

**INFLUENCE OF TEACHER'S CHARACTERISTICS ON EFFECTIVE USE OF
INQUIRY BASED APPROACH IN TEACHING SCIENCE IN PRESCHOOLS IN
KUJA ZONE, RONGO DISTRICT**

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the requirement of the degree of Master of Education in Early Childhood
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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 university.

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DEDICATION

This research project is dedicated to all science teachers who effectively use and advocate for the effective use of inquiry based approach in teaching science.

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ABSTRACT

The purpose of the study is to find out the influence of teacher's characteristics on the use of inquiry based instructional method of teaching science in pre-schools in Kuja Zone, Rongo district, Migori County, Nyanza province. The study has five research questions and five research objectives based on the influence of teacher's characteristics on effective use of inquiry based approach in teaching science in pre-school. The study population was approximately 63 teachers both in public and private pre-schools in Kuja Zone, Rongo district, Migori County. Forty two (42) teachers were from the public pre-schools of which 33 were female and 9 male, within the other 21 teachers from the private pre-schools in Kuja Zone one (1) was a male. The research design used in the study was a descriptive survey and the study sample covered all teachers that is the total study population because it was a small group. The target population was purposively and randomly selected both male and female teachers. The sample constituted of forty (53) female pre-school teachers and ten (10) male teachers. To collect data, the researcher used questionnaire, interview schedule and observation. The data collected using these tools was recorded, analyzed, interpreted and presented in tables and pie-charts using frequencies and percentages.

TABLE OF CONTENTS

DECLARATION	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT.....	v
TABLE OF CONTENTS.....	vi
ABBREVIATIONS AND ACRONYMS	xii
LIST OF FIGURES	x
LIST OF TABLES.....	xi
CHAPTER ONE	1
INTRODUCTION.....	1
1.1 Background to the Study.....	1
1.2 Statement of the Problem.....	5
1.3 Purpose of the Study	6
1.4 The Research Objectives.....	6
1.5 Research Questions	7
1.6 Significance of the Study	7
1.6.1 Significance of the Study to Kenya Institute of Curriculum Development	7
1.6.2 Significance of the Study to Teachers Colleges	8
1.6.3 Significance of the Study to Quality Assurance Officers	8
1.6.4 Significance of the study to researchers.....	8
1.6.5 Significance of the Study to Other School Stakeholder.....	8
1.7 Limitations	9
1.8 Delimitation	10
1.9 Basic Assumption of the Study.....	10

1.10 Definition of Significant Terms	10
CHAPTER TWO	12
REVIEW OF RELATED LITERATURE.....	12
2.1 Introduction.....	12
2.2 Teacher’s Characteristics	12
2.2.1 Teacher’s Knowledge of Subject	13
2.2.2 Teacher’s Professional Levels	15
2.2.3 Teacher’s Years of Experience	16
2.2.4 Teacher’s Attitudes	17
2.2.5 Teacher’s Gender	19
2.3 Inquiry Based Approach	20
2.4 Theoretical Framework	22
2.5 Conceptual Framework.....	23
CHAPTER THREE.....	25
RESEARCH METHODOLOGY	25
3.1 Introduction.....	25
3.2 Research Design.....	25
3.3 Research Population.....	25
3.4 Sampling and Sample Size.....	26
3.5 Sampling Procedure	26
3.6 Research Instrument.....	27
3.6.1 Questionnaire	27
3.6.2 Interview Schedule.....	28
3.6.3 Structured Observation Schedule.....	28
3.7 Validity and Reliability of research Instrument.....	29

3.7.1 Validity	29
3.7.2 Reliability.....	30
3.8 Data Collection Procedure	31
3.9 Data Analysis.....	32
3.10 Ethical Considerations	33
CHAPTER FOUR.....	34
FINDINGS AND DISCUSSIONS.....	34
4.1 Introduction.....	34
4.2 Questionnaire Return Rate.....	35
4.3 Demographic Information on Respondents	35
4.3.1 Gender Composition of the Respondents	35
4.4 Questionnaire’s for Pre-School Teachers	36
4.4.1 Teacher’s Professional Levels	36
4.4.2 Teaching Experience.....	37
4.5 Respondent Background Knowledge.....	44
4.5.1 Science Methods Courses took in college and how they helped change teacher’s attitude on effective use inquiry based method in teaching science	45
4.6. Science Teaching Attitude	47
4.7 Written Interview for Teachers	50
4.8 An Observation Schedule	53
CHAPTER FIVE	57
SUMMARY, CONCLUSION AND RECOMMENDATIONS FOR FURTHER STUDY	57
5.1 Introduction.....	57
5.2 Summary of the Study	57

5.2.1 Teachers Gender and the Effectiveness of Inquiry Based Method.....	59
5.2.2. Teachers Experience and Effective Use of Inquiry Based Method	59
5.2.3 Teachers Professional Level and Effective Use of Inquiry Based Method	59
5.2.4 Teachers background knowledge and effective use of inquiry based method.....	60
5.2.5 Teachers attitude and effective use of inquiry based method	60
5.3 Conclusion	60
5.4 Recommendations.....	61
5.4.1 Recommendation from the Study	61
5.4.2 Recommendations for Further Studies.....	63
REFERENCES	64
APPENDICES	72
APPENDIX 1: QUESTIONNAIRE FOR TEACHERS	73
APPENDIX 2: Interview schedule for teachers.....	76
APPENDIX 3 Structured observation schedule	78
APPENDIX 3: RESEARCH AUTHORIZATION	79

LIST OF FIGURES

Figure 2.1 Conceptual Framework	23
Figure 4.1 Science Skills Rating	51
Figure 4.2 Barriers of Science Learning	52

LIST OF TABLES

Table 4.1: Questionnaire Return Rate.....	35
Table 4.2 Distribution of the Respondents by gender.....	36
Table 4.3 Teacher’s Professional Levels	37
Table 4.4 Number of Teaching Experience	37
Table 4.5 Grade levels currently taught by the teachers	38
Table 4.6 Preferred subjects currently taught by the teachers	38
Table 4.7 Average time spend weekly teaching science.....	39
Table 4.8 Amount of time required for Science Instruction weekly.....	40
Table 4.9 Time spend weekly preparing to teach science (including planning and material gathering).....	41
Table 4.10 Teacher’s use inquiry based method or text book based method science lessons per week	42
Table 4.11 Teacher’s background knowledge in science in high school and college affected his or her ability to effectively teach science using inquiry based method.....	44
Table 4.12 Science Methods Courses took in college and how they helped change teacher’s attitude on effective use inquiry based method in teaching science n teaching science.....	46
Table 4.13 Science Teaching Attitude	47
Table 4.14 Perception on the following abilities in science	48
Table 4.15 frequency of Self-evaluation of science content.....	49
Table 4.16 Barriers Science Learning.....	51
Table 4.15 science skills in order of importance	50
Table 4.17 instructional resources the pre-school teacher’s displayed in the classroom	53
Table 4.18 other instructional resources used in preschool	55

ABBREVIATIONS AND ACRONYMS

T T P	Teachers Training Programs
K P S S S	Kenya Primary & Secondary Schools Science
C B M	Curriculum Based Management
AAAS	American Association for the Advancement of Science
KICD	Kenya Institute of Curriculum Department
MoE	Ministry of Education
ECE	Early Childhood Education
ECDE	Early Childhood Development and Education
ID	Inspectorate Department
QA	Quality Assurance
SEACMEQ	Southern and Eastern Africa Consortium Monitoring and Education Quality

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

In teaching, especially in teaching science, a teacher is usually the enabler, the inspiration and also the constraint. This problem is reflected in the fact that many pre-school teachers, although competent and enthusiastic in most of the subjects they teach, simply do not enjoy science and do not feel comfortable teaching it Vaidya, (1993). Yet today, we are continually reminded of the substantial gap between the current science curriculum being taught in our schools and the scientific and technological orientation needs of tomorrow's careers Hadfield, (1993).

Arguments supporting the need for better science education in pre-schools have been based on the desire to develop in today's learners the knowledge, reasoning, and problem-solving skills required for the rapidly changing and technology based society Plourde, (2002). Current research in the area of science education supports the notion that a hands-on inquiry-based approach to teaching science at the pre-school level is a preferred method to use for developing those skills that will be necessary to handle the world's future scientific needs. Unfortunately, there is strong evidence to suggest that many pre-school teachers do not always feel science curriculum is a high priority and when it is addressed in the classroom, it is often not taught in a way that enhances and encourages student achievement Riggs & Enochs, (1990). At a time when national reform focuses on science for all children, it is a disturbing trend to see that science is frequently taught very little in the pre-schools Silversten, (1993), and that teaching which is done is accomplished primarily through lecture and textbooks rather than through exploration and experimentation.

In order to promote deep concern, understanding of science skills, development and positive attitude towards science, American Association for the Advancement of Science (1994) recommended that science teaching and learning should focus on the use of scientific reasoning and experimental procedures to investigate real life phenomena. There are many factors that can challenge the effectiveness of inquiry based instructional approach in teaching and learning science in pre-school. These include teachers' knowledge of the subject, teachers' attitudes, teachers' experience and academic qualifications among others.

Teacher's factors in implementation have also been seen as a way in which a given curriculum is interpreted to teachers on thought and opinions by Key and Bryan, (2011). The way in which the curriculum is conducted will necessarily vary based on individual beliefs and perceptions related to teaching, learning and instructional environment as explained by Bybee, (1993). The teachers' belief and attitudes, teachers' cognitive models to teaching, learning knowledge in science topics and teaching environment have been identified as teacher's characteristics which affect the use of different instructional methods in KNAPP (1997).

McGregor and Bazo, (2001) define science as a distinct discipline of knowledge, activities and methods important in understanding the natural phenomena and solving societal problems. They further assert that science in school serve several purposes, including preparing children who will go out to study science and technology at the university and become engineers. Brown and Atkins, (1988) confirms that the teacher should use progressive methods that are based on the discovery, critical activities, group work, creative activities and manipulation of concrete objects. Edgar, (1994) and

Michael, (1987) further explain that teaching methods spread over continuum from old teaching methods to expository and caustic methods. Mutuinga and Breakel, (1992) supported this when they assert that the choice of instructional method is based on the content and objectives to be learned and achieved. Therefore Whitebook, (1989) view the achievements of children as being found on how the teacher develops the children under his/her care.

According to the K.I.E (2003), the general objectives of science at the early childhood development and education (ECDE) level are: To develop children's curiosity, create opportunities for them to observe, hypothesize and experiment and report or record findings as well as helping them to develop problem solving skills and acquiring science concept such as measuring, weighing, speed, floating and sinking and solubility. It is important to note the objectives of pre-school science are acquisition of knowledge and process skills. Children ought to have hands on experience relating science at home and science at school. This explains why inquiry based instruction is the most important and appropriate instructional methods in teaching and learning pre-school science.

The national research council (1996) defines science as a particular way of knowing about the world. It further explained that in science, explanations are limited to those based on observation and experiments that can be sustained by other scientists. The scientists assert that science is a way of investigating and it interacts with technologies and society. Finally Ongosi, (2007) define science as a body of knowledge that consists of facts, concepts, principles and laws, theories and explanatory modes for natural phenomenon which forms the content in science. To make science activities practical

the researcher suggests that the best instructional method to be used is inquiry based approach.

Mukachi, (2006) defines Instructional methods as primarily descriptions of the learning objectives oriented activities and flow of information between teachers and learners. She further found out that all the teaching methods used by teachers have advantages and disadvantages therefore it requires a teacher to be knowledgeable, experienced and an expert in the use of a given instructional method. In addition, she asserted that proper pedagogical approaches that encourage children to learn a form of science close to the way practicing scientists work as much as possible are of paramount importance to the teaching of preschool science.

Muckachi, (2006) also argued that preschool children have poor conceptualization of scientific knowledge since teachers behave as information providers instead of teaching children to construct scientific knowledge. Similarly, she noted that teachers are not encouraged to carry out innovations of new curriculum and methodologies. Ongosi, (2007), in his research on instructional strategies and students acquisitions of science process skills in Kisii district revealed that teachers teach science as telling science rather than as a process. Preschool teachers need to make science more relevant, realist, enjoyable, easy and meaningful to learners Ongosi, (2007). In essence then, the researcher suggest that teaching methods should be improved and appropriate strategy employed as teaching and learning process demands.

This research study is an attempt to understand the influence of teacher's characteristics towards science teaching and teaching behavior (avoidance/expressed willingness to

using an inquiry approach in their science teaching) in pre-school which must be understood and improved if we hope to better prepare our young children to perform better and be future science problem solvers. In this research, teacher's discomfort with hands-on teaching methods, lack of content knowledge, academic qualification, years of experience, attitude towards science and gender will be explored.

1.2 Statement of the Problem

In Kenya today, there are over 6 million children under the age of six. Their education, care, socialization and development are major concerns for the country. The government recognizes pre-school education as one of the educational cycles which can lay a firm, healthy foundation for children during these formative years Sessional paper No. 6 of (1988). Pre-school science instruction increases in importance because it is within these formative years that substantial exposure to mathematical and scientific concepts and processes is thought to be critical to later achievement in these areas Riggs & Enochs, (1990). Therefore for children to perform better in science as at pre-school to higher levels of education and become better future scientist's, teachers should lay a firm and healthy foundation in science as a subject during the formative years (pre-school) Sessional paper No. 6 of (1988).

In Kenya Primary and Secondary Schools Science, a lot of concern has been expressed by parents and educators on poor performance in science as it is one of the subjects which is poorly performed. This is evidence from KCPE analysis in science (2006-2011) Examination Department Office in Rongo district, Migori County. They argue that girls especially in mixed schools perform poorly in science subjects, the teacher's characteristics have been found to be an influence on the use of various

instructional approaches especially inquiry based approach which eventually is likely to lead into poor performance in science right from pre-school level. Studies have been conducted on performance of students at primary level, contextual and teacher factors affecting implementation of science in primary schools but little has been done in relation to the approach of teaching science in pre-schools. Therefore there was need to carry out this research to find out whether teacher's characteristics mentioned in the research objectives and questions have influence on effective use of inquiry base approach in teaching science in pre-school in order to achieve better performance in science as a subject.

1.3 Purpose of the Study

The purpose of the study was to find out the influence of teacher's characteristics on effective use of inquiry based approach in teaching science in preschools in Kuja Zone, Rongo District.

1.4 The Research Objectives

1. To find out whether teacher's gender has influence on effective use of inquiry based approach in teaching science in preschools in Kuja zone, Rongo District.
2. To determine whether the teacher's professional levels have influence on effective use of inquiry based approach in teaching science in preschools in Kuja zone, Rongo District.
3. To establish whether teacher's years of experience have influence on effective use of inquiry based approach in teaching science in preschools in Kuja Zone, Rongo District.

4. To explore whether teacher's subject knowledge has influence on effective use of inquiry based approach in teaching science in pre-schools in Kuja Zone, Rongo District.
5. To find out whether teacher's attitude has influence on effective use of inquiry based approach in teaching science in preschools in Kuja Zone, Rongo District.

1.5 Research Questions

1. Does teacher's gender has influence on effective use of inquiry based approach in teaching science in pre-school?
2. What is the influence of teacher's professional levels on effective use of inquiry based approach in teaching science in preschool?
3. What is the influence of teacher's years of experience on effective use of inquiry based approach in teaching science in preschool?
4. Does teacher's subject knowledge has influence on effective use of inquiry based approach in teaching science in pre-school?
5. Does teacher's attitude has influence on effective use of inquiry based approach in teaching science in preschool?

1.6 Significance of the Study

1.6.1 Significance of the Study to Kenya Institute of Curriculum Development

The findings of the study would enable the Kenya institute of Curriculum Department design a better pre-school curriculum for teaching and learning science. Consequently the findings of the study would enable the curriculum developers to create awareness and sensitize preschool stake-holders on the importance of inquiry based instructional method of teaching science in preschool.

1.6.2 Significance of the Study to Teachers Colleges

The teacher would be able to adopt a better style of teaching in general and especially science in particular. The findings of the study would enable Teachers Training Programs to reflect more of what the teachers need in the classroom when they become teachers. These training programs too need to make pedagogical changes to the curriculum to reflect science course requirements that give pre-service teachers more background and concept development appropriate to their preferred teaching levels and more modeling of hands-on methods and strategies that they can use in their classrooms.

1.6.3 Significance of the Study to Quality Assurance Officers

In addition, research findings will enable the Ministry of Education, Inspectorate Department and the Quality Assurance to ensure the implementation of inquiry based method to teaching and learning with better teaching methodologies for science.

1.6.4 Significance of the study to researchers

Last but not least findings of the study will help to verify the validity and reliability of theories related to this study and help researchers to carry out further research on general factors affecting the effective use of varies instructional approaches right from pre-school level.

1.6.5 Significance of the Study to Other School Stakeholder

Finally, findings of this study will help the pre-school stakeholders to have positive attitude towards the use of inquiry based approach in order to come up with better future scientists who are innovative, independent, problem solvers and rational thinkers.

1.7 Limitations

One limitation encountered in this research was the access to teachers only in Kuja Zone, Rongo District. It cannot always be assumed that the responses on gender, qualifications, years of experience, subject knowledge and attitude of teachers in this area would be similar to or the same as that of pre-school teachers in other parts of Kenya. As well, ideally, participants would be exposed to experimental study for a longer period of time and with a before/after format in order to more accurately assess effectiveness; however constraints on time due to college semester deadlines dictated an inability to accomplish this.

Another limitation was the way that this type of information must, by design, be gathered. Humans are fallible creatures, which lends it to difficulties in self-reflecting, and accurate/truthful responses to questions concerning one's own abilities and/or disabilities that might ultimately negatively reflect on themselves and their teaching style/ability. As a result the accuracy and reliability of the information may contain flaws or inaccuracies. The nature of the beast makes self-reflection difficult for many people, and thus creates difficulties for a researcher's ability to analyze responses and look for patterns in perhaps flawed responses.

A final limitation, discovered during the research, was the difficulty of getting voluntary respondents to fill out and return a questionnaire that holds no "reward". For many, filling out information that will not impact their own lives and is not required seemed to be too much for those already busy with their own work, limiting the number of returned responses.

1.8 Delimitation

Delimitation is setting boundaries for study to make it manageable Mugenda and Mugenda (2003). The study was carried out in 21 preschools in Kuja Zone, Rongo district. The target population was 63 preschool teachers from which a population sample of 50 teachers were purposively and randomly selected. There were a number of factors that had a relationship with teacher's use of inquiry based instructional method but this study merit the factors to the influence of teacher's characteristics on effective use of inquiry based approach. The study used a questionnaire, interview schedule and observation. The study findings were generalized to all preschools in Kenya.

1.9 Basic Assumption of the Study

The study was based on the assumptions that: All the teachers have some knowledge on inquiry based approach. The preschool teachers who handle science in preschool are academically and professionally qualified. All the respondents were to cooperate and give accurate responses to items in the research instrument. Teachers were to pose different characteristics which could influence the effectiveness of inquiry based approach.

1.10 Definition of Significant Terms

Teacher's characteristics: typical features or qualities of a person in terms of skills, gender, attitudes, and year of experience, academic qualifications that affect effective use of inquiry based approach in teaching science in pre-schools.

Knowledge of the subject: being aware or having information or facts about a topic or a theme or a matter.

Professional levels: educational school trainings that have been attained by the teacher whether certificate or diploma or degree.

Years of Experience: the period through which the teacher has been involved practicing.

Attitude: a teacher's general outlook towards science teaching, whether positive or negative.

Gender: the sex of a teacher whether male or female.

Inquiry based approach: the manner of teaching, a style or strategy adopted in teaching in general and science in particular in which a teacher allows learners to study science based on their own investigation via observation and concrete experiences, hypotheses formulation, designing experiments, performing their own designed experiments, analyzing and discussing their findings and communicating results.

District: geographical areas of a country covering divisions and headed by a D.C for official administrative purposes.

Preschool: an institution where children below age of formal school go to acquire the basic foundation for formal school. It is the institutional nurture of children in the age group 3-6 years.

Teacher: a trained and qualified personnel in school whose work is to impart knowledge to the learners in the learning process, acts as a facilitator in the learning process.

Preschoolers: children in the age group 3-6 years enrolled and attending a preschool to acquire basic foundation for normal school.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter constituted a review of related literature from primary and secondary sources. Review of related literature showed that very few studies have been done on relationships between teacher's characteristics and effectiveness of inquiry based approach in preschools in Kenya but none in Kuja Zone, Rongo District, and Migori County, Nyanza province. The researcher focused on the teacher's characteristics like teacher's gender, academic qualification, years of experience, knowledge of the subject, and attitudes and their influence on the effective use of inquiry based approach in teaching pre-school science in Kuja Zone, Rongo District, Migori County.

2.2 Teacher's Characteristics

Teacher's characteristics are of primary concern in regard to the type of instructional method to be used in teaching and learning process. Bitengo (2005), in his research findings on preschool teacher's attitude towards the teaching of mathematics in Kasarani division in Nairobi, found that there is a significant relationship between the teacher's characteristics, content, instructional resources, learning activities, individual differences among children and the objectives to be achieved at the end of the learning process. Gichure, (2010) in her study on relationship between teacher's characteristics and effectiveness of project method in preschools in kikuyu district found out that teachers are controlling, restricting and limiting children to construct knowledge through project method. In the present study, the researcher investigated the influence of

teacher's characteristics on the effective use of inquiry based approach in teaching science in preschool to yield a better achievement in science.

2.2.1 Teacher's Knowledge of Subject

With reference to Bandura's (2000) theory of self-efficacy, Jenny de Laat analysis of interview and observations indicated that teachers with high personal science teaching self-efficacy had a long interest in science and a relatively strong background of formal science studies with opportunities for exploring out of school activities. Although they may have experienced negative science experiences in their own schooling while other factors existed, this maintained their interest. The instructional strategies in science lessons were more child centered than those reported by teachers with lower personal science teaching self-efficacy.

Allinder, (1995) in the examination of the relationship between teacher's efficacy and effects of personal and teaching efficacy of teacher's use of Curriculum Based Management (CBM) and its effects on student's achievements were studied. Nineteen special education teachers each monitored two elementary school students with mild disabilities over sixteen weeks in Math computation using CBM. The report indicated that teachers with high personal and teaching efficacy more often increased student's end- of year goals. According to Kartz, (2001) the role of teachers in science, particularly project or inquiry method is that teachers should document children's experiences, display children's work; provide a rich environment with rich experiences and activities that encourage sharing, turn taking, team spirit instead of competition, knowledge and response.

Several studies by Darling-Hammond, (1999), (2006), Gold Hager and Brewer, (2000), Guyton and Farrokhi (1987) showed a positive relationship between teacher's preparation in the subject matter they later teach and student's achievement while others have less unequivocal result. However, Monk and King (1994) found both positive and negative effects of teachers in the field preparation on student's achievement. In addition, Gold Haber and Brewer (2000) found a positive relationship for students' mathematics achievement but no such relationship for science. Similarly, Rowan et al (1997) reported a positive relationship between students' achievement and teachers with a major in mathematics.

In research done by Stephens and Wenner, (1996) it was noted that one might reasonably expect to find a positive relationship between higher level of subject matter, knowledge and express willingness to teach science and the relationship between lower level of science subject matter, knowledge and a decreased confidence to teach science. The research found however, that this was not always the case. Also discovered through research a lack of background knowledge in science often reduces the capacity to exercise judgment to handling the unexpected behavior of children when using hands or materials, Spickler and Hernandez-Azarraga, (1997).

Okere, (2003) suggested that teachers with thorough mastery on use of an instructional method adjust children information according to children's needs and always give feedback to their parents who should be sensitized to buy instructional resources and facilitate projects related activities and time to interact and observe their children as they carry out the project. He further said that for a teacher to handle a lesson in a subject

appropriately and successfully, the teacher must have thorough knowledge of the subject, good mastery of content and an expert contributing to the teachers' self-efficacy as the teacher imparts the knowledge to the learners.

2.2.2 Teacher's Professional Levels

Data collected as part of the Trend International Mathematics and Science Study (TIMSS), (2003) in Israel on teachers qualifications and their impact on students achievement, make it possible to validate several assumptions regarding the relationship between certain teacher's characteristics and learner's achievement related to the need to ensure the presence of highly qualified teachers in every classroom and to determine how best to define and prepare these qualified teachers. Quality teachers are often seen simply as good teachers and are considered to be those who exhibit the desirable traits and uphold the standard and norms of the professions. Similarly, quality teachers are considered to be those who bring about students learning. These teachers are called effective, Berliner, (1987, 2005) or successful, Fenstermacher and Richardson, (2005).

Findings from Trend International Mathematics and Science Study, (2003) data for Israel on teachers qualifications and their impacts in students achievements found out that because of psychometric difficulties in assessing teachers by their normative attributes- the logical, the psychological and especially the ethical are defined differently across cultures. Student's achievement is considered an accurate measure of teacher's effectiveness and has become a basis for value-added teacher assessment system Braun, (2005). McCafrey et al (2007), Sanders, (2000), Sanders and Rivers, (1996), Monk, (1994) however found that having a major in mathematics had no effect on student's achievement in mathematics, while having a substantial amount of under-or

post graduate coursework had a significant positive effect on students in physics but not in life science.

According to research by Plourde (2002), less than a third of elementary teachers feel well qualified to teach science, especially when asked to use the currently-preferred inquiry approach. Perhaps this is because most, but not all, pre-school teachers in the classroom today were not taught using a hands-on method while students in elementary school Nabors, (1999). Therefore, they are not as comfortable with it as they are with the content-based programs that they are more familiar with from their own youth.

2.2.3 Teacher's Years of Experience

Studies on the effect of teachers experience on students learning have found a positive relationship between teachers' effectiveness and their years of experience, but the relationship observed is not always a significant entirely linear one Klitgaard and Haal, (1974) and (1981). The evidence currently available suggests that when experienced teachers are less effective than more senior teachers, the benefit of experience level off after a few years Rivkin, Hanushek and Kain, (2000).

The relationship between teacher experience and students achievement is difficult to interpret because this variable is highly affected by market conditions and/or motivation of women teachers to work during the child rearing period. Harris and Sass (2007) point to a selection bias that can affect the validity of conclusion concerning the effect of teachers' years of experience. If less effective teachers are more likely to leave the profession, this may give the mistaken appearance that experience raises teacher's

effectiveness, selection bias could however work in the opposite direction if more able teachers with better opportunities to earn are those teachers most likely to leave the profession.

2.2.4 Teacher's Attitudes

Plourde, (2002) in his study on the influence of student teaching on pre-service elementary teachers, teachers science self-efficacy and outcome expectants reported that beliefs and attitudes that teachers have about science and science instruction play a critical role in shaping their patterns of instructional behavior Plourde, (2002). Inadequate teacher background in science, insufficient facilities and equipment and negative attitude about science have all been cited by elementary teachers as obstacles to effectively teaching science Tarik, (2000). Ineffective teaching methods result into reduced motivation, increased negative attitudes towards learning and further yield too low achievement Chiapetta and Roballa, (2006).

Students involved in inquiry-based programs increase their creativity, have better attitudes towards science, and have improved logic development, communication skills and reading readiness (Haury & Rillero, 1994). Ginns and Walter, (1990) found that teachers beliefs and attitudes regarding the teaching of science were often firmly set prior to entry into teaching as a result of their science related experience in elementary and high school. According to Lawton, (1997) students who are exposed to an inquiry approach to science express a more positive attitude to learning in all areas, show increased enjoyment of school, and have increased skill proficiency in many areas,

including independent thinking abilities, than those students taught the traditional way (Lawton, 1997).

Regarding teacher attitudes towards science teaching, a survey by Tilgear, (1990) showed that over half of all elementary school teachers found teaching science very threatening and ranked science at or near the bottom of subject they preferred to teach cited Kelbe and Howard, (1994). Interview responses analyzed by Tarik, (2000), during his research on teacher attitude found that the descriptors used his study participants to describe their feelings about teaching science were overwhelmingly negative. Further, these negative feelings towards science negatively affected teaching self–efficacy even for those participants who had experienced earlier high achievement in science. Buss (1975, 1978) argued that psychology, as a discipline, has shifted back and forth between two basic world views. Reality constructs the person and the person constructs reality. These two views are based upon the relationship between individuals and the forces that shape them (i.e. society). Buss, (1975) define world views as a set of implicit causal relationships shared across apparently desperate conceptual domains.

Hopefully, this research has added even greater understanding of the effect of teacher’s characteristics like teacher’s subject knowledge, academic qualifications, years of experience, attitude and gender on the use of inquiry based approach in teaching science in pre-schools which led us to understanding why science literacy level are generally low in Kuja Zone, Rongo District.

2.2.5 Teacher's Gender

The review of related literature on the relationship between teacher's gender and learner's outcomes offers almost every possible conclusion. Thomas Dee (2006) investigated the effect of teacher's gender using National Education Longitudinal Survey (NELS) data on 8th graders from US and found that same gender teachers had a positive effect for example girls do better in school when taught by women and boys do better when taught by men. Dee also found that effect of teacher's gender varies depending on the subject: for girls to benefit of being assigned to a female teacher are concentrated in history. A study by Michaelowa, (2001) using data from Francophone sub-Saharan Africa similarly finds support for the same-gender effect Michaelowa, (2001).

Contradicting these studies, however a larger sample based study in the US shows that regardless of student's gender, students taught by women perform better than those taught by men Krieg, (2005). In accordance with Krieg, based on findings from the Southern and Eastern Africa Consortium for Monitoring Education Quality (SEACMEQ), a recent (UNESCO 2000) finds that children in female teacher's classroom tend to perform better. But a large study in Pakistan presents findings that contradict the studies above. Warwick and Harouna (1994) studied 1000 teachers, 300 school supervisors, and 11,000th and 5th grade students in Pakistan. He found that rural students of male teachers scored significantly higher in math than did rural students of female teachers. However, the author notes that it is unclear whether the differences arose from teacher, students, school or cultural factors.

Further complicating this picture, other researchers have found no relationship between teacher's gender and student's outcomes. In the Netherlands, for instance, Cole, Catherine (5th September 2007) found that teacher gender has no effect on student achievement, attitudes or behavior regardless of student gender, ethnic background or socioeconomic status. Thus the evidence that increasing the presence of female teachers will improve girls' learning outcomes is at best limited.

With respect to the positive relationship between the presence of female teachers and improved school participation for girls the argument is that the presence of a female teacher may help alleviate parental concerns about influence of teacher's characteristics' on the effective use of inquiry based method and well-being of their daughters in traditional gender-segregated societies and encourage them to send daughters to school UNESCO (2000). Here the picture is less contradictory and to value of female teachers is more easily apparent.

2.3 Inquiry Based Approach

Inquiry-based instruction is a method of using hands-on activities that allow children to explore scientific concepts as well as instruction in which the focus is on using the process skills to gain deeper understanding of the connection in science. Historically, the early paths of science instruction followed the philosophy of exercising student's minds through rote memorization of information. During the 1960's however, research done by Jean Piaget as well as others, began to change this approach of thinking about science instruction. These newly developed philosophies of learning styles and learning environments supported the assumption that "learners actively construct individual

world views based on personal observations and experiences, and that learners respond to format instruction in terms of pre-existing intuitive perspectives"...Cole & Beuhner-Brent, (1991, p.3). Piaget's research in particular recommended that positive learning environments be rich in physical experiences for children. This research indicated that involvement in learning was the key to intellectual development, especially during the early elementary years.

Further research has also shown that science instruction needs to consist of direct physical manipulation of objects, equipment and materials to be successful Haury & Rillero, (1994). This "experiential learning" that occurs in elementary classrooms provides a strong base that allows for the development of abstract thinking later in life Haury & Rillero, (1994). Using inquiry-based instruction allows children to improve their abilities to reason and provides experiences that enhance the early stages of cognitive development. Rarely do the activities allow students to perform an operation and derive their own hypothesis or conclusion about the materials or phenomena Haury & Rillero, (1994).

Inquiry based programs, on the other hand, are "dynamic, depicting science as an ongoing process of exploration and discovery, rather than a content domain to be memorized" Mastropieri & Scruggs, (1994, p.11). Deep understanding of most science concepts comes with inquiry-oriented instruction that engages students in the investigative nature of science. Important process skills such as recording data, communicating and measuring are often seen in textbook-based programs, but the higher level process skills of predicting, inferring, hypothesizing, experimenting and

identifying & controlling variables can only truly occur through activity-based experiences Mastropieri & Scruggs, (1994). In essence, inquiry-oriented teaching engages students in investigations to answer questions. These questions are usually answered when students have constructed mental frameworks that adequately explain their direct experiences.

Even though it is important to note that for science to achieve its goals, the teaching of science process skill is a must. To achieve the general objective of science as outlined by the KIE, (2003) teacher characteristics is key in order to achieve in use of the inquiry based instruction method. According to researcher's own experiences, the researcher has strong feelings that teacher's characteristics is a key factor to be put into consideration. Therefore these calls for intensive investigation of the influence of teacher's characteristics on the use of inquiry based approach in teaching science in pre-school. The teacher should be able to develop, foster and support children social skills.

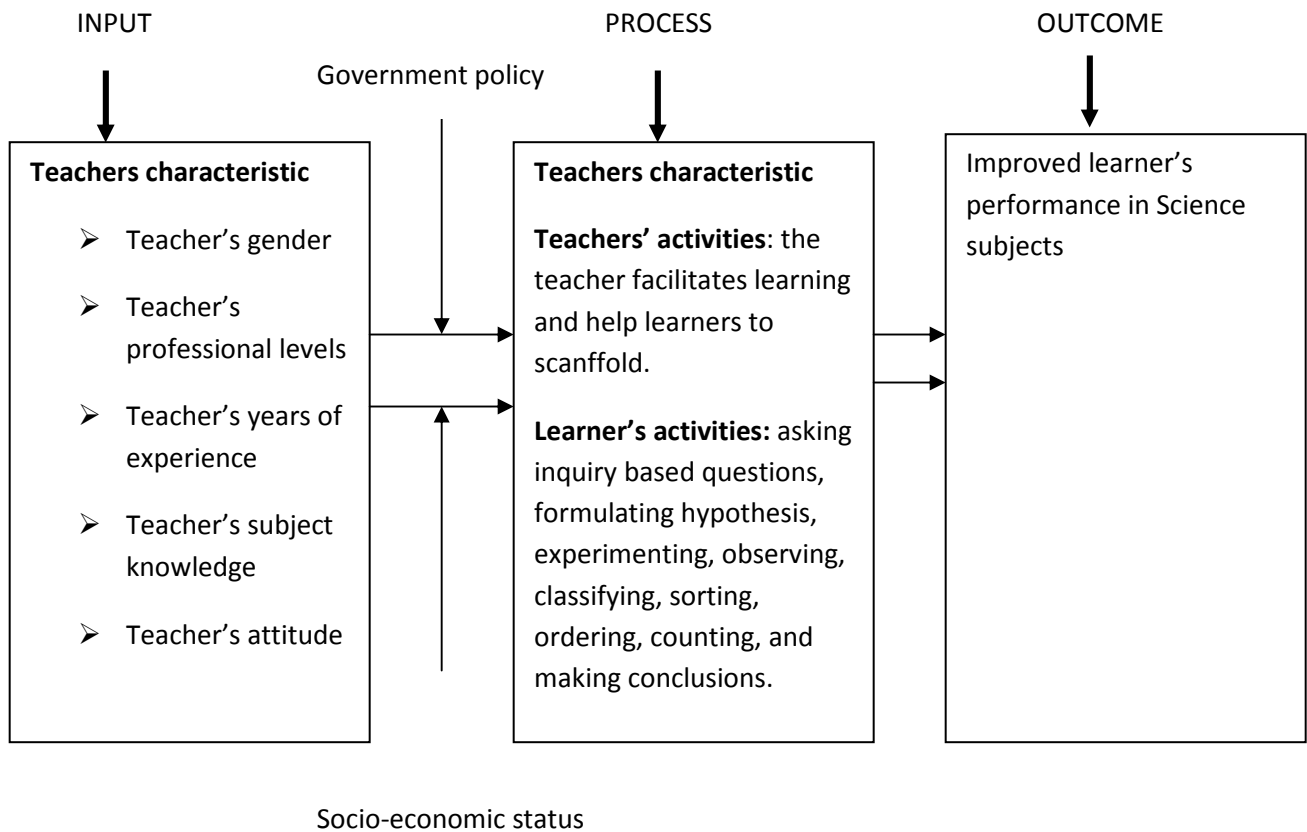
2.4 Theoretical Framework

This research is based on constructivist theory by Dewey, (1966); Brunner, (1961) who asserted that individuals actively construct knowledge and understanding from their immediate environment through social interaction with the environment. These theorists emphasized that a learner must be actively engaged in meaningful and relevant activities. John Dewey philosophy is ideal in inquiry based instructional method of teaching/learning in that, learners are given opportunity to come up with their own problems for investigation with an aim of getting solutions to the problems.

Suntrock, (2004); Brook and Brook, (2001) asserted that in the constructivist views, teachers should not simply pour information into children’s mind but should encourage children to explore their world, discover knowledge, conduct experiments, reflect, think critically and report results. For active/practical learning to take place, teacher’s characteristic is a key despite other contextual factors like teaching facilities and resources which should be made available. In essence then the constructivist theory is more suitable in relation to finding out the influence of teacher’s characteristics on the effective use of inquiry based instructional method in teaching science in pre-school.

2.5 Conceptual Framework

Figure 2.1 Conceptual Framework



The conceptual frame-work above describes the connection between the input process and the output in inquiry based instructional approach in science in preschool. The input consists of the teacher's characteristics. These variables could affect the effective use of inquiry based instructional approach positively or negatively. Thus leading to either improved learner achievement or low learner achievement in science (out-come).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter contains the research design, population, sampling and sampling size, research instrument, validity and reliability of the research instrument, data collection procedure, data analysis and ethical considerations.

3.2 Research Design

The research design used was a descriptive survey design. It is a qualitative study and it uses descriptive techniques of analysis. Descriptive studies collect information by interviewing or administering questionnaire to a sample of respondents. It can also be used when collecting information about people's attitudes, opinions on education or social issues Mugenda, Olive M, (1999). The study aims at collecting information from respondents on their gender, academic qualification, years of experience, subject knowledge and attitudes, on their influence on the use of inquiry based approach in teaching science in pre-school in Kuja Zone, Rongo district in Migori County. Surveys are excellent vehicles for the measurement of characteristics of a large group.

3.3 Research Population

The target population included 63 pre-school teachers in Kuja Zone, Rongo District, Migori County. The research population included a total of 21 pre-schools with an estimated population of 63 pre-school teachers constituting of 53 female and 10 male teachers. There were 14 public schools with a total number of 42 teachers and approximately 7 private schools having a total of 21 teachers. The percentage used is

more than 30% as recommended by Mugenda and Mugenda (1999). The respondents included pre-school teachers purposively selected from both public cum private pre-schools in Kuja Zone, Rongo District. They will be male and female pre-school science teachers purposively selected from the target population.

3.4 Sampling and Sample Size

The sampling frame comprised of 63 pre-school teachers from both public and private pre-schools in Kuja Zone, Rongo district, Migori County who were purposively and randomly selected. Rongo district is convenient, diverse and would give the researcher a more representative picture on the influence of teacher's characteristics on effective use of inquiry based approach in teaching science in pre-school. In this study the sample size was all pre-school teachers in Kuja Zone purposively selected from the 21 pre-schools in Kuja Zone, Rongo district. This sample size helped to yield a research data that was generalized to a larger population.

3.5 Sampling Procedure

The purposive sampling was utilized to randomly select the respondents based on these criteria;

1. Male or female respondents in public or private pre-school in Kuja Zone, Rongo District.
2. Pre-school teachers in public or private pre-school in Kuja Zone, Rongo District.
3. Teachers teaching science activities in public or private pre-school in Kuja Zone, Rongo District.

From the list of qualified respondents chosen based on the inclusion criteria, the purposive random sampling was used to finally select the respondents with consideration to the computed minimum sample size.

3.6 Research Instrument

The tools employed were questionnaire, interview schedule and observation. The researcher used mainly Primary data. The Primary data was obtained using the three tools. These instruments are described below.

3.6.1 Questionnaire

The researcher used both closed-ended and open ended questionnaire. For the close ended questionnaire the researcher posed written questions and possible responses were given for the respondents to select. While for the open-ended questions, the researcher posed written sets of questions which were left for the respondents to freely express themselves. The questionnaire was administered to the respondents and once filled was collected back by the researcher on agreed upon date and time for data collection, analysis and presentation.

The instrument was piloted before the actual data collection in two schools and two pre-school teachers in schools which were not under the study were involved to avoid contamination of the results. Drafted question items were piloted in order to avoid threats to reliability, revealing vague questions and unclear instructions Gay, (1981) piloting was done on the basis of ability to generalize data. Cronbachs Coefficient alpha was used because it assessed reliability for multiple choice questions and items that had

no right or wrong answers. During the piloting research instrument was test-retested. The purpose of test-retest was to assess clarity of the instruments and reliability of each of the items in the questionnaire and the suitability of language used in the instrument Mulusa, (1998).

3.6.2 Interview Schedule

An interview schedule is an item with pre-coded questions to produce quick, cheap and easy quantitative data which is high in reliability but low in validity. It allows the researcher to get a detailed data Graziano, (1989). Interviews are a good data collection instrument since they allow the researcher to seek for clarification in case they do not understand a given concept. The interview aimed at gathering information on teacher's perception on various science skills and frequency of occurrence of barriers to effective learning. This tool was prepared in advance and was administered on the selected respondents.

3.6.3 Structured Observation Schedule

This instrument was used to determine the teacher's and learner's behavior during the teaching and learning process. Kothari, (2004) stipulated that observation is an effective method of data collection because information gathered is relevant to current occurrences and respondents too feel relaxed for less demands on them. This tool focused specific patterns of the teacher's entry behavior in class on how the lesson was conducted, classroom was managed, the condition of the class and teachers mannerism in relation to the teacher's behavior in the classroom situation. The researcher was an active participant since the researcher was personally present in the classroom making

direct and keen observations during teaching and learning process thereby recording observed behavior patterns and content analysis was done using frequency and percentages.

3.7 Validity and Reliability of research Instrument

3.7.1 Validity

According to Kombo and Trom (2006), a research instrument is said to be valid if it measures what it is supposed to measure. Validity therefore refers to the accuracy of the content in the research instrument in regard to collecting data that will remain accurate. It stipulates where the instrument is measuring what it is intended to measure. In addition, Borg and Gall (1989) stress that content validity ascertains that each instrument measures only what it is intended to measure and it covers all the areas of the study. To ascertain **validity** of the tools that were used by the researcher, the researcher administered the instruments to three scholars and the supervisor independently who assessed the relevance of the content used in the instruments. The researcher used feedback from expert judgment of the supervisor and the three scholars to improve the content validity for the three research instruments. Expert judgments from the three scholars and the supervisor were used to identify if the content validity of the instrument had any of the following: any weakness, check on the clarity of the questions, elicit comments from the respondents on how to modify it and detect if there were any flaws in the administration of the instruments. Their responses, views and suggestions were incorporated in constructing the final draft of the instruments. Adjustments were made in line with Best and Khan (1997), Mugenda and Mugenda (1999) and Kothari (2004), who emphasized that an instrument is valid if relevant adjustments are done so that it

measures the content, outlined in the research questions. The supervisor reviewed the instrument before data collection to ensure that there was content validity.

3.7.2 Reliability

Reliability is a measure of how consistent the result from a test is Mugenda (1999). Kombo and Tromp (2006) also asserted that a reliable test is one that consistently produces the expected results. If the average score for all items exceed 75%, then this is an indication that the instrument is reliable. Reliability therefore refers to the consistency of the research instrument in order to get the specific data needed. The result should be consistent and stable even when the data is collected over repeated times at different intervals. On the same note, Coolican (1994) describe reliability as a measure of consistency that should give similar results on different but comparable occasions.

To establish **reliability** the researcher tested and retested the instrument on two separate occasions to teachers in the other zone (Cham gi wadu zone). The teachers selected had similar characteristics with the population of the main study sample but were not the main study sample. These teachers were purposively and randomly selected. The researcher compared the two results that is, the results of the first and the second test for each respondent and each instrument. Responses from the test re test results for both occasions were the same. These proved that the instruments were reliable and consistent confirming Best and khan (1992), that an instrument is reliable to the extent it measures. The researcher three scholars also checked objectives, research questions and the literature review to ensure that the items on the questions cover the objectives and

research questions, specific, simple and clear. The researcher also employed the expertise of the supervisor who assessed and examined the questionnaire individually and provided the feedback. All the recommendations provided were used to fine tune the final questionnaire.

3.8 Data Collection Procedure

The researcher ensured that questionnaire was available in the correct numbers and ready for use and that the sample was clear. For example in this study the sample purposively and randomly selected all pre-school teachers teaching science activities in pre-school from a population of 63 pre-school teachers in Kuja Zone, Rongo District, Migori county. The researcher asked permission to carry out the study from the relevant authorities before collecting any information or data from the field of study giving information to the respondents requesting them to answer the questionnaire for the purpose of collecting data on the influence of teacher's characteristics on the use of inquiry based approach in teaching pre-school science activities. Sixty three questionnaire copies were then distributed to male and female pre-school teachers in public and private institutions. Only Forty-eight questionnaire copies were returned, however three respondents didn't teach science and so the responses on those questionnaire were eliminated the researcher worked out the finding with forty five respondents. There were 38 female and 10 male respondents. 21 of the respondents had Diploma in Early Childhood Education, 10 had Certificate in areas other than education, and 14 had Certificate in education.

3.9 Data Analysis

The purpose of this study was to find out the influence of teacher's characteristics on effective use of inquiry based approach in teaching science in pre-schools in Kuja Zone, Rongo District, Migori County. After pre-testing the instrument with the teachers, research was carried out. The study was carried out in 16 preschools in Kuja Zone, Rongo district. The questionnaire was distributed to teachers at public schools and private schools in Kuja Zone, Rongo district. Information was gathered that was related to teacher's gender, academic qualifications, years of teaching experience, feelings about their background science knowledge, attitudes about the subject of science teaching itself, and teacher's behavior towards inquiry method usage for teaching science in their pre-school classrooms. The results were coded and recorded upon return to the researcher.

The returned responses for the questionnaire were originally hand recorded on a master spreadsheet, with "explanation" answers written word-for-word, and "Likert-type" answers coded 1 through 5. This information was then transferred to a Microsoft Excel computer spread sheet for better and more accurate analysis of the "rated" responses. Commonalities, themes and patterns were sought in relation to inquiry method teaching training, science background knowledge, classroom experiences and teachers' attitudes towards science in general, as well as how these may or may not affect individual teacher's comfort level with using hands-on lessons in the classroom. Analysis of the hand written responses involved breaking down the responses and categorizing them according to response versus gender, professional levels, experience, background knowledge the subject and attitude as indicated on other portions of the questionnaire.

For every item in the questionnaire responses were coded in a tally sheet, the percentage was calculated from frequencies obtained.

Interview schedule was analyzed in line with research objectives and research questions. The findings from the observation schedule were also analyzed in terms of the activities observed and done in the classroom. The collected data was registered, coded and analyzed for quantifiable responses on frequency tables and pie-charts.

3.10 Ethical Considerations

Treatment of the respondents was confidential and did not subject them to any form of harassment. Consequently results were treated with confidence and humane treatment was also observed throughout the study.

CHAPTER FOUR

FINDINGS AND DISCUSSIONS

4.1 Introduction

In this chapter the result of the study are presented, analyzed and interpreted in the context of the objectives and the research questions of the study. The study was intended to investigate the influence of teacher's characteristics on the effective use the effective use of inquiry based method in teaching science in pre-schools in Kuja Zone, Rongo District in Migori County. The information sought in this survey concerned six main areas; teacher's gender, academic qualifications, years of teaching experience, feelings about their background science knowledge, attitudes about the subject of science teaching itself, and teachers' behavior towards inquiry method usage for teaching science in their pre-school classrooms.

The study sought to answer the following research questions:

- Does the teacher's gender has influence on the effective use inquiry based method in teaching science in pre-school in Kuja Zone?
- What is the influence of the teacher's academic/professional qualifications on the effective use of inquiry based method in pre-schools in Kuja Zone?
- What is the influence of the teacher's years of experience on the effective use of inquiry based method in pre-schools in Kuja Zone?
- Does the teacher's subject knowledge has influence on the effective use of inquiry based method in pre-schools in Kuja Zone?
- Does the teacher's attitude has influence on the effective use of inquiry based method in pre-schools in Kuja Zone?

4.2 Questionnaire Return Rate

The researcher filled up the questionnaire as per the instructions given by the researcher but the turn up was 100%. The questionnaire was returned as follows.

Table 4.1: Questionnaire Return Rate

Return Rate	Frequency	Percentage (%)
Used questionnaire	48	100
Unused questionnaire	00	00
Total	48	100

As indicated from table 4.1, all the questionnaire sheets administered were returned hence the findings were deemed reliable.

4.3 Demographic Information on Respondents

The researcher used the frequency counts and percentages to analyze the demographic data of the respondents who participated in the study. The information obtained included:

- Gender composition of the respondents
- Professional Levels
- Teaching experience

4.3.1 Gender Composition of the Respondents

The researcher found it necessary to seek information about gender composition of the respondents to establish whether gender influence the effective use of inquiry based

method in teaching science in pre-schools in Kuja Zone. Qualitative data was analyzed using descriptive statistic and the results were presented on a table using frequency and percentages as shown below on table 4.2.

4.4 Questionnaire's for Pre-School Teachers

Table 4.2 Distribution of the Respondents by gender

Gender	Frequency	Percentage (%)
Male	10	20.83
Female	38	79.17
Total	48	100.00

From the above table, it was realized that male pre-school teachers were the minority 10 (20.83%) whereas female pre-school teachers were the majority (79.17%). There was great disparity between the male and female pre-school teachers which might have been as a result of the assumption that teaching pre-school is women oriented job and the fact that in the African Traditional it was believed that child nurturing and bearing was a key role of the women (mothers).

4.4.1 Teacher's Professional Levels

Qualitative data generated was analyzed using descriptive statistics and results presented on table using frequencies and percentages as shown below.

Table 4.3 Teacher's Professional Levels

Professional Levels	Frequency	Percentage (%)
Untrained	00	00
Certificate	24	53.33
Diploma	21	46.67
Total	45	100

Majority the teachers (53.33) are certificate holders and a good number are diploma holders (46.67). This shows that they are experienced, trained, qualified and therefore are likely to effectively use inquiry based method in teaching science in a pre-school despite of their personal characteristics.

4.4.2 Teaching Experience

The table below seeks to establish whether teacher's years of experience have influence on effective use of inquiry based approach in teaching science in pre-school.

Table 4.4 Number of Teaching Experience

Category	Frequency	Percentage (%)
0-5 years	25	55.56
6-10 years	15	33.33
11 years and above	05	11.11
Total	45	100.00

According to these findings 55.56% of the teachers had a teaching experience of between 0 and 5 years, 33.33 had a teaching experience of 6-10 years and 11.11 had a teaching experience of 11 and above.

Table 4.5 Grade levels currently taught by the teachers

Grade Levels Taught	Frequency	Percentage (%)
Baby Classes (3-4 years)	16	33.33
Middle Classes (4-5 years)	14	31.11
Pre-unit classes (5-7 years)	15	33.33
Total	45	100.00

From the findings in table 4.5, researcher found out that there were at least an average of 2 teachers in a class.

Table 4.6 Preferred subjects currently taught by the teachers

Favorite subject	Frequency	Percentage (%)
Science	38	84.44%
Subjects other than Science	07	15.56%
Total	45	100.00

Results from table 4.6 indicated that thirty-eight (38) or (84.44%) of the respondents felt that science was their favorite subject to teach while, seven (7) or (15.56%) respondents indicated otherwise, that their favorite subject preferences were subjects other than science.

Table 4.7 Average time spend weekly teaching science

Average Time spend weekly (IN HOURS)	Frequency	Percentage (%)
5.1 hours	17	37.78
8.7 hours	7	15.56
12.25 hours	7	15.56
14.0 hours	7	15.56
17.0 hours	7	15.56
Total	45	100

On average, 1.28 hours of science instruction were occurring weekly in the respondent's classrooms. However the differences when broken down individually by respondent showed a different picture. Seventeen (17) or (37.78%) of the respondents said that only about one to 5.1 hours of science teaching a week was taking place in their classrooms. Seven (7) or (15.56%) teachers responded that two to 8.7 hours a week was average, and (7) or (15.56%) teachers wrote that 12.25 hours weekly was normal. On the higher end of the spectrum, seven (15.56) teachers taught at least 14 hours of science weekly and seven (15.56%) teachers indicated that 17.5 hours weekly was their average. A few of the questionnaire's indicated that science was considered a split-time class with Social Studies, either one subject or the other was taught in a week, but not both subjects. And three (6.67%) respondents honestly indicated that sometimes no science was taught at all.

Table 4.8 Amount of time required for Science Instruction weekly

Suggested Time / other responses (Hours weekly)	Frequency	Percentage (%)
4-5hours	16	35.5556
45 minutes daily-2hours	10	22.2222
Anything in between (45minutes-5hours)	07	15.5556
Has never been set	03	6.6667
N/A	03	6.6667
Unsure/20 minutes	03	6.6667
Curriculum says 30 minutes	03	6.6667
Total	45	100.0002

By far the biggest difference noted in the questionnaire as per Table 4.7 was the understanding of the amount of time that was required for science instruction weekly. The responses indicated that there was very little agreement on this question amongst the educators. Answers ranged from four to five hours weekly to 45 minutes daily to two hours weekly and everything in between. Some of the questionnaire simply had a question mark beside the question.

One respondent noted, "... it has never been set", one questionnaire was marked "N/A", one respondent honestly reported, "unsure/20 minutes a day", and a final survey response was marked "the curriculum says 30 minutes weekly for science instruction", which seems somewhat dubious. This researcher feels that this lack of clarity is clearly an issue that needs to be addressed. If teachers are not even sure how often they should

be teaching science in their classrooms, it will be difficult to change the direction and styles of teaching in the less effective classrooms to begin to reach the levels of science literacy the learners need before leaving pre-school school behind.

Table 4.9 Time spend weekly preparing to teach science (including planning and material gathering)

Time (Hours per week)	Frequency	Percentage (%)
1-2 hours	28	62.2222
Less than1 hour	14	31.1111
3 hours	03	6.6667
Total	45	100.0000

From table 4.9 the amount of preparation time needed weekly to teach science classes as reported by the respondents seemed to ring true. 28 (62.22%) of the respondents indicated that they needed one to two hours weekly to prepare to teach science in their classrooms, 14 (31.11%) of the respondents felt that less than one hour was adequate, and 3 (6.67%) spent around 3 hours weekly preparing to teach their science classes.

Table 4.10 Teacher’s use inquiry based method or text book based method science lessons per week

No. of lessons (Inquiry based method lessons)	No. of lessons (Text book based method lessons)	Frequency	Percentage (%)
5 hours	5	3	6.67
2-3 hours	0	6	13.33
1-2 hours	1	6	13.33
Less than 1 hour	1	3	6.67
1.5 hours	1.5 hours	3	6.67
Less than half an hour	More than half an hour	3	6.67
Not often used	4 hours	3	6.67
1 hours	3-4 hours	3	6.67
1-2 hours	3 hours or more	3	6.67
3 hours	1 hour	3	6.67
As much as text-book lessons	As much as inquiry based lessons	3	6.67
2 hours	2 hours	3	6.67
1 hour	2 hours	3	6.67
Total	-	45	100.00

Another area of response that showed a wide diversity of answers was the section asking about hours taught weekly using hands-on methodology versus hours taught weekly using a text-based lesson. According to table 4.10 three nursery teachers with strong science background indicated five lessons weekly in both categories. However, none of

the other classes even came close to this number of hours of science instruction. Of the teachers with nursery classes, minus the class just reported, 6 indicated two to three times weekly using hands-on strategies and no text based lessons, 6 indicated one to two lessons weekly using inquiry method and "maybe 1" text based lesson, 3 indicated less than once weekly using hands on strategies and about one text-based lesson as well, and the final 3 nursery respondents indicated one half-hour lesson weekly in both categories.

The three Diploma level teachers' responses fortunately indicated that a little more science was occurring in their classrooms, but also unfortunately indicated that the emphasis was clearly not on using hands-on strategies with their science lessons. 3 certificate teachers reported that their science was "not often" taught using inquiry strategies, but that they did spend about four hours weekly on text-based science lessons. Other 3 certificate teachers responded that perhaps once weekly she had inquiry lessons, but three to four times weekly she had text-book based science lessons.

Another 3 certificate teachers indicated that she had one to two lessons weekly using hands-on methods and three or more lessons weekly using text-book based strategies. 3 male middle class teachers seemed to have the best "numbers". They responded that they usually had three weekly hands-on activities and one weekly text-based lesson. Perhaps because it is more difficult to teach high vocabulary textbook lessons to learners with less English based vocabulary knowledge it is naturally easier to teach science using a hands-on method. 3 baby class female teachers indicated that they taught science only every other week, when they could "fit it in", but those they used hands-on and text-based lessons equally. And another three female baby class teachers indicated

that two hours weekly using both types of lessons was normal for her classroom. Lastly, three female 3rd grade teachers' respondents said that they used hands-on lessons once a week, over a few days, and text-based lessons two times a week or more.

4.5 Respondent Background Knowledge

The table below was used to explore whether teacher's subject knowledge has influence on effective use of inquiry based approach in teaching science in pre-school.

Table 4.11 Teacher's background knowledge in science in high school and college affected his or her ability to effectively teach science using inquiry based method

Responses	Frequency	Percentage (%)
Helped develop love for and enjoyment of teaching	17	37.78
Definitely helped	08	17.78
Peaked interest	08	17.78
Strengthen teaching to some degree	05	11.11
Allowed pulling of different disciplines into teaching	06	13.33
Did not give any help at all when it came to teaching science	01	2.22
Total	45	100

When questioned about how their college science classes affected their ability to effectively teach science at the pre-school level using inquiry based method, most of the teachers indicated that that it gave them broader background/foundation knowledge to

understand science, but not necessarily the ability to teach it. Seventeen (37.78%) of the respondents indicated that their college science courses are where they developed their love for and enjoyment of teaching science. Other responses included, eight (17.78%) respondents said "definitely helped", another 08 (17.78%) "Peaked my interest", 05 (11.11%) "strengthened it to some degree" and 06 (13.33%) "Allow them to pull different disciplines into their teaching now". Only one (2.22%) respondent noted that her college science background did not help at all when it came to teaching science.

4.5.1 Science Methods Courses took in college and how they helped change teacher's attitude on effective use inquiry based method in teaching science

The question concerning the science methods classes required in most liberal arts teaching programs and how they might have helped the teachers teach science effectively using inquiry based method in their own classrooms had some very strong responses, most of them negative. As shown below in Table 4.12.

Table 4.12 Science Methods Courses took in college and how they helped change teacher’s attitude on effective use inquiry based method in teaching science n teaching science

Responses	Frequency	Percentage (%)
Science methods classes did not help at all	20	50
Science methods classes did give some new ideas of how to teach science effectively in lower grades	04	10
Science method classes convince the teachers that hands-on learning, inquiry and experimentation were essential to understanding science concepts	04	10
Definitely in the minority regarding the value of college teaching programs science method classes	12	30
Total	40	100

Five of the teachers had not graduated with Certificate in education, so they were not required to take science methods classes. Of the survey respondents left, twenty (50%) responded that the methods classes did not help them at all in teaching science in their own classrooms. Four (10%) female respondents said that their methods classes did give them some new ideas of how to teach science effectively using inquiry based methods to lower grades, and other four (10%) female teachers indicated that their methods classes convinced them that hands-on learning, inquiry and experimentation were essential to understanding science concepts. However, twelve (30%) respondents were definitely in the minority regarding the value of college teaching programs' science methods classes. This might perhaps also be an excellent area for further research.

4.6. Science Teaching Attitude

A large portion of the survey centered on teacher's attitudes about their own science teaching. The questions were set up in a Likert-type format for easier answering and there were five levels of agreement and each level was given points with answers choices including Excellent (E) = 5 points, Good (G) = 4 points, Fair (F) =3 points , Poor (P) = 2 points, and Terrible (T) = 1. The findings were presented in the table below.

Table 4.13 Science Teaching Attitude

	E	G	F	P	T
Your science content knowledge for teaching pre-school science	-	45	-	-	-
Your competency in teaching pre-school level science	-	03	42	-	-
Yourself as a teacher of science	-	28	14	03	-
Your learners responses to science instructions	21	24			
Your learner's ability to retain science content knowledge	-	28	17	-	-
Your learner's enjoyment of learning science	24	21	-	-	-
Your science class on the following statement: My class is fun, interesting and has high potential for learning	24	21	-	-	-

All of the respondents 45 (100%) indicated that they felt that their science content knowledge was good, and all but 03 (7%) ranked their competency for teaching pre-school level science as good. Twenty Eight of the teachers (62%) ranked themselves “good” as a science teacher, fourteen (31%) said they were “fair” science teachers, and three (7%) felt they were “poor” science teachers. All of the teachers felt that their learners responded either “good-24 (53%) responses” or “excellent-21 (47%) responses” to their science instruction, lending credence to the notion that even poorly taught science is better than no science instruction at all. Most teachers also felt that their learners’ ability to retain science content knowledge was at least “fair” or “good” with the average response being 22.5 when 17 = fair and 28 = good. The respondents also ranked their learner’s enjoyment of science at 23.53 when 21 = good and 24 = excellent and most also indicated that they believed that their science class was fun, interesting and had a high potential for learning with the average response being 21.07.

Table 4.14 Perception on the following abilities in science

	Always	Usually	Often	Sometimes	Never	Mean
Teach science effectively	36	-	-	-	-	4.0
Necessary skills to teach science	-	-	34	-	-	3.80
Effectively monitor science experiments	-	-	-	-	35	3.90
Difficulty in explaining why science experiments work	-	-	-	36	-	4.0

In specifically rating their own abilities as a teacher of science, all of the respondents indicated that they “usually” or “always” teach science effectively (average answer being 4.0 when answer choices ranged from Always, Usually, Often, Sometimes and Never), and most felt that they “usually” or “often” felt they had the necessary skills to teach science (3.84). Again, most of the respondents felt that they “usually” or “often” were able to effectively monitor science experiments, with the total being pulled down by one “Never” response for an average of 3.92. All of the teachers indicated that they “sometimes” or “never” had difficulty explaining why experiments worked.

Table 4.15 frequency of Self-evaluation of science content

How frequent do your science lessons:

	Always	Usually	Often	Sometimes	Never	Mean
Involve exploratory learning	-	-	28.35	-	-	3.15
Teach process skills in context	-	-	29.08	-	-	3.23
Allow learners to experience something new			31.15			3.46
Promote social interaction			36			4.0

Self-evaluations of science lesson content showed some interesting patterns. With response choices being 5=Always, 4=Usually, 3=Often, 2=Sometimes and 1=Never, the

teachers felt that their science lessons often (3.15) involved exploratory learning, often (3.23) taught process skills in content, often (3.46) allowed the kids to experience something new and usually (4.0) promoted social interaction.

4.7 Written Interview for Teachers

Section A

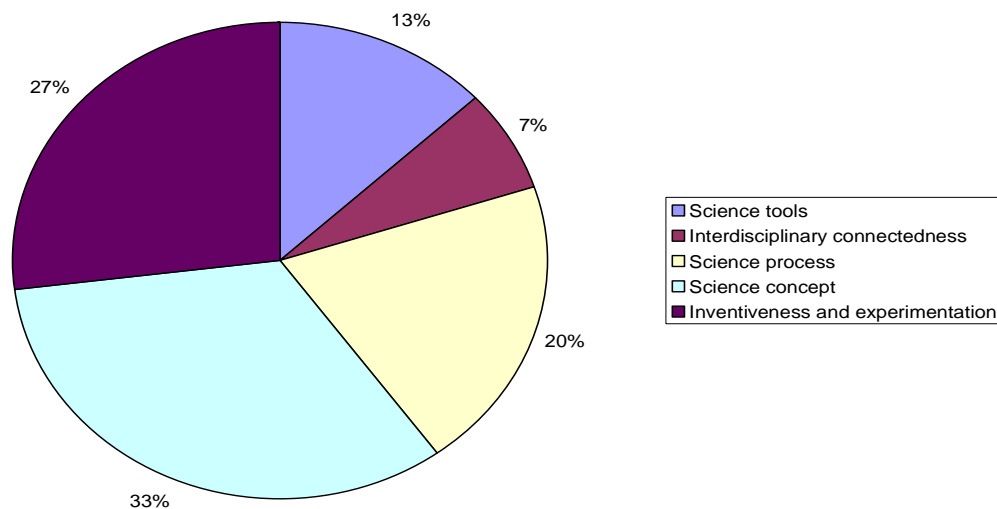
Table 4.15 science skills in order of importance

Skills	Frequency	Percentage (%)
1. Science concepts	14.85	33
2. Inventiveness and experimentation	12.15	27
3. Science processes	9.00	20
4. Use of science tools	5.85	13
5. Interdisciplinary connectedness	3.15	07
Total	45.00	100

The final portion was an interview that requested teachers to “Rate” certain science skills in order of importance, 1 being most important and 5 being least important and the other section requested teachers to **Rate frequency of occurrence of barriers to effective learning**. The answers received from table 4.15 above and figure 2 below indicated that, at least for this group of respondents, science concepts were most important (33%), closely followed by inventiveness and experimentation (27%). Further down the list science processes ranked third (20%) and use of science tools fourth

(13%). Interdisciplinary connectedness ranked last (7%). The pie chart (Figure 4.1) below shows the ratings of the skills according to the teacher respondents.

Figure 4.1 Science Skills Rating



Section B

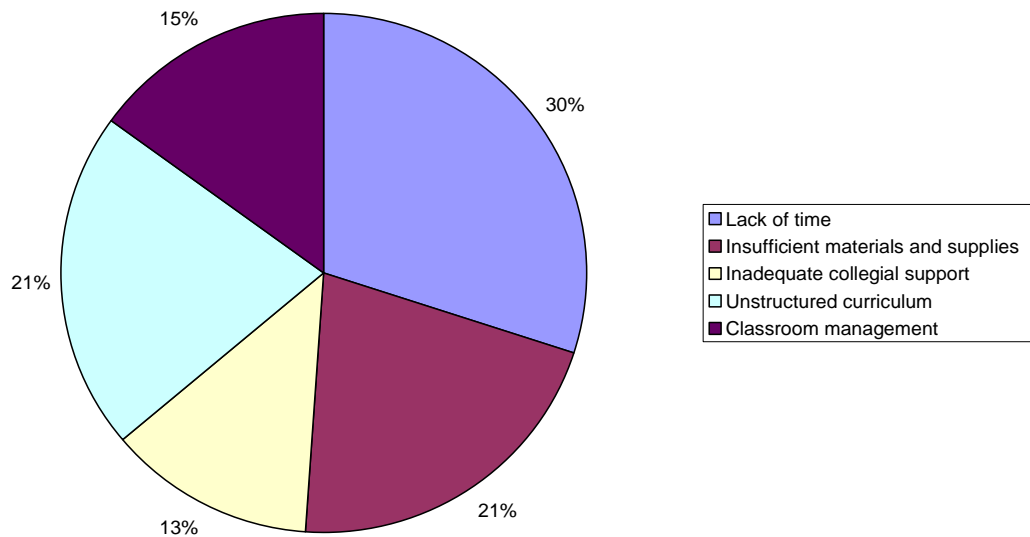
Table 4.16 Barriers Science Learning

Barriers to effective learning	Frequency	Percentages (%)
1. Lack of sufficient time	13.5	30
2. Insufficient materials/supplies	9.45	21
3. Unstructured curriculum/resources	9.45	21
4. Classroom management	6.75	15
5. Inadequate collegial support	5.85	13
Total	45.00	100

According to table 4.16 above and figure 3 below the teachers were also asked to rate “Barriers to Effective Learning” (see also Figure 3) according to how often they encountered each barrier. By a large margin “Lack of sufficient time” came in as the biggest barrier (30%). Following by a fairly large margin, second place was a tie between insufficient materials/supplies (21%) and unstructured curriculum/resources (21%). In third place was classroom management (15%) and inadequate collegial support (13%) came in a close fourth.

See the chart below for the “Barriers” results. Some individual comments mentioned the standardized testing push (TAKS) and a lack of student background knowledge as barriers to effective science teaching as well.

Figure 4.2 Barriers of Science Learning



4.8 An Observation Schedule

This tool focused specific patterns of the teacher’s entry behavior in class on how the lesson was conducted, classroom was managed, the condition of the class and teachers mannerism in relation to the teacher’s behavior in the classroom situation. It contained a number of areas discussed below. The instructional resources are important in helping the learner’s to build and refine organized rational thinking of their experiences. Hence would be able to unfold naturally and become an independent individual in the society and self-actualized Maslow, (1975). In essence then, teacher’s should provide learner’s with age appropriate and concrete instructional resources to motivate learner’s to enable to construct their own knowledge which gradually aids in their independence and self-actualization Maslow (1975). Teacher’s planning and organization of learning activities to provide problems for learner’s to solve making them responsible and better problem solvers Bishop, (1985)

Table 4.17 instructional resources the pre-school teacher’s displayed in the classroom

Type of instructional resources	Number of pre-schools		Frequency 20	Percentage 59%
	Public 13	Private 07		
Free choice corner	√	√		
Charts	√	√		
Science corner	√	√		
Shop corner	√	√		
Market corner	√	√		
Social studies corner	√	√		
Sand corner	√	√		
Language corner	√	√		

Table 4.17 shows instructional resources that preschool teachers displayed in 20 out of 34 preschools that were visited. Out of 20 preschools visited, (13 public and 7 private schools), 65 % (n=13) of public schools and 35% (n=7) of private schools had well displayed instructional resources as indicated in table 4.18 above. Flanders (1965) and Ngome (2002) suggested that the use of adequate instructional resources and practice aids in internalization of information in detail. It also aids in self-discovery learning. The implication is that children in such preschools may have missed out early stimulation. It was also found out those instructional resources that instructional resources were not displayed at the children height; hence they could not manipulate them effectively. As a result, effective use of materials did not take place. This was mostly observed in public preschools.

All the teachers interviewed 100% (n= 45) were in agreement with the fact that instructional resources aid learner's learning in terms of concentration attention, skill acquisition and reinforcement of concept learned. Ngome (2002) had the notion that instructional resources help in making learning more realistic and arouse curiosity, interest and practical ability of learners, constructing their own knowledge hence self-actualization.

Table 4.18 other instructional resources used in preschool

Instructional Resources	Type	Type
	Realia	Commercial
Plasticine		√
Leaves	√	
Bottle tops	√	
Building block	√	
Plastics	√	
Papers		√
Stones/ Sand		√

Availability of other instructional resources indicate that teachers involved children in tasks that provided immediate feedback instead of those based on higher level of thinking as suggested by Gagne(1985) who advocated for learning to involve problem solving activities that are relevant and engaging. Learner’s practical work depicted a lot of drilling. But Ominde, (1964) and Gachathi (1976) in their reports on the education system in Kenya rebuked drilling and failure to involve children in problem solving activities as this would lead to production of children who are not self-actualized and lack independence. These reports stated further that education should become relevant to social realities if designed in a way that learners used it to solve contemporary issues. The study also sought to find out whether the teachers prepared professional documents were based on the learners varied needs. The researcher observed how the teachers conducted teaching and learning process in class. This information was compared to the statement in the structured schedule and the researcher found out that there was a

relationship between teachers in public and private schools in that, majority in both did not prepare schemes of work and lesson plans regularly. This might have been attributed to the difference in professional level of the teachers.

All preschool teachers interviewed (45=100%) did not have the current year scheme of works and lesson plans other the ones prepared for the observation by the researcher. The teaching document were highly absent among the older teachers than the younger ones under probation. This was quite evident that the older teachers had many years of teaching experience in the same topic content over a long period of time and therefore find it useless to redefine in the same to fit the digital error and the children varied need, as they only provided the old scheme of works and lesson plans which they used for reference while teaching. It was also observed that the diploma teachers effectively used their background knowledge acquired in college and high school as observed in how they prepared their schemes of work, lesson plan, class room organization, class room management and display of instructional resources. Their preparation was up to date.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS FOR FURTHER STUDY

5.1 Introduction

This chapter presents a summary of the study, conclusions made from the findings of the study, given recommendations from the study and for further study.

5.2 Summary of the Study

The study sort to find out the influence of teacher's characteristics on effective use of inquiry based method in teaching science in pre-schools in Kuja zone in Migori County. A lot of concern has been expressed by parents and educators during various parent meetings, prize giving days and education days on poor performance in science as it is one of the subjects poorly performed. According to this findings teacher's characteristics have been found to have influence on the effective use of inquiry based approach in teaching science in pre-school.

The study sort to achieve the following objectives; to find out whether teacher's gender has influence on effective use of inquiry based method in teaching science in pre-schools in Kuja zone, to determine whether the teacher's professional level has influence on the use of inquiry based method in teaching science in pre-schools in Kuja zone, to establish whether teacher's years of experience have influence on effective use of inquiry based method in teaching science in pre-schools Kuja zone, to explore whether teacher's subject knowledge has influence on effective use of inquiry based method in teaching science in pre-schools in Kuja zone and to find out whether

teacher's attitude has influence on effective use of inquiry based method in teaching pre-schools in Kuja zone.

The findings of the study are significant to the following; Kenya institute of curriculum development, teachers colleges, quality assurance officers and researcher's. The literature review was on the teacher's characteristics like gender, professional levels, years of experience, attitude, knowledge of the subject in relation to effective use of inquiry based method of teaching.

Under methodology, descriptive survey design was used and the research population included all the preschool teachers in Kuja zone, sampling frame work comprise of both public and private preschools in Kuja zone who were all purposively and randomly selected. Research instrument used to collect data were; questionnaire, interview and structured observation. Frequencies and percentages were used to present the findings.

The study found that teachers with diploma effected the inquiry method better than those with certificates and during the class room observation, teachers with few planning experience depicted quality of being more enthusiastic than their colleagues with low teaching experience. This was observed in the way the younger teachers in the profession actively involved their learners in hands on learning process and had well prepared recent schemes of work and lesson plans among others. In other classes, learner's involvement was below average because of inadequate learning resources

5.2.1 Teachers Gender and the Effectiveness of Inquiry Based Method

From the study, female teachers were more than the male teachers and they possessed better organization skill than the male teachers. The female teachers were the majority as the male teachers have poor attitude towards teaching preschool students and they have a misconception that mothers have a key role of associating with and upbringing children. The female teachers were friendlier to the learners and allowed them to freely manipulate instructional resources which were available creating an opportunity for the learner's to construct knowledge from the immediate learning environment.

5.2.2. Teachers Experience and Effective Use of Inquiry Based Method

The highest number of working experience was 5 years (55.5 %) compared to 6 and above years. This margin depicted that teachers in kuja zone have little experience in use inquiry base method and might not effectively use this approach. In contrary, teachers length of teaching experience may not be used to determine the effectiveness of inquiry based method.

5.2.3 Teachers Professional Level and Effective Use of Inquiry Based Method

Learners should be taught to construct knowledge that would help them solve various challenges in life and become independent individuals Piaget, (1980) and Maslow, (1975). Teacher's professional level is a key characteristic to effective use of any given instructional method. Low professional level hinders teachers from understanding the concept being taught. This means that teachers who do not hold any professional level may not be efficient and reliable to facilitate a learning process which should enable children construct their own knowledge. This calls for a practical policy in regard to

overall minimum academic grades that should be considered for admission for teachers training. More emphasis should also be put in regards to specific grades attained in mathematics and science

5.2.4 Teachers background knowledge and effective use of inquiry based method

Use of inquiry based method shall only be effective when teachers have adequate background knowledge of the subject. Learners taught by teachers who have adequate knowledge Of the subject and inquiry based method were able to do the practical activities. As a result the attention was captured throughout the lesson. Their teacher's felt more confident while giving instructions.

5.2.5 Teachers attitude and effective use of inquiry based method

Attitude determines how the teacher involves learners in the learning process s the learners manipulate instructional resources and construct knowledge from the immediate learning environment. Thus, enabling the learners to link and solve problems 5.in a class situation or at home.

5.3 Conclusion

The focus of science education has been on hands-on methods for some time, but the process of change is slow. Contrary to earlier research findings, this research showed that science was an interesting and well-liked subject. Most teachers feel that they are competent and have good content knowledge, yet they don't necessarily feel that they are good "science teachers". Making them good science teachers needs to be a priority. Good science teachers will have students who respond well to science instruction, enjoy

science as a subject and have the ability to retain what they are learning. If teachers feel that they can effectively teach science and have the skills they need to effectively monitor experiments, experiments that they feel they can explain, then it appears that "good" science instruction will be simply a matter of giving classroom teachers ideas and strategies that they can use to teach science using the inquiry process.

5.4 Recommendations

5.4.1 Recommendation from the Study

First, diploma-level teacher training programs need to reflect more of what the teachers will need in the classroom when they become teachers. These programs need to make pedagogical changes to their curriculum to reflect science course requirements that give pre-service teachers more background and concept development appropriate to their preferred teaching levels and more modeling of hands-on methods and strategies that they can use in their classrooms. What is needed is a restructuring of the traditional one "science methods class" currently required with most teacher training programs to include more semesters of science methods classes, perhaps at least one semester for each of the major scientific areas of study. Colleges need to prepare the pre-service teachers FOR teaching pre-school level science. College level astronomy courses won't teach a fledgling instructor how to explain to their young charges about the vastness of space.

Second, there needs to be clearly set guidelines as to how much science should be occurring daily and weekly in the classrooms...more uniformity to the time spent daily in each classroom on science instruction and clearer curriculum expectations. This

should also include better monitoring of the amounts and types of science instruction (textbook-based vs. inquiry method) taking place. There should be as much emphasis placed on science problem solving as is placed on Math and Reading standardized test scores at the preschool level, and this needs to be validated and encouraged by school administrators as well as science organizations.

Third, the idea of science “concepts” still holds too much weight at the pre-school level. This mind frame has got to change if we expect to see major science literacy changes here in the Kenya. **Process skills** need to be emphasized more in the classroom. Unfortunately, “Often” teaching the skills that the Kenya Institute of Curriculum Development recommends for good inquiry-based learning is NOT enough. There need to be more “usually” and “always” responses from pre-school teachers when asked how often their lessons involved exploratory learning, process skills in context, experiencing something new and promoted social interaction. Better teacher training, better in-service programs, and more encouragement by administrators could begin to address the issue. As far as barriers, time is still the enemy, or LACK of time. Teachers have to be given adequate time to teach if they are to use the more-time-consuming hands-on approach. If teachers can get the science materials they need without a hassle, have it clearly explained to them what and how to teach science and be sure that they are trained to use the preferred inquiry method to teach the concepts in the process-based curriculum, then science literacy in this country will once again rise to the levels of expectation and competition in the world economy.

5.4.2 Recommendations for Further Studies

Further research should be done on relationship of teachers characteristic and effectiveness of other instructional methods compared to inquiry based methods. The government through the teachers service commission should employ preschool teachers with the best practice which would promote learners construction of own knowledge

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APPENDIX 1: QUESTIONNAIRE FOR TEACHERS

THE INFLUENCE OF TEACHER'S CHARACTERS ON THE USE OF INQUIRY BASED APPROACH IN TEACHING PRE-SCHOOL SCIENCE IN KUJA ZONE, RONGO DISTRICT

I Inda, A. N. of the University Of Nairobi department of education would highly appreciate if you answer this questionnaire for the purpose of the above mention study.

You do not need to indicate your name.

FACE SHEET: DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

1. Gender (Please Tick)

Male

Female

2. Professional Qualifications under education discipline (Please specify)

Certificate

Diploma

Bachelor

Masters

Qualifications other than education _____

3. Teaching experience

(a) Number of years of teaching experience

0- 2yrs
3- 5yrs
6 and above

(b) What grade levels do you currently teach? _____

(c) What subjects do you currently teach? _____

(d) What subjects do you prefer to teach? _____

(e) How much time do you spend weekly teaching science?

(f) How much time is you required to spend weekly teaching science?

(g) How much time do you spend weekly preparing to teach science (include planning and material gathering)?

(h) How often during a week do you use hands-on (inquiry-based) science activities?

(i) How often during a week do you use textbook or trade-book based science lessons?

4. Respondent background knowledge

(a) What science-related courses did you have in high school?

(b) What science-related courses did you have in college (include methods courses)?

How did the science-related classes that you took in high school and college affect your ability to teach science?

How did the science methods courses you took in college change your attitude about teaching science?

Science teaching attitude

How would you rank your science content knowledge for teaching pre-school science?

Excellent Good Fair Poor Terrible

How would you rank your competency teaching elementary level science?

Excellent Good Fair Poor Terrible

How would you rank yourself as a science teacher?

Excellent Good Fair Poor Terrible

How would you rank your student's response to science instruction?

Excellent Good Fair Poor Terrible

How would you rank your student's ability to retain science content knowledge?

Excellent Good Fair Poor Terrible

How would you rank your student's enjoyment of learning science?

Excellent Good Fair Poor Terrible

How would you rank your science class on the following statement: My class is fun, interesting and has a high potential for learning?

Excellent Good Fair Poor Terrible

Rank the following statements:

I can teach science effectively:

Always Usually Often Sometimes Never

I have the necessary skills to teach science:

Always Usually Often Sometimes Never

I am able to effectively monitor science experiments:

Always Usually Often Sometimes Never

I find it difficult to explain why science experiments work:

Always Usually Often Sometimes Never

How often do your science lessons:

-involve exploratory learning...

Always Usually Often Sometimes Never

-teach process skills in context...

Always Usually Often Sometimes Never

-allow the kids to experience something new...

Always Usually Often Sometimes Never

-promote social interaction...

Always Usually Often Sometimes Never

APPENDIX 2: INTERVIEW SCHEDULE FOR TEACHERS

Rate the skills below in order of importance to you, #1 being most important & #5 least important.

Science Processes.....

Science Concepts.....

Inventiveness & Experimentation.....

Interdisciplinary connectedness.....

Use of science “tools”

Comments:

Rate these “barriers to effective science teaching” in the order of which you encounter them the most, #1 being most often encountered & #6 being least often encountered.

Lack of sufficient time.....

Insufficient materials and supplies.....

Inadequate collegial support.....

Unstructured curriculum & resources....

Classroom management.....

Other (please explain).....

APPENDIX 3: STRUCTURED OBSERVATION SCHEDULE

Teacher's gender..... Type of school.....

Subject...SCIENCE ACTIVITY..... Topic...Floating and sinking

Time.....

	COmments
<ol style="list-style-type: none"> 1. Preparation: lesson plan concurrent with schemes of work and objectives sequence of content. Learning activities. Time estimate. Instructional resources. (chalk board, charts, learning areas, real objects) 2. Introduction: statement of topic. Entry behavior (motivation and use of learners experience) 3. Lesson Development: mastery, treatment and sequence of content; appropriate methods eg. Inquiry based method. Leaners involvement 4. Class Room management: control discipline, organization display and marking learners class work 5. Personal Factors: appearance, mannerism, communication, innovation, confidence. 6. Summary/ evaluation: review, evaluation, assignment, achievement of objectives 	

Comments:

APPENDIX 3: RESEARCH AUTHORIZATION

MINISTRY OF EDUCATION

Telephone: 0203508047
Fax no: 0203508047
When replying please quote
REF: RON/ ED/GEN/1/VOL.II/91



DISTRICT EDUCATION OFFICER
RONGO DISTRICT
P.O. BOX 245- 40404,
RONGO
29/10/2013

TO
ALL HEADTEACHERS
KUJA ZONE
ECDE SCHOOL

DEAR SIR/MADAM

RE: RESEARCH AUTHORIZATION; NANCY ATIENO INDA TSC 451038.

This is to notify you that the above named; who is a post-graduate student of university of Nairobi pursuing MED (Early childhood Education) is hereby granted authority to carry out her research in your schools.

Kindly assist her


KANDITI M.O.
DISTRICT EDUCATION OFFICER
RONGO.

