ( )

   b) School ( )

   c) Children ( )

   d) Parents ( )

10. How often do teachers use inquiry method when teaching pre-school science activities?

    a) Always ( )

    b) Sometimes ( )

    c) Rarely ( )

11. Do teachers have pre-school teachers activity guides?

12. Highlight the difficulties faced by the science teachers when using inquiry in teaching science.

13. What measure should be put in place to overcome the difficulties.

APPENDIX IV

Research Observation Checklist

Name of the school .....

Location .....

Facilities/Resources	Available	Fair condition adequate	Poor condition inadequate	Permanent	Temporarily
Head Teacher office					
Staffroom					
ECE classroom					
Science Textbooks					
Nature corner					
Science corner					
Sand Corner					
Water corner					
Play ground					
Playing materials					
Learning Aids					
Toilets/Latrines					

APPENDIX V

Pre-school Children's Science Assessment

NAME.....

SCHOOL.....

Answer the following questions.

Choose the correct answer

1. In our school we get water from..... .....(Tap, Borehole, River)
2. A maize seed .....in water (Float, Sink)
3. A feather .....in water (Float, Sink)
4. A stone ....in water (Float, Sink)
5. A leaf .....in water (Float, Sink)
6. A coin ..... in water (Float, Sink)
7. A piece of wood .....in water (Float, Sink)
8. Things that sink in water are ..... (Heavy, Light)
9. Things that float in water are ..... (Heavy, Light)
10. A piece of paper is .....(Heavy, Light)

APPENDIX VI

Sample Schemes of Work

WEEK	TOPIC	SUB-TOPIC	OBJECTIVES	ACTIVITIES	MATERIALS	REFERENCES	REMARK
1	Water	Sinking and Floating	By the end of the lesson, learners should be able to:			Higher flier,(2007) comprehensive Nursery class encyclopedia,Nairobi: Higher flier pages 7-8 KIE (2003) Kenya Preschools Teachers' Activity guide series Book 3 page 102-103	
			Say the poem "Water is life"	Say poem	Flash cards		
			Spell words Sinking and Floating				
			Count letters in the words sinking and floating	Count letters	Flash cards		
			Name the objects that Sink and float		Chart showing a poem		
			Group the objects that sink and ones that float	Put objects in water	Water, stones, feathers, bottle tops, maize seed Leaves, papers, coins, grass, spoons, pens, chalk, cans, nails		
		Test	Test understanding of the covered work	Write a test	A written test	Test papers	