RELATIONSHIP BETWEEN SCHOOL INFRASTRCTURE, PUPIL-TEACHER RATIO, LEARNING MATERIALS AND STANDARD THREE PUPILS ACHIEVEMENT IN MATHEMATICS IN DANDORA ZONE, NAIROBI COUNTY

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DECLARATION

I declare that this thesis is my original work and has not been presented in any other university/institution for consideration. This research thesis has been complemented by referenced sources duly acknowledged. Where text, data (including spoken words) graphic, pictures or tables have been borrowed from other sources, including the internet, these are specifically accredited and references cited in accordance with anti-plagiarism regulations.

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DEDICATION

I dedicate this piece of work to Almighty God for his strength, grace and inspiration in my endeavour to carry out this research. Secondly, I wish to express my sincere gratitude and appreciation to my loving parents George Ngusa and Jane Rhoda who nurtured my education and firmly encouraged me through their unwavering prayers and support that has brought me this far. Finally this work is dedicated to my beloved sisters Roseline, Irene, Lilian, Agnetta and Martha for their encouragement and support during the period of my studies at Kenyatta University.

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LIST OF ABBREVIATIONS AND ACRONYMS

CEB	County Education Board
EFA	Education for all
FPE	Free Primary Education
GOK	Government of Kenya
KCPE	Kenya Certificate of Primary Education
KCSE	Kenya Certificate of Secondary Education
KICD	Kenya Institute of Curriculum Development
KNEC	Kenya National Examinations Council
MOE	Ministry of Education
MOEST	Ministry of Education Science and Technology
PTR	Pupil-Teacher Ratio
SMASSE	Strengthening Mathematics and Science in Secondary Education
STAR	Student Teacher Achievement Ratio
UNESCO	United Nations Educational Scientific and Cultural Organization
UNICEF	United Nations International Children's Education Fund
UPE	Universal Primary Education
W H O	World Health Organisation

ABSTRACT

Mathematics plays a vital role in individual, national and international development. Mathematics for young children lays a foundation of the concepts and skills on which future learning is built on. However, despite the role it plays in society, in Kenya it has continued being a major concern because of the persistent poor performance which has been below average. Although several factors have been pointed out as making major contribution, limited studies have focused on relationship between infrastructure, pupil-teacher ratio and learning materials on pupil's performance in mathematics. The study investigated the relationship between school infrastructure, pupil-teacher ratio and teaching-learning materials. Ecological model by Urrie Bronfenbrenner guided the study. The study employed descriptive research design. The dependent variable was pupils' achievement in mathematics; while the independent variable was conducive school environment. The study targeted all the primary schools and standard three pupils and teachers in Dandora Zone. Purposive sampling was used to select the location of the study and standard three pupils, while stratified random sampling and simple random techniques were used to select categories of schools and standard three teachers to be involved in the study. The sample consisted of 19 primary schools, 4 public, 15 private and all the standard three teachers and pupils in the sampled schools. Questionnaire, pupils achievement proforma and observation schedule were used to collect the required data. Content validity was used to ensure the validity of instruments, while test-retest method was used to determine reliability of the instruments. Data collected was coded and analysed using Statistical Package for Social Sciences (SPSS). Quantitative and Qualitative methods were used to analyse data. Descriptive statistics computed included frequencies, means and percentages. The inferential statistics used to test null hypotheses was chi-square test at alpha value 0.05($p<0.05$). The results from data analysis revealed that there was significant relationship between availability of infrastructure and pupils achievement in mathematics where p value was 0.0294. Materials and pupil-teacher ratio were not found to be significantly related to pupils' achievement in mathematics where p value was 0.294 and 0.386 respectively. It was concluded that school environment in most schools was not conducive hence affected pupils performance in mathematics. The study recommended emphasis to be placed on importance of school environment through sensitization and empowerment seminars for primary school teachers and other stakeholders. The Ministry of Education Science and Technology should liaise with other stakeholders to provide schools with adequate infrastructure, teaching-learning materials and also enforce policy on staffing quality and pupil-teacher ratio in order to facilitate learning and improve pupil's performance in mathematics.

CHAPTER ONE

INTRODUCTION AND BACKGROUND OF THE STUDY

1.0 Introduction

This chapter describes background to the study, statement of the problem, purpose of study, objectives, and research questions. The chapter also has significance of the study, limitation and delimitation, assumptions, theoretical and conceptual framework based on the theory of Urie Bronfennbrenner and operational definition of terms.

1.1 Background to the Study

Mathematics is a way of thinking and reasoning which enhances the learning of man no matter what place he is in society (Taiwo, 1974). In addition, Mutunga and Breakell (1992) defined mathematics as an organized body of knowledge where ideas, principles and concepts involving numbers are built up logically. The main goal of teaching mathematics at pre-school level is to prepare pupils to develop creative and critical outlook as they face challenges in their daily lives and also apply knowledge acquired in their next level (Mireemikwu, 2008).

Mathematics is a pillar for almost all the streams in education as it serves as a gateway to future professions in variety of fields. In Kenya, it is a core subject in school curriculum for both primary and secondary schools. Mathematics provides an effective way of building mental discipline and encourages logical reasoning and mental rigour (Skemp, 2008). In addition, as Schoenfield (2012) observes mathematical knowledge plays a crucial role in understanding the contents of other

school subjects such as science, social studies and even music and art. The United States, National Council of Teachers of Mathematics (NCTM, 1992) argued that a high quality mathematics education is one that develops mathematical power for all students. The Council defines mathematical power as the ability to guess, explore, and reason logically, to communicate about and through mathematics for problem solving and to solve problems including those that are technology-based.

Mathematics for young children lays a foundation of concepts and skills on which future learning and operations are built. It makes children make a sense of their world outside school as well as helping them construct a solid foundation for later success in school work (NCTM, 2002). According to Ummeh (2011) mathematics teaches children problem solving skills that they can apply to other areas of learning in their daily life. Children should be provided with a variety of activities during the early years in order to help them learn basic concepts and have a firm basis in the subject. This is because educational skills and concepts are hierarchal and failure to obtain fundamental skills leads to failure in the achievement of advanced skills. Young children need learning and teaching environment that is conducive to the development of problem solving to help them become capable learners.

Despite the important role that mathematics plays in society, there has always been poor performance in the subject at national exams in Kenya (Aduda, 2003). According to the Kenya National Examination Council (KNEC, 2008). In Kenya general performance has been below average and a large part of this performance is contributed to poor performance in mathematics. The government of Kenya, in partnership with JICA (Japanese International Corporation Agency), introduced

SMASSE (Strengthening Mathematics and Sciences in Secondary Education) project in July 1998 and later launched it in the whole country in May, 2003 with the aim of improving students' performance in mathematics and sciences.

Poor performance in mathematics is also recorded in lower primary classes. A study by KNEC (2010) to monitor learner's achievement in literacy and numeracy revealed that only 52% of standard three pupils were competent in solving mathematics problems. The report further revealed that home environment contributed to poor performance in mathematics. If no measures are put in place, there is a possibility of continued poor performance in mathematics in later school life of the children. In addition KNEC (1996) identified coverage of syllabus; inability to cover simple and basic concepts is the reason for poor performance. However, the extent to which these factors influence performance has not been taken into consideration seriously hence need for study. A survey conducted by Uwezo (2010) showed that seven out of ten pupils in class three cannot do class two work. Uwezo findings further reveal that 60% of standard three pupils in public schools do not have the basic mathematical skills. 34% of the pupils in standard three cannot perform simple tasks that demonstrate numeracy and this may be attributed to school environment. There was therefore, need to establish school environment and find out whether pupils perform better in mathematics when their school environment is conducive.

Learning environment plays an inherent role in moulding the innate potentialities. Further the world conference on Education for All that took place in Thailand (2009) purported that environmental experiences during the early years of development are very crucial since they can enhance or hinder realization of one's potential. When a school environment is in a good state, learners become positive hence good

performance. In addition, a report by UNICEF (2009) on child friendly school manual asserts that schools should provide child friendly environments that include; access to safe water, proper hygiene and sanitation facilities and school buildings free from hazards such as indoor air pollution.

Several factors have generally been identified as the influence of students' achievement in mathematics. Relating this study to international occurrences are the assertions in Turkey by Tuncay and Omur (2009) on identifying factors affecting mathematic of students for better instruction design found out that factors such as age, instructional methods, facilities and individual factors affected achievement in mathematics. Learning materials when provided will aid in teaching-learning and consequently improve the academic achievement of the student. In Africa, Jekanyifa (2010) conducted a study to investigate effects of teaching learning materials for teaching history in secondary schools. The findings reveal that students with plenty of materials for teaching-learning in history scored an average of 60% while schools with insufficient teaching-learning materials scored less than 60%. Significantly better scores were obtained by schools with plenty of materials than those of schools with insufficient materials. In addition Zacharia (2011) conducted a study on adequacy and the extent to which teaching-learning resources for mathematics are available in the subject in the secondary schools. Findings revealed that secondary schools are poorly equipped with learning materials for mathematics. There is need therefore for further studies to find out whether there is a relationship between availability of teaching-learning materials and standard three pupils' performance in mathematics in primary schools in Dandora.

Nationally, The Kenya National Examinations Council (KNEC, 2004) report emphasized that for many years, performance in mathematics has been declining. Further (KNEC, 2010) revealed that factors such as overcrowding in primary schools, poor teaching methods such as chalk and high incidences of teacher absenteeism hindered effective learning of mathematics. In addition, Eshiwani (2001) points out that poor performance in mathematics in Kenya is due to poor teaching methods and acute shortage of text books. Another study by Munda, Tanui and Kaberia, (2000) in Bungoma county Kenya investigated the relationship between selected educational facilities and students' academic performance in secondary schools and found out that, infrastructure contributed positively to student's performance. This study investigated availability of infrastructure and pupils performance in mathematics in primary schools.

The above studies shed light on causes of poor performance, their main focus was on higher classes dealing with older children and standard three pupils, are not given full attention and they are also a key part that is affected by poor performance in mathematics hence there was need to establish relationship between infrastructure, pupil-teacher ratio and learning materials and standard three pupil's achievement in mathematics.

1.2 Statement of the Problem

School environment is an important aspect of learning because this is where learners spend most of their time. The school environment is also greatly responsible for influencing the well-being of children and educational outcome. Achievement in mathematics continues to be a major concern in the country. Studies have revealed that majority of standard three pupils in primary schools in Kenya do not possess

basic mathematical skills. Concerted efforts have been made to curb the challenge such as reviewing of curriculum, introduction of Strengthening Mathematics and Sciences in Secondary Education (SMASSE), in servicing of teachers and provision of learning materials to improve mathematics achievement. In spite of this no significant improvement has been realised. There was need to ascertain whether school environment plays a role in this trend.

Some factors that have been found to cause poor performance include age, instructional methods, individual differences like personal attitude of the student, poor staffing, unsatisfactory teaching methods, shortage of textbooks and facilities, teachers not using student centred approaches among others.

Although several studies had pointed out major factors contributing to poor performance in mathematics, a lot of literature had focused on KCSE and KCPE mathematics examinations that involve older children. Lower primary classes should not be neglected as they also play a critical role in laying a good foundation for learning mathematics. Other studies conducted focused on age, instructional methods and school environment was not studied. Therefore, this study looked at relationship between infrastructure, pupil-teacher ratio and learning materials on standard three pupil's achievement in mathematics in primary schools.

1.2.1 Purpose of the Study

The study investigated on the relationship between school infrastructure, pupil-teacher ratio, learning materials and standard three pupils' achievement in mathematics in primary schools in, Nairobi county Kenya.

1.2.2 Objectives of the study

The following objectives guided the study.

i. To investigate the relationship between availability of infrastructure and pupils achievement in mathematics.

ii. To find out the relationship between pupil-teacher ratio and pupils' achievement in mathematics.

iii. To investigate the relationship between availability of teaching and learning materials and pupils' achievement in mathematics.

1.2.3 Research Hypotheses

The research hypotheses were:

Ha1: There is a relationship between availability of infrastructure and standard three pupil's achievement in mathematics.

Ha2: There is a relationship between teacher-pupil ratio and standard three pupil's achievement in mathematics.

Ha3: There is a relationship between availability of teaching-learning materials and standard three pupil's achievement in mathematics.

1.3 Significance of the Study

The study, first and foremost may provide information to headteachers on importance of conducive school environment and actions to promote healthy school environment. Secondly, teachers may benefit from the findings as they get the information on how the school environment influences pupils' achievement in mathematics and how to improve the environment in order to promote pupils achievement in mathematics.

Thirdly, Ministry of Education Science and Technology and County Government may use the findings to come up with interventions, ways of creating and improving school environment. Lastly, the study may be of importance to the management of the school as it sheds light on school environmental factors influencing pupils' achievement in mathematics.

1.4 Limitations and Delimitations of the Study

The limitation and delimitation are described in the following sub-sections:

1.4.1 Limitations of the Study

The following challenges restricted the research process. Since the study was limited to one administrative area in Kenya, the significance of the findings will be generalized to primary schools in the zone and in other areas with similar and population.

1.4.2 Delimitations of the Study

The study was delimited to children in standard three of primary schools both public and private in Dandora Zone, Nairobi County. It also involved standard three primary school teachers in the zone. Although several factors may influence achievement in mathematics like entry behaviour, home related factors among others, only school environmental factors: availability of infrastructure, pupil-teacher ratio and teaching-learning materials were investigated. The study did not therefore provide information on the contribution of other factors that may also have a possible impact on pupil's achievement in mathematics. The study was confined to primary schools drawn from Dandora Zone, Nairobi County.

1.5 Assumptions of the Study

The following were the assumptions of the study

i. Pupils in all the schools have the potential of excelling despite the different learning environment.

ii. All sampled schools follow the same prescribed syllabus by KICD and the content is the same in all schools.

1.6 Theoretical and Conceptual Framework

1.6.1 Theoretical Framework

The study adopted Ecological Model by Urie Brofenbrenner (1979). The theory focuses on child development within a context of systems of relationship that form his/her environment and it's predominantly applicable in this study. The model is divided into five layers:

Microsystem: This is the immediate environment and it is the layer closest to the child and contains structures within which the child has direct contact. Structure in this micro system comprises of family, classroom, peers and neighbours. Children need to interact with the school environment which includes teachers, teaching-learning resources and infrastructure for effective learning to take place. School environment can directly affect children's achievement in mathematics either negatively or positively. School is the immediate environment for the children because this is where they spend most of their time in. Thus school environment has a strong influence on children's learning. This means that school infrastructure, pupil-teacher ratio and teaching learning materials in school are important to the development of children.

Mesosystem: It is the second layer of the environment where relations between micro systems take place. It comprises the interrelationship among two or more settings in which the child actively participates (Brofenbrenner, 1979). The child directly participates in the learning process and interaction between home and school is therefore one of the most significant mesosystems for a child. The way in which a parent relates to a teacher for example may have an effect on learning and influence pupil's performance in mathematics. Home experiences will influence school behaviour and vice versa. It is an indisputable fact that classroom, infrastructure and PTR affect student's achievement. Creating a good and conducive environment will have a positive effect in the learning outcome.

Exosystem refers to more than one setting which indirectly influences development. These includes social, religious, political and economic context. They influence the structure and availability of the microsystems and therefore indirectly affect the child.

Macrosystem is the distant reaching layer that contain information, ideologies, policies and law that form a basis for understanding the actions and reactions of lower layer (Bronfenbrenner, 1979). It includes the larger social cultural context. School cannot remain in isolation hence it needs to interact with the society that affects and influences its organisation. Unconducive school environment and poor performance in mathematics may be as a result of factors such as government policy, attitudes of parents and community towards school and stereotype towards mathematics. Policies such as introduction of free primary education can influence school environment and in turn affect pupil's performance in mathematics.

Chronosystem refers to patterning of environmental events and transitions. School environment should be open to changing programs of education and should be

upgrading with the current trends. Adequate physical facilities, teaching and learning resources and pupil-teacher ratio should be reviewed often to ensure they are adaptable to current changes. This study focused on school environment and this theory has shown clearly how various factors from different systems influence achievement in mathematics.

1.6.2 Conceptual Framework

The diagram below illustrates some of the variables in school environment that influence teaching learning process and in turn affects pupils' achievement in mathematics.

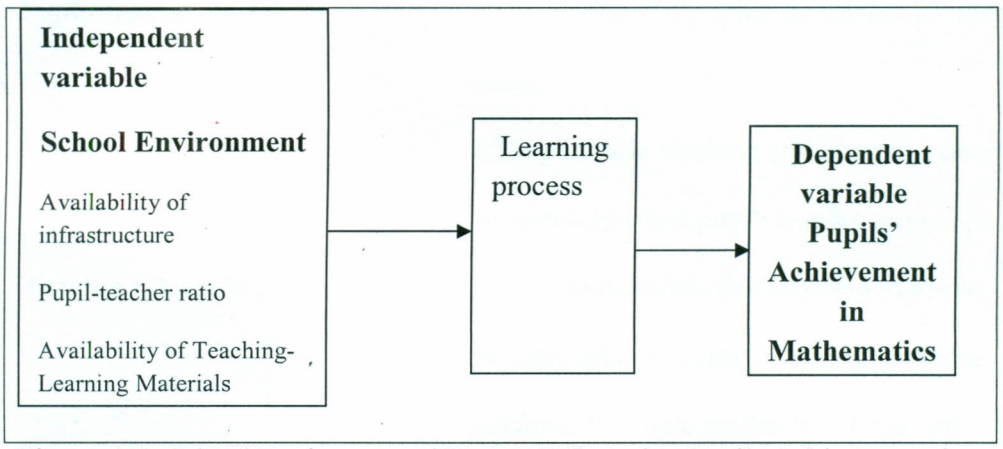

Figure 1.1 School Environmental Factors Influencing Pupils Achievement in Mathematics

As illustrated in figure 1.1 the independent variable (school environment) is assumed as the possible factor that influences standard three pupil's achievement in mathematics. It comprises availability of infrastructure like classrooms, teaching-learning resources and pupil-teacher ratio. The dependent variable was pupils' achievement in mathematics.

1.7 Operational Definition of Terms

Achievement in Mathematics : Refers to pupil scores in mathematics test in end of term examination.

Achievement : Ability of pupils measured by results obtained in end of term examinations.

School infrastructure : School equipments and physical facilities used to aid teaching and learning process for example classrooms, library, teachers chair and table and furniture.

Pupil- teacher ratio : The numbers of pupils per teacher in class three.

School environment : They include teaching and learning materials, infrastructure and pupil- teacher ratio.

Teaching- learning materials : Refer to materials that are used in lower primary schools during teaching- learning sessions. Example textbooks, charts and chalkboard

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviewed literature of previous studies that relate to the topic being discussed. The review of literature and summary of reviewed findings brings to light most of the issues under research and gaps in this sphere of knowledge. The review is organized as per the objectives of the study under the following sub- topics:

2.1 Availability of Infrastructure and Pupils Achievement in Mathematics

Poor performance in mathematics has always been a major concern in Kenya (Aduda, 2003). A survey conducted by Uwezo (2010) showed that seven out of ten pupils in class three cannot do class two work. Uwezo findings further reveal that 60% of standard three pupils in public schools do not have the basic mathematical skills. 34% of the pupils in standard three cannot perform simple tasks that demonstrate numeracy. Several factors have been pointed out as major cause. School facilities play an important role in student's outcome. The quality and adequacy of infrastructure have impact on learners' performance. Munda, Tanui and Kaberia (2000) investigated the relationship between selected educational facilities and student's academic performance in secondary schools in Bungoma District and pointed out that infrastructure contribute positively to pupils' academic achievement.

Despite the introduction of Free Primary Education, expansions in the number of classrooms has not increased and other learning facilities have been over stretched in most schools and lack of adequate facilities have been reported (Adrienne, 2009).

Consequently this has impacted negatively on pupils learning as it was revealed that schools that have facilities are likely to perform better than those without. In addition Abubakar (2013) carried out a study on school based factors affecting the KCSE performance of students in Garrisa County. The study aimed at investigating the most influential school based factor affecting pupil's performance. A descriptive survey was used. Simple random sampling technique was used to select study samples which comprised of seven public secondary schools. Findings from the study found out that 70% of students and 83% of head teachers reported lack of facilities as a factor that affected performance in KCSE. The above studies were done in secondary schools while the current study was done in lower primary class three.

Similarly, Karimi (2013) carried out a study on school based factors in secondary schools in order to determine what school based factors affect pupil's performance in public day secondary schools. Descriptive survey design was used and the target population was 14 principals and 196 teachers. From the findings it was revealed that a strong relationship exists between science laboratories, textbooks, classrooms and students performance in KCSE. Performance was better in schools with facilities than those without. It was concluded that poor or fair performance in the sampled schools was as a result of inadequate facilities like libraries, textbooks and laboratories. There was need for further study using a different design and in a primary school level and to confirm Karimi's findings. A study done by Eshiwani (2001) stated that the difference in school facilities such as laboratories, playing fields, electricity and library seemed to explain for differences in achievement. He found out that schools with adequate facilities constantly performed well thus, high or low achievement is determined by presence or absence of school facilities. Further Wachiye (1990) stated

that facilities such as library, textbooks, laboratories, playing fields among others determine how students perform. There was need for further study at a different level (primary) and different situations to reveal whether available infrastructure have any relationship with student's achievements in mathematics in primary schools.

Christine (2013) conducted a study on the effect of classroom environment on achievement in mathematics of preschool children within pioneer zone, Uasin Gishu County, Eldoret. One of the objectives was to determine the difference in academic performance in mathematics in preschools with adequate and appropriate furniture (seats) and those without. The researcher used the survey design. The study targeted 11 public preschools, 52 private preschools, 126 preschool teachers and 63 school administrators (head teachers). Stratified random sampling technique was used to select the following study sample ; 4 public preschools, 16 private preschools, 38 preschool teachers and 19 school administrators (head teachers). Data was collected through observation schedule and interview schedules. The researcher observed that although there was an attempt by private schools to provide appropriate and suitable chairs and tables for the pre-schoolers, the pre-schoolers in public schools were mostly using benches and desks which are not appropriate for them. This inappropriate furniture makes it difficult for the pre-schoolers to learn as in most cases the furniture occupies the entire classroom. The above study focused on preschools and classroom environment while the current focused on standard three pupils and relationship between infrastructure, pupil-teacher ratio and learning materials on their performance in schools.

2.2 Pupil - Teacher Ratio and Pupils Achievement in Mathematics

Pupil teacher ratio refers to the number of pupils per teacher. Class size is a factor that affects pupil's achievement and effective learning. According to the Ministry of Education (2011) the total primary school enrolment was a project to increase from 8.3 million in 2007, to 10 million in 2012 and 11.5 million by 2015. The pupil-teacher ratio (PTR) is quite high and is clear to have major impact on teaching and learning processes. This enrolment was high due to the introduction of free primary education and feeding program in Kenya. The increase becomes a challenge because the number of pupils exceeds the existing human and physical resources in the country (Wamuru, Kamau and Ochola, 2006).

Another study was done by Majanga, Nasongo and Sylvia (2010) on effects of class size on interaction during mathematics discourse in the wake of free primary education in Nakuru County. The main purpose of the study was to look at influence of FPE challenges in classroom interactions. The main objective of the study was to determine influence of FPE policy on class size and on teacher pupil ratio. The study adopted ex post factor research design. It targeted 59 public schools in Nakuru County and simple random sampling was done to select 4 schools for the study while purposive sampling was used to select class 1 and 6 in the lower and upper primary. Findings revealed that FPE policy created high PTR, overcrowded classrooms and teacher shortage among others. Further they noted that schools where PTR was high, performance of pupils was very low compared to schools with low PTR. PTR for the sampled schools was 1: 80 for lower class and 1: 50 for upper classes. The study focused on effects of FPE on achievement in mathematics while the current study was

to find out whether there is a relationship between pupil-teacher ratio and their performance in mathematics.

Similarly, Kraft (1994) conducted a study on the ideal class size and effects on effective teaching and learning in Ghana and concluded that class size above 40 has negative effects on student's achievement. In the same vein Kaloki (2012) investigated on pupil teacher ratio and its impact on academic performance in public primary schools in Machakos County. One of the objectives was to determine whether PTR influences academic performance. Descriptive survey design was used and data was collected through the use of questionnaires from head teachers, teachers and county staffing officers. Findings from the study revealed that PTR extensively influences performance of pupils in national exams. Increase in PTR affects the achievement of pupils negatively. This study investigated whether pupil teacher ratio influenced pupil's achievement in mathematics in class three.

On the other hand Glass and Smith (1978) conducted an experiment on relationship of class size and achievement. The findings revealed that small classes had increased probability of improving academic achievement. They showed that low achievement was as a result of increase in class size. Their findings pointed proof between reduced class size and pupils performance. A class of 15 or less scored several percentiles positions above that of pupils in class of 20 and 12 when it comes to academic achievement. There is need to conduct further studies in different environments to establish whether smaller classes have any relationship with student's achievement in mathematics. In addition Bain, Johnson and Word (1989) conducted a study on Tennesse student teacher ratio. The project was implemented in 79 schools for 7,000

K-3 students. At every grade level K-3 a strictly controlled study was set up to examine whether small (13-17) classes made a disparity in student accomplishments in the early years, when compared to regular (22-25) classes, or regular classes with full-time teacher assistant. Children and teachers were at random assigned to one of the three types of classrooms: small (13-17) students, regular (22-25 students with one teacher) and regular with teaching assistant (22-25 students with one teacher and one teaching assistant). In evaluating the impact of these three scenarios, they concluded that small classes (13-17 students with one teacher) produced better student achievement in both reading and mathematics. The findings revealed that smaller class-size and the lower student-teacher ratio had impact on student achievement (Bain Johnson and Word, 1989). The findings of the study also revealed that academic achievement increased significantly in the smaller class size (lower student-teacher ratio) in the regular classes. Based on the above findings this study sought to establish the size of class in Dandora schools and how it affects children's performance in mathematics.

By contrast other studies reveal that small class sizes were either not significant or even disadvantageous to student's performance. Njagi (2013) conducted a study on an investigation into some of the factors which influence student's performance in mathematics in public secondary school in Embu County. The study aimed at determining the teacher student and school related factors that influence performance of mathematics in the district. It adopted descriptive research design and targeted population was mathematics teacher and form 3 students. The independent variable was student gender, class size, teaching methods and availability of teaching and learning materials and dependent variable was student outcome. Findings revealed

that large class size of 40 and above students, medium class (12-39) performed significantly better than small classes (<29>). The study was conducted in secondary schools while the current study was carried out in primary schools on standard three pupils to find out whether there was a relationship between pupil-teacher ratio and achievement in mathematics.

Various studies have different opinions on class size and there is no clear association between class size and student's performance since performance level differs in schools. This researcher intended to find out whether class size could be used to explain variations in achievement in mathematics among standard three pupils in primary schools in Dandora. According to the ECD Development Service Guideline (2006) the teacher to child ratio in an ECD centre of children between ages 6-8 years should be 1:40. Despite the fact that the ECD service guideline for ideal PTR, there is minimal compliance. There was need to conduct further study to ascertain whether schools in Dandora primary have an ideal PTR and also explain the relationship between class size and standard three pupils achievement in mathematics in primary schools.

2.3 Availability of Teaching and Learning Materials and Pupils Achievement in Mathematics

Learning resources and materials are the fundamental prerequisite for education and must be available to learners in adequate quality and quantity. Availability of teaching and learning materials is critical in teaching and learning of pupils and can also affect effectiveness of the lesson. According to Mwangi (2010) in teaching and learning processes materials are of great importance because they improve retention

which makes learning more lasting. They also arouse and sustain learning through providing first hand experiences with realities of physical and social environment. In addition, materials have some merits which include; assisting the teacher to pass on information easily since they motivate learners to desire to learn more; they also act as a study reference, arouse learner curiosity and stimulates learning. When children are provided with plenty of materials and real experiences they understand abstract ideas better (Ausubel, 1973). Children should begin learning mathematics as a basis for laying the foundation for abstract experiences. The study established whether teaching-learning materials are used to improve pupils' performance in Dandora primary schools.

A study was conducted in Rwanda by Damien (2010) on the nature of schools academic performance of pupils in primary schools in Gasobo, Kigali. The purpose of the study was to compare academic performance of pupils in private and public schools in Rwanda. Descriptive cross sectional survey design was used and data was collected from 40 teacher and 10 head teachers using questionnaire and interview guide. It was established that resources availability affects pupils' academic performance in primary schools. 80% of academic performance in schools is generally the result of school facilities like books and charts. This study investigated whether Dandora schools have teaching- learning materials and their impact on achievement in mathematics.

In addition Momoh (1980) conducted a study in Kwara estate on effects of instructional materials on students' performance in West African school certificate examination. He correlated resources with academic performance of students in 10 subjects. Five teaching schools were given resources to be used in teaching and

information was collected from the subject teachers. From his findings, material resources were found to have significant effects on students' achievement in each of the subject. Further two schools were used in a study in Nigeria to investigate the effects of teaching learning materials for teaching history in secondary schools. One had plenty of materials for teaching history and the other had insufficient materials. The findings of the study were that students in schools with plenty of materials for teaching and learning in history scored 60%, while schools with insufficient materials scored below 60%. Significantly better scores were obtained by schools with plenty of learning materials than those of schools with insufficient materials (Jekayinfa, 2010). There was need for further study in Kenya and specifically primary schools to reveal whether availability of teaching and learning materials have a relationship with students' achievement in mathematics in schools.

Another study was done by Njagi (2013) on an investigation into some of the factors which influence student's performance in mathematics in secondary schools in Embu County. The study adopted descriptive survey design and target population was mathematics teachers and form three students. Findings revealed that adequate resources in secondary schools enables pupil to perform better and learn mathematics effectively. The study was done in secondary school while the current study was done in primary school to establish the influence of teaching and learning materials in mathematics performance and also confirm the above findings.

Kibui (1992) conducted a comparative study on the factors that influence examination papers in public and private schools, found out that there was a relationship between availability of textbooks and pupils achievement, where problem solving was the main activity. Further, Bert (2011) on impact of school facilities on learning

environment revealed that significant rise in students' performance in mathematics and social studies was related to excellence and education sufficiency of educational facilities.

On the other hand Emma (2011) did a study on factors contributing to poor performance of students in the basic education certificate examination in selected public junior schools in Ghana. Findings revealed that one of the factors that contributed to poor performance of students was found to be inadequate teaching and learning materials. It was recommended that adequate teaching and learning materials should be supplied to improve teaching and also elevate academic values. There was need to ascertain whether materials could be the contributing factors for students poor performance in mathematics in primary schools.

A study done by Karimi (1993) on instructional strategies and utilization of learning resources in teaching social studies indicated that lack of learning resources leads to low creativity among learners because they are not actively involved in class. The researcher found out that there was lack of enough materials for teaching social studies but did not look at how resources affects achievement hence need for the study.

A study done by Joyce (2007) on factors contributing to poor performance in primary schools in the KCPE Gatundu District, Kiambu County. One of the objectives of the study was to find out whether there were adequate resources. Questionnaires were administered to head teachers and pupils. The researcher found out that in the sampled schools, there were inadequacy of teaching and learning materials. The current study looked at how the inadequacy of these materials impacted on learning of mathematics in primary schools in Dandora Zone, Nairobi County.

Ngasike (2010) conducted a study on Turkana children's socio cultural practices on pastoralist life style and science curriculum and instructions in Kenyan Early Childhood Education. It was established that pre-school in Turkana were always empty and the only learning resource found in the classrooms for the teaching of science was the blackboard. The current study sought to establish learning materials found in classrooms in primary schools for teaching of mathematics.

Research has indicated that availability of teaching and learning resources makes a difference in pupil's achievement but does not indicate whether they are used in primary schools to improve pupil's performance. This study therefore, had an objective of comparing availability of teaching-learning materials and its influence on achievement in mathematics of standard three pupils in primary schools.

2.4 Summary of Literature Reviewed

From various studies conducted by different scholars in Kenya and other countries, it has been revealed that mathematics is important in our daily lives as it builds a solid foundation on which future learning is based upon. A number of factors contribute to students' potential success and they include pupils'-teacher ratio, teaching strategy, syllabus coverage, adequate teaching-learning materials among others. The study intended to examine the relationship between school environment and standard three pupils' achievement in mathematics in primary schools in Dandora. Debates on school environmental factors on pupils' achievement in mathematics have not been conclusive because different studies are pointing towards different directions and attributing various reasons for the poor performance. Moreover even though literature has revealed that various factors influence pupil's achievement in mathematics, most

of the studies were done outside Dandora and in either secondary schools or upper primary classes with older children. Specifically, no known study has been done on the relationship between infrastructure, pupil-teacher ratio and learning materials on pupils' achievement in mathematics in Dandora Zone, Nairobi County hence the gap in the literature which this study sought to fill.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.0 Introduction

This chapter highlights the research design, research variables, location of the study, target population, sampling techniques and sample size, instruments, piloting, data collection, procedures, analysis, logistical and ethical considerations.

3.1 Research Design

This study employed descriptive research design. This is because the researcher had no control over the independent variable. The design intends to present facts about the nature and status of a situation as it exists at the time of study (Creswell, 2007). The design was appropriate because it helped to describe the current condition and situation based on information gathered on school environment and pupils' performance. The design is also convenient in collecting extensive data from a large sample within a short time. The independent variable was (school environment) and dependent variable (standard three pupils' achievement in mathematics). Quantitative and Qualitative approaches were adopted in the study.

3.1.1 Variables

In this study, the research variables that were measured are described in the following subsections.

3.1.2 Independent Variables

The independent variable in the study was conducive school environment which comprised of:

i. **Availability of Infrastructure** Desks were considered available by checking if they were there and met the required standard if the ratio of seating was 3:1 in a desk and if they were age appropriate (size and height) and in right condition. The study investigated whether children learned in classrooms and whether the rooms were adequate for the number of children they accommodated. Library was measured by checking if it was available, functional and had books for teaching- learning mathematics, teachers chairs were measured by ensuring that each teacher had a place to sit and write on while toilets were measured by checking whether they are available and separate for boys and girls and ratio was 1:45 by Ministry of Education (2014).

ii. **Pupil-Teacher Ratio** involved the number of students per teacher in class three and comprised of ratio 1: 40 as recommended by ECD service guideline.

iii. **Availability of Teaching-Learning Resources** like textbooks were measured using number of children sharing one book. The ratio should be 3:1. Exercise books were measured by checking whether each child had a book where he/she could write mathematics class work and homework. Charts, syllabus and teachers guide were measured by checking whether they were available. Chalkboard was measured by checking whether each class had one, the size and condition.

3.1.3 Dependent Variable

The dependent variable of this study was standard three pupil's achievement in mathematics. It was measured by obtaining pupils average score in end of term scores from class progress record.

3.2 Location of the Study

The study was conducted in Dandora Zone of Nairobi County. Dandora is located in Nairobi, Kenya and it is part of Embakassi division which is situated about 15km from city centre. Dandora area was selected because it has both public and private primary schools and cosmopolitan nature of early childhood activities. The area has also consistently registered poor performance in mathematics in both primary and secondary schools. (Area Education Officer, 2012). Dandora is located near a dumpsite with poor infrastructure and poor population, with children as young as five years old scavenging in a 100 acre dumpsite from day to day for survival (UN-Habitat, 2001). This could have influenced pupil's achievement in mathematics because they can skip classes to go and scavenge.

3.3 Target Population

The target population of the study were all the primary schools in Dandora zone both public and private, teachers and standard three pupils enrolled in the schools. There were 62 schools; 50 private and 12 public and 1054 standard three pupils.

3.4 Sampling Techniques and Sample Size

The sampling techniques and sample size used in this study are described in the following sub-section;

3.4.1 Sampling Technique

Purposive sampling method was used to select Dandora Zone and standard three pupils. Stratified random sampling was used to select the schools to participate from both private and public primary schools and also standard three teachers who were categorized into two groups male and females. In case a sampled school had more than one stream, simple random sampling technique using lottery method was used to select the teacher and standard three classes. This method gave every subject an opportunity to be chosen.

3.4.2 Sample Size

From the total population of 62 primary schools and teachers, 19(30%) were sampled for the study. Gay (1992) has shown that a sample size of 10% to 30% of the total population is adequate for the study in descriptive research. Teachers provided information on pupil's performance in the end of term scores for the class three pupils' achievement proforma records.

Table 3:1 Sampling Frame and Sample Size

School type	Number of school		Number of teachers		Number of Children
	Total number of schools	School sample size 30% of population	Total number of teachers	Teachers sample size	Children sampled
Public	12	4	12	4	270
Private	50	15	50	15	489
Total	**62**	**19**	**62**	**19**	**759**

Table 3.1 shows that 19 primary schools and teachers were selected out of which 4 teachers were from public while the remaining 15 were from private schools. It also shows that 759 standard three pupils in the selected classes were also studied.

3.5 Research Instruments

3.5.1 Questionnaire for Standard Three Teachers

Questionnaire was used to collect information from teachers. Questionnaire was used because it has greater anonymity and gathers data over a large sample. The questionnaire had two parts, A and B. Part A consisted demographic information about the teachers while part B contained items that were developed on the basis of research objectives.

3.5.2 Observation Schedule

The observation schedule enabled the researcher to collect information about the school environment directly by observing and recording the current state of school facilities and teaching-learning materials in the primary schools. This tool helped the researcher to evaluate the availability and adequacy of teaching-learning resources, infrastructure and the general school environment. It also helped cross check information obtained from the questionnaire.

3.5.3 Pupils Achievement Performa

The researcher obtained pupils score in mathematics from teachers' record and had two parts. Part A requested background information while part B contained information about pupils' achievement in mathematics. The researcher reviewed the

academic achievements of standard three pupils in their end of term exams and then recorded in the proforma.

3.6 Pilot Study

The researcher piloted the instruments in two primary schools, one public and the other private which were not included in the final study. The purpose of pre-test study was to establish the validity and reliability of instruments. Responses to the items in the instruments were used to check if the questions were clear, if the instruments were well constructed to give consistent results and remove ambiguity, detect adjustments necessary in order to work out the unforeseen pitfalls before the main study.

3.6.1 Validity of Instruments

Mugenda and Mugenda (1999) define validity as the appropriateness of the instrument in measuring whatever it is intended to measure. They further define content validity as the degree to which the content of an instrument corresponds to the content of what it is designed to measure. To this end, content validity was verified to determine the extent to which the instruments really measuring the objectives of this study. To check the content validity of the instruments, expert-judgment technique was used. Using this technique, the instruments as well as research objectives/ questions were given to two experts in the area under investigation to give their judgements and opinions on how each question item in the instrument is related to the intended objectives/research questions. Their opinions and judgments were incorporated starting the field work.

3.6.2 Reliability of Instruments

According to Mugenda and Mugenda (1999) the term reliability refers to the degree to which the instrument consistently measure whatever it is measuring. They add that stability reliability is the degree to which the results of the same test by the same individuals are consistent over time. For them, the best techniques to check this type of reliability it the 'Test-retest method'. Therefore, to check the reliability of the instruments for this research test-retest technique was used. This means that with an intervening period of two weeks, the instruments for this study were administered twice to 8 respondents who were purposively selected from schools that were not to be used in the main study. For the first administration, the instruments were distributed to 8 respondents who answered to all question items and their answers were scored, recorded and ranked. This was repeated after a period of two weeks. After this exercise, using the following formula Spearman rank order correlation coefficient was computed to correlate the two rankings:

$$\text{rho} = \left\{ \frac{1 - 6\sum D^2}{n(n^2 - 1)} \right\}$$

Where **rho:** stands for spearman's correlation coefficient, **n**: stands for size of the sample, and **ΣD**: stands for the sum of difference between ranks.

The calculations using this formula gave a correlation coefficient of 0.83 which was enough to conclude that the instruments for this research are reliable as Mugenda and Mugenda (1999) recommend that a correlation co-efficient of 0.80 or more is required for an instrument to be reliable.

3.7 Data Collection Technique

A permit to conduct the study was obtained from National Commission for Science and Technological Innovation and area Education Officer. The researcher first visited the sampled school for familiarity. After going through the consent forms, teachers were issued with consent to sign indicating their willingness to participate in the three stages of data collection. The researcher, in collaboration with the standard three teachers then set a date for carrying out the research which was to take place for three weeks every day before 12.00 noon. Data was collected in three phases:

Stage 1: The questionnaires were administered by a direct method which involved the distribution of questionnaire directly to the respondents and waiting until the respondents completed. Before collecting the filled questionnaire the researcher checked for errors in order to achieve reliable results.

Stage 2: The researcher conducted observation and recorded availability of physical facilities, teaching learning materials and pupil's teacher's ratio.

Stage 3: Document analysis. Document analysed was pupils' achievement proforma records obtained from standard three class teachers which showed pupils achievement in mathematics in their end of term exams and their overall mean score.

3.8 Data Analysis

Data was analysed using inferential statistics while descriptive was used to summarise. Descriptive statistics that were calculated were frequencies, mean and percentages. Inferential statistics used was Pearson Chi square test to establish statistical significance at 0.05 levels. The Chi square was used to establish whether or

not there was significant difference between the two variables, the dependent variable (achievement in mathematics) and independent variable (School environment). Results were presented using tables and texts and organized according to the objectives.

3.8.1 Null Hypotheses

The statistical hypotheses tested were:

H_o1: There is no significant relationship between availability of infrastructure and standard three pupil's achievement in mathematics at .05 level of significance.

H_o2: There is no significant relationship between teacher-pupil ratio and standard three pupil's achievement in mathematics at .05 level of significance.

H_o3: There is no significant relationship between availability of teaching-learning materials and standard three pupil's achievement in mathematics at .05 level of significance.

3.9 Logistical and Ethical Considerations

The researcher sought permission to carry out the study from relevant authorities that are; Kenyatta University Graduate School, the Kenyatta University Ethics review Committee (KU-ERC) and National Commission for Science and Technological Innovations. There after permission was sought from Dandora education officer. Once in schools, appointment with the headteachers to the primary schools selected were sought to be briefed on research. With the consent of headteachers, standard three teachers were contacted and briefed about the intended study so that they could make informed decisions about their participation in the study. They would then sign a

consent form. Confidentiality given by the respondents was upheld by ensuring that they do not write their names on the questionnaire. All information given was used for academic purpose and all respondents were told to keep anonymity on the questionnaire and interview schedules.

CHAPTER FOUR

FINDINGS, INTERPRETATION AND DISCUSSION

4.0 Introduction

This chapter presents the results, interpretation of results and discussion of study findings. The organisation of this chapter is based on the objectives that guided the study and they were;

i. To investigate the relationship between availability of infrastructure and pupils achievement in mathematics.

ii. To find out the relationship between pupil-teacher ratio and pupils' achievement in mathematics.

iii. To investigate the relationship between availability of teaching and learning materials and pupils' achievement in mathematics.

4.1 Teachers Demographic Characteristic

In this study, 19 primary school teachers were sampled 4 from public and 15 from private schools. The demographic characteristics of the teachers with respect to their gender, age, educational qualifications and teaching experience are presented in Table 4.1.

Table 4.1 Teachers Demographic Characteristics

Characteristics	Description	Frequency	Percentage	Total %
Gender	Male	5	26	
	Female	14	74	100
Age	21-30	11	58	
	31-40	6	50	100
	41-50	2	11	
Educational qualification	A level	1	6	
	P1	16	83	100
	Diploma	2	11	
Teaching experience	1-5	9	47	
	6-10	7	37	100
	11-15	1	5	
	16-20	2	11	

n=19

Results in Table 4.1 show that the majority of standard three teachers in the zone constituted 74 percent female, while the proportion of males was 26 percent. This pattern was exhibited by both public and private schools, leading to the conclusion that primary school teaching profession in Dandora zone for standard three was dominated by females. The dominance could be explained by the fact that Dandora is a sub-urban area and female teachers were probably wives whose spouses were employed in other sectors of the urban centre.

Data on the age of the respondents revealed that teacher's age spread across all the age brackets presented, but the majority (58%) of teachers were between 21 and 30 years. The second cohort comprising of (32%) was aged between 31 and 40 years. In majority of the schools teachers' age fell between 21 and 40 years of age implying that standard three teaching in schools in the zone was dominated by very youthful teachers. This means that majority of the teachers were fairly young and therefore would be expected to be more energetic in teaching the subject. The teachers youthful age could however be attributed to the fact that most schools, especially private prefer employing young people who are inexperienced because they are easy to hire and cheap compared to highly qualified and long experienced persons.

On qualifications, findings show that majority (83%) of the teachers had P1 certificate which is the requisite qualification for one to teach in a primary school. Professional competence often transforms into high quality of teaching with prospect that this will influence learning of the pupils and their achievement in mathematics. Minority of the teachers had other qualifications which included A-level certificate (6%) and Diplomas in Early Childhood Education (11%).

On teaching experience, slightly less than half (47%) teachers had between one to five years of experience. This finding implied that the teachers had enough exposure and work experience and therefore would teach mathematics and deliver the content well. Of the remaining teachers, (36.9%) had between 6-10 years, (5%) had 11-15 and (11%) had between 15-20 years of experience. This could be as a result of high turnover of teachers making them to go for greener pastures elsewhere due to poor payment.

4.2 Availability of Infrastructure and Pupils Achievement in Mathematics.

The first objective of the study was to investigate the relationship between availability of infrastructure and pupils achievement in mathematics. To achieve this objective, the researcher used observation schedule, questionnaire and pupils achievement proforma.

4.2.1 Pupils Achievement in Mathematics

In order to find this, the researcher first reviewed the achievement of standard three pupils in their end of term exams. To determine pupil's achievement in mathematics, their mean score was calculated using their end of term scores in mathematics. The pupils' achievement in mathematics for the 19 schools has been presented in Table 4.2

Table 4.2 Pupils Achievement in Mathematics

Schools	Mean Score in Mathematics
1	64.23
2	59.01
3	72
4	67.81
5	69
6	65.63
7	65.16
8	62.10
9	74
10	80.05
11	81.25
12	89.92
13	73.10
14	88.4
15	82.36
16	81
17	68.45
18	69.12
19	85.5

Table 4.2 shows that pupils' achievement in mathematics was above average in most of the schools. Variance in performance in mathematics could be explained by difference in school environment, availability of physical facilities, pupil teacher ratio and teaching learning materials.

Information was sought on availability of infrastructure using an observation schedule, questionnaire and the results are presented on Table 4.3.

Table 4.3 Availability and Standards of Infrastructure

Facilities	Schools					
	Have standard facilities	%	Have sub-standard facilities	%	No facilities	%
Desks	8	42.1	11	57.9		
Classroom	6	31.6	12	63.1	1	5.3
Teachers chair and table	16	84.2			3	15.8
Library	5	26.3	1	5.3	13	68.4
Toilets	9	47.4	10	52.6		

As can be seen in Table 4.3 less than half (42.1%) of the schools had available furniture that met the required standards, while in more than half (58%) of the schools the furniture did not meet the required standards. It was observed that in most of the schools, pupil-teacher ratio was above the recommended one and the desks were in poor condition as some were broken and unrepaired. Others were inappropriate for learners because they were either too high or too low than their reading level and this did not provide the physical comfort needed for concentration and learning of mathematics.

About classrooms, it was observed that a few classrooms 6(31 %) had required standards which included good ventilation, cemented floor, lockable strong doors, enough class size of 1:40, proper roofing and tidy class that is well arranged and litter was not scattered all over. Most of the schools 12(63.1%) had poor conditions which

included small size classrooms. Many schools had an average of over 40 pupils per class and were too small in size leading to congestion and overcrowding in classroom because they were not built to specifications. This led to inadequate space for movement in the classroom. Pupils were thus limited and this means their participation during mathematics activity and their interaction with teaching learning materials was minimal. Others had one large hall that had many portions hence pupil's concentration could easily be distracted because different classes were doing different activities.

In schools with poor conditions, classrooms had leaking roofs, some had no doors or windows while others had earth floors and the ones with cement had large patches where cement was worn out. They also had poor ventilation system which means that diseases would spread easily leading to absenteeism in schools and hence affecting performance in mathematics. Some of these schools were located in noisy environments near business places which interfered with pupils learning mathematics. One of the schools did not have a classroom for standard three pupils and so they were forced to share a class with standard two pupils.

Majority of the schools (84.2%) had suitable teachers' chairs and tables while (15.8%) did not have enough chairs and tables and so the teachers were forced to share the desks with the pupils while marking their work. On availability of library, majority (68.4%) of the schools did not have a library and so pupils were forced to do most of their reading from class or outside and could not easily access other supplementary books for mathematics. In (26.3%) of the schools, libraries were available and meet the required standards and in (5.3%) they were available but not functional.

On availability of toilets for pupils, it was observed that majority (52.6%) of the schools did not meet the required standards as it was noted that both boys and girls had to share one toilet and slightly less than half (47.4%) had separate toilet for boys and girls. In some schools there was only one toilet available and so the pupils were forced to queue for a long time. This led to time wastage and could affect pupil's performance in mathematics. In Kenya the Ministry of Education (MOEST, 1999) recommends that toilets should be adequate and in good sanitary conditions. The MOEST recommends two toilets, one for boys and one for girls for a pre-school with 50 children. The above results imply that the available infrastructure with regards to the availability of toilets did not meet the required standard for teaching and learning of mathematics.

To establish the relationship between available infrastructure and pupil's achievement in mathematics, pupil's average scores in mathematics were calculated and presented alongside the availability of physical facilities. Table 4.4 summarizes the findings.

Table 4.4 Availability of Infrastructure and Pupils Achievement in Mathematics

Facilities	Availability and Standard	Frequency	Percentage	Mean score in maths
Desks	Available and meets required standard	8	42.1	76.05
	Available and does not meet required standard	11	57.9	71.75
	Not available	0	0	0
Classroom	Available and meets required standard	6	31.6	77.80
	Available and does not meet required standard	12	63.1	72.10
	Not available	1	5.3	65.63
Teachers chair and table	Available and meets required standard	16	84.2	73.93
	Available and does not meet required standard	0	0	0
	Not available	3	15.8	71.6
Library	Available and meets required standard	5	26.3	73.13
	Available and does not meet required standard	1	5.3	82.36
	Not available	13	68.4	61.85
Toilet	Available and meets required standard	9	47.4	74.06
	Available and does not meet required standard	10	52.6	73.11
	Not available	0		0

Results in Table 4.4 show that schools that had desks, classrooms, teachers chairs and table and toilets which meet the required standard had a high mean score compared to those which did not meet standards or were not available. The more availability of physical facilities, the higher the performance of pupils scores in mathematics. However on libraries, schools which had a library that did not meet the required condition scored higher marks than schools which had libraries with required standards. This could be attributed to the fact that pupils do their reading from class under teacher's supervision and are given revision materials and most of the time they

carry their books at home. There was a slight difference in performance between schools with toilets that had required standards and those that did not have. The results imply that there was an association between availability of infrastructure and pupils achievement in mathematics. The more the availability of infrastructure with required standards, the higher the achievement of pupils in mathematics.

Further analysis was done to determine whether there was a relationship between availability of infrastructure and pupils achievement in mathematics and results are presented in Table 4.5

Table 4.5 Relationship between Availability of Infrastructure and Pupils Achievement in Mathematics

Physical facilities	Pearson Chi-Square	
	Value	Sig.
Desks availability	0.175	0.030
Classrooms	0.347	0.014
Teachers chairs and tables	0.079	0.042
Library	0.047	0.847
Toilets	0.019	0.036

The table above shows relation between availability of infrastructure and pupils achievement in mathematics. Desk, classrooms, teachers chair and table and availability of toilets were clearly significant and associated with pupil's achievement in mathematics at alpha <0.05. However, the library did not have any significant influence on pupil's performance in mathematics. This could be attributed to the fact that most of the standard three pupils carry their books at home and do most of their studies from class and so a library is not used most of the time. This implies that most of the schools had available infrastructure that did not meet the required standards

thus interfering with learning of mathematics. Pupil's achievement in mathematics was influenced by the desks, classrooms, toilets and teachers table and chair.

Further analysis was done by the researcher to find out whether relationship between availability of infrastructure and pupils achievement in mathematics was significant. To test the result, the following hypothesis was formulated and tested.

Ho1: There is no significant relationship between Availability of Infrastructure and Pupils Achievement in Mathematics.

A chi-square was used to find out whether the relationship between availability of infrastructure and pupils achievement in mathematics was significant and the results are presented in Table 4.6 below.

Table 4.6 Relationship between Availability of Infrastructure and Pupils Achievement in Mathematics

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	162.000[a]	3	0.0294
Likelihood Ratio	73.188	3	1.000
N of Valid Cases	19		

Table 4.6 shows that the relationship between availability of facilities and pupils achievement in mathematics was ($0.0294<p< 0.05$). The results show that the relationship between availability of infrastructure and pupil's achievement in mathematics was significant. The null hypothesis was thus rejected. This means that infrastructure influence pupil's achievement in mathematics. The results implied that the more the availability of infrastructure with the required standards the higher the pupils score in mathematics.

The current study findings are in agreement with the study findings of SACMEQ (1999) which indicated that shortage of physical facilities, text books and other equipment affected students learning and their subsequent performance. Similar results were reported by Karimi (2013) who carried out a study on school based factors affecting students in public day secondary schools. From the findings it was revealed that a strong relationship exists between science laboratories, textbooks, classrooms and students performance in KCSE and indicated that performance was better in schools with facilities than those without. It was concluded that poor or fair performance in the sampled schools was as a result of inadequate facilities. In addition Adeboyeje (1994) and Ayodele (2004) have variously pointed out that the availability of adequate school buildings, classrooms, chairs, desks, laboratories and other facilities are necessary for the accomplishment of any educational goals and objectives.

Whitbread (1999) found that children perform better when their classes are organized, have enough space and conducive conditions, which give a chance for children to develop good starting points for their ideas. Consistently, Moyer (1995), states that school building design features and component have been proven to have a measurable influence upon pupils' learning and their performance in schools. On the contrary, overcrowded school building and classrooms have a negative influence upon students' performance. In addition Ndani (2008) states that lack of adequate supply of fresh air in a classroom means limited supply of air in the body cells. Poorly ventilated and crowded rooms lead to increase of polluted air which often makes children sick, tired and dull. This can suffocate the child and make him or her unable

to carry out every day activities effectively. This also means that poor ventilation would affect performance in mathematics activity. Overcrowding may also lead to poor performance because there is no space for the children to carry out actual mathematical activities. From the above discussion it can be concluded that majority of the schools in Dandora had inadequate infrastructure to support children's good performance in mathematics. However, the current study findings contradict the study findings by Obiero (2010) that the facilities did not significantly influence the performance of pupils.

4.3 Pupil-Teacher Ratio and Pupils' Achievement in Mathematics

The second objective was to investigate the relationship between pupil teacher ratio and pupils achievement in mathematics. Results on pupil teacher ratio are presented in Table 4.7.

Table 4.7 Pupil-Teacher Ratio

The following were results on the ratios of standard three classes.

Schools	Pupil-Teacher Ratio
1	1:75
2	1:25
3	1:12
4	1:47
5	1:21
6	1:16
7	1:60
8	1:41
9	1:94
10	1:21
11	1:22
12	1:50
13	1:68
14	1:15
15	1:24
16	1:44
17	1:35
18	1:29
19	1:50

Table 4.7 shows that majority of the schools 13 out of 19 had the recommended ratio of 1: 40 pupils per class while others did not meet the requirement of pupil teacher ratio and had large classes. It was also observed that their rooms were very congested and teachers were handling over 1; 40 of pupils which translated to less individual attention and excessive workload. Overcrowded atmosphere does not provide good environment for teaching and learning mathematics as pupils find it difficult to write because they are squeezed and teachers cannot easily move around to assist needy pupils. The results imply that in majority of the schools, the pupil-teacher ratio was 40 and below.

To establish the relationship between pupil teacher ratio and pupils performance in mathematics, pupils' average scores were calculated and presented alongside the pupil teacher ratio. Table 4.8 summarizes the results.

Table 4.8 Pupil-Teacher Ratio and Pupils' Achievement in Mathematics

Ratio	Frequency	Percentage	Mean Score in Mathematics
Recommended ratio (40 below)	11	57.9	74.98
Not recommended ratio (above 40)	8	42.1	71.61

Results in Table 4.8 show that there was a difference in pupils' achievement in mathematics between schools with recommended ratio and those without. The schools that had 40 and below pupils in class, registered slightly higher averaging (74.98) compared to schools which had above 40 pupils in class with a mean score of (71.61). The results imply that pupil-teacher ratio which was below 40 promoted a conducive environment for learning mathematics and influenced pupils achievement positively.

To understand the relationship between pupil-teacher ratio and pupil's performance in mathematics, the following hypothesis was formulated and tested.

H02: There is no significant relationship between pupil-teacher ratio and pupils' achievement in mathematics.

Chi-square was used to determine whether the relationship between pupil-teacher ratio and pupils' achievement in mathematics was significant. The results are presented in Table 4.9 below

Table 4.9 Relationship between Teacher-Pupil Ratio and Pupils Achievement in Mathematics

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.000[a]	3	.386
Likelihood Ratio	12.315	3	.722
N of Valid Cases	19		

Results in Table 4.9 show that the relationship between pupil-teacher ratio pupils achievement in mathematics was not significant at ($.386 > p > 0.05$) As such, the null hypothesis was accepted. The results reveal that the relationship between pupil-teacher ratios was not significant. This could be because the majority of the schools had the recommended ratio of 40 and below.

The current study findings are in agreement with the study findings of Afolabi (2002) who also found out that there was no significant relationship between class size and students learning outcomes. These findings are however inconsistent to those reported by Majanga, Nasongo and Sylvia (2010) on effects of class size on interaction during mathematics discourse in the wake of free primary education in Nakuru County. The objective of the study was to determine the influence of FPE policy on class size and on teacher pupil ratio. Findings revealed that FPE policy created high pupil-teacher ratio, overcrowded classrooms and teacher shortage. Further, they noted schools

where PTR was high; performance of pupils was very low compared to schools with low PTR. A study by Kaloki (2012) further revealed that PTR extensively influences performance of pupils in national exams and increase in PTR affected performance of pupils negatively. A similar study done by Njagi (2013) revealed that large class size of 40 and above students, medium class (12-39) performed significantly better than small classes (<29>).

4.4 Availability of Teaching and Learning Materials and pupils Achievement in Mathematics

The third objective was to investigate the relationship between availability of teaching learning materials and pupils' achievement in mathematics. The study investigated the availability of teaching-learning materials using observation schedule and questionnaires and results are presented in Table 4.10.

Table 4.10 Availability and Standard of Teaching-Learning Materials

Materials	Schools					
	Schools with standard materials	%	Schools with substandard materials	%	Schools without materials	%
Textbook	9	47.4	10	52.6		
Charts	2	10.5	9	47.4	8	42.1
Chalkboard	7	36.8	11	57.9	1	5.3
Teachers guide	16	84.2	2	10.5	1	5.2
Syllabus	17	89.5			2	10.5
Pupils exercise book 2	11	57.9	8	42.1		

As it can be seen in Table 4.10 less than half of the schools (47.4%) had available textbooks that met the required standards, while more than half (52.6%) of the schools had available textbooks that did not meet the required standard which is 1:3. It was also observed that in most schools (52.69), students did not have a copy of their own textbooks and this resulted to sharing. Due to this shortage at times teachers were forced to copy the work on the board for pupils. Government policy on pupil-textbook ratio stipulates that lower primary and preschools should have a ratio of at most 1:3, while upper primary should have a ratio of at most 1:2 in all main subjects (Mutai, 2001). However in some schools, textbooks were not available, while in others the sharing ratio was very high and this could affect pupils' performance in mathematics.

Teaching aids help in stimulating young children's physical, mental and emotional development. It was observed that 2(10.5%) of the schools had charts that were adequate for teaching mathematics. 9(47.4) did not have varieties, while 8(42.1%) did not have any chart for teaching mathematics. Teachers reported that due to high pupil-teacher ratio which translated to high workload, teachers did not get time to develop teaching learning materials for teaching mathematics. Majority of these schools lacked learning charts. Those which had charts with illustration were poorly displayed on the walls far beyond children's reach.

Chalkboard is still the most influential tool used in instruction and learning mathematics. Mathematic is taught by solving problems on chalkboard. More than half of the schools (57.9%) had chalkboards that did not meet the required standards, were faded and badly worn out so learners had difficulties seeing what was written on the board. Others were too small for the big class so pupils were forced to strain and

also the teacher could only write few mathematics on the board because of the small space then wait for learners to copy then clean the board to write the next item. In one school, one of the class three rooms did not have a blackboard and so they were forced to share with standard two pupils.

On availability of teachers guide, majority (84.2%) of the schools had them and meet the required standards. This assisted the teacher in teaching appropriate content to the standard three pupils. Majority (89.5%) of the schools had syllabus, while (10.5%) did not have the syllabus. Pupils exercise books were also available in more than half (57.9%) of the schools which made the pupils write their class work in one of the books and copy homework in the other book to go and do at home. Slightly less than half (42.1%) had only one exercise book for mathematics. It was observed that such pupils did not do their homework because most of the time their books were left in schools for the teacher to mark their class work. Others had unmarked books because they had only a book which was for both homework and class work. The results imply that most of the teaching-learning materials were available but did not meet the required standards hence this did not provide a conducive environment for teaching and learning of mathematics.

A comparison on the relative achievement in mathematics of pupils in schools where materials were available and those where they were not yielded the results presented in Table 4.11

Table 4.11 Availability of Teaching Learning Materials and Pupils Achievement in Mathematics

Materials	Availability	Frequency	Percentage	Mean score in Mathematics
Textbook (1:3)	Available and meets required standard	9	47.4	76
	Available and does not meet required standard	10	52.6	72
	Not available	0	0	0
Charts	Available and meets required standard	2	10.5	70
	Available and does not meet required standard	9	47.4	73
	Not available	8	42.1	75.4
Chalkboard	Available and meets required standard	7	36.8	77
	Available and does not meet required standard	11	57.9	65
	Not available	1	5.3	66
Teachers guide	Available and meets required standard	16	84.2	70.2
	Available and does not meet required standard	2	10.5	66
	Not available	1	5.3	80
Syllabus	Available and meets required standard	17	89.5	74
	Available and does not meet required standard	0	0	
	Not available	2	10.5	73
Pupils exercise book 2	Available and meets required standard	11	57.9	75
	Available and does not meet required standard	8	42.1	72
	Not available	0	0	0

Table 4.11 shows that performance was high (76%) in schools that had available textbooks which meet the required standard of 1:3 compared to those which did not

meet the required standards. It was also revealed that most schools had available teaching learning materials. However, some schools did not have teaching-learning materials and their performance was still high compared to those that had. This could be attributed to the fact that other locally available teaching materials were used for teaching mathematics and teachers were doing tuition on their pupils and this could have boosted their performance. On availability of charts, less than half (42.1%) of the schools did not have the chart for mathematics but their performance was high compared to those that had charts in their classrooms. On availability of chalkboard, schools that had well maintained boards and of appropriate size had a high mean score as compared to those that did not have.

Majority (84.2%) had teachers guide available and their performance was (70.2%) while schools that did not have scored a high mean score of (80%). Majority (89.5%) of the schools had syllabus in their schools while only (10.5%) did not have any copy available and their performance was (73%). This is because teachers had other supplementary books for teaching mathematics. On availability of pupils exercise books, more than half (57.9%) of the schools had pupils with two exercise books one for class work and the other one for homework and their mean score of (75%) was higher compared to schools where pupils did not have both books. Results imply that availability of teaching-learning materials that met the required standards influenced pupils' achievement in mathematics positively.

To establish the influence of teaching-learning materials on pupils achievement in mathematics, a Chi-square test was done and the results are presented in Table 4.12

Table 4.12 Relationship between Availability of Teaching Learning Materials and Pupils Achievement in Mathematics

Teaching-learning material	Pearson chi-square	
	Value	sig.
Textbooks	0.226	0.035
Charts	-0.206	0.397
Chalkboard	0.33	0.167
Teacher guide	0.036	0.883
Syllabus	0.028	0.908
Exercise book	0.186	0.035

Table 4.12 shows relationship between availability of teaching learning materials and pupils achievement in mathematics. The significance level is $p< 0.05$ hence availability and adequacy of textbooks and pupils exercise books influenced pupils performance in mathematics. Government policy on pupil-textbook ratio stipulates that lower primary and pre-schools should have a ratio of at most 1:3, while upper primary should have a ratio of at most 1:2 in all main subjects (Mutai, 2001). However in some schools, textbooks were not available while in others the sharing ratio was very high and this affected pupils' performance in mathematics. However, other teaching-learning materials like charts, chalkboard, teacher guide and syllabus did not affect pupils achievement because their $p>0.05$. This implies that most schools did not have teaching-learning materials of required standards but this did not influence their achievement in mathematics. This could be as a result of teachers

using other supplementary materials that enhance understanding of concepts in mathematics.

After the above analysis, the researcher wanted to find out whether relationship between availability of teaching-learning materials and pupils achievement in mathematics was significant. The following hypotheses was generated and tested.

H03: There Is No Significant Relationship between Availability Of Teaching-Learning Materials And Pupils Achievement in Mathematics

Chi-square test was used to test whether the relationship between availability of teaching-learning materials and pupils achievement in mathematics was significant. The results are presented in Table 4.13.

Table 4.13 Relationship between Availability of Teaching-Learning Materials and Pupils Achievement in Mathematics

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	162.000[a]	3	.294
Likelihood Ratio	75.822	3	1.000
N of Valid Cases	19		

Table 4.13 shows that the relationship between availability of teaching-learning materials and pupils achievement in mathematics had a level of significance of .294. The results imply that the relationship between availability of teaching-learning materials and pupils achievement in mathematics was not significant. The null hypothesis was therefore accepted. The results imply that teaching learning materials

did not influence pupil's achievement in mathematics. This can be attributed to the fact that most schools had available teaching-learning material but were not adequate. From the information gathered in the field other locally available materials were used for teaching-learning mathematics.

These findings are inconsistent with those of Adeogun (2001) who discovered a very strong positive significant relationship between instructional resources and academic performance. According to Adeogun, schools endowed with more resources performed better than schools that are less endowed. Mutai (2006) who asserted that learning is strengthened when there are enough reference materials such as textbooks, exercise books, teaching aids and class rooms, he further asserted that academic achievement illustrates per excellence the correct use of these materials.

Further Eshiwani (2001) describes a significant relationship between use and presence of textbooks and achievement in primary schools. In addition Eshiwani (1993) in his research on the determinant of school achievement in Kajiado District found that pupils who had their own text books performed much better in examinations than their colleagues who did not have text books, especially in Kiswahili, Mathematics and English. He also found that the more money a school spends on text books, the higher the chances of it performing well in examinations. Therefore, text books are an important learning input that provides the learner with different learning experience. Another study done by Njagi (2013) revealed that adequate resources in secondary schools enables pupil to perform better and learn mathematics effectively.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter deals with the summary, conclusions and recommendations of the study. The general objective of the study was to investigate the relationship between infrastructure, pupil-teacher ratio and learning materials on standard three pupils' achievement in mathematics in primary schools in Dandora Zone, Nairobi County, Kenya.

5.1 Summary of the Study Findings

The results show that in most of the schools, pupil's achievement was above average. The results further revealed that availability of infrastructure that met the required standards influenced pupil's achievement in mathematics. This is because the mean scores of schools with available facilities were higher compared to those that did not have facilities, or where they were inadequate. Common facilities available in most of the schools were desks, chairs, classrooms and toilets and were significantly associated with pupils' performance in mathematics at alpha < 0.05. The relationship between availability of infrastructure and pupil's achievement in mathematics was significant. Chi-square was $0.0294<p<0.05$.

In regards to the relationship between pupil- teacher ratios and achievement in mathematics, results revealed that the relationship between pupil-teacher ratio and pupils achievement was not significant at the level p ($>0.0.5$) and pupil-teacher ratio did not influence pupil's achievement in mathematics.

On the relationship between availability of teaching-learning materials and pupils achievement in mathematics results revealed that availability of teaching-learning materials did not meet the required standards hence this did not provide a conducive environment for teaching and learning of mathematics. It was observed that most schools did not have teaching-learning materials of required standards. Consequently, the relationship between availability of teaching-learning materials and pupil's achievement in mathematics was not significant.

5.2 Conclusion

Results from this study have shown that availability of adequate infrastructure influenced pupils' achievement in mathematics. This is because schools with available and standard infrastructure performed better compared to those that did not have facilities, or where they were inadequate.

This means that one of the aspects that schools need to address if they are to improve pupils' performance in mathematics is that of physical facilities.

Pupil-teacher ratio did not influence pupils' achievement in mathematics. It was clear from the study findings that most of the schools scored high even with the high pupil teacher in class. Availability of teaching-learning materials did not influence pupils' achievement in mathematics. This was because majority of the schools had available teaching-learning materials and other supplementary materials were used in teaching-learning mathematics.

5.3 Recommendations

To improve school environment and pupils' achievement in mathematics, the following are recommendations for different stakeholders.

5.3.1 Recommendations for the Ministry of Education Science and Technology

Results revealed that some teaching-learning materials and infrastructure were available in most of the schools but not adequate. Firstly, the Ministry should increase provision of infrastructure and adequate teaching- learning materials for mathematics. This can be done by ensuring that they give more financial support to schools. Secondly, the Ministry of Education Science and Technology should enforce the provisions and guidelines on the standard minimum requirements for infrastructure before a primary school is allowed to operate. This is because results revealed that most of the infrastructure in schools did not meet the required standards. Thirdly, The Ministry of Education Science and Technology should enforce the Policy on staffing quality and the pupils-teacher ratios in both public and private schools. The number of students per class should not be more than 40. Results had shown that some schools had a high pupil-teacher ratio which led to overcrowding and congestion. This would ensure that the teachers effectively and efficiently handle the pupils as well as increase individual attention. Lastly the Ministry Of Education Science and Technology should conduct regular audit and inspections in primary schools to ensure conformity to standard guidelines.

5.3.2 Recommendations for Primary School Teachers

Findings indicated that most of the schools did not have adequate teaching-learning material for teaching mathematics. Teachers should develop variety of teaching learning materials which are relevant for teaching mathematics. This is because materials make learning more realistic and enhance acquisition of concepts. They

should also be sensitized on importance of school environment and how it influences pupils' achievement in mathematics.

5.3.3 Recommendations for Head teachers

Findings from the study had shown that most of the schools did not have adequate physical facilities, teaching-learning materials and pupil-teacher ratio was above the recommended one. To improve mathematics in schools, it is recommended that schools should have a conducive learning environment that comprises of adequate physical facilities, teaching learning materials and balanced pupil teacher ratio. They should provide such environments to improve pupil's performance in mathematics.

5.3.4 School Management

Availability of infrastructure was significantly associated with pupils' achievement in mathematics. There is need therefore for school managers to ensure that facilities like classes are built to specifications this is because most of the schools had small classroom sizes. They should also ensure that pupil-teacher ratio is 1:40 by admitting enough number of pupils per class and recruit more staff.

5.4 Suggestions for Further Research

This study was done in Dandora Zone, Nairobi County. A replication of this study should be done in other county's in the country, in order to give a better picture of the situation in the country. Many other factors could be influencing pupil's achievement in mathematics. School environmental factors such as physical facilities, pupil teacher ratio and teaching learning materials were investigated in this study. Studies should be done on other factors like home environment among others which might be influencing pupil's achievement in mathematics in Kenya.

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APPENDICES

APPENDIX I: RESPONDENTS INFORMED CONSENT

My name is Ngusa Judy and I am a master's student from Kenyatta University. I am conducting a study on relationship between infrastructure, pupil-teacher ratio and learning materials on standard three pupil's achievement in mathematics in primary schools in Dandora Zone. The information will be used by the Ministry of education Science and Technology and County Education Board to come up with interventions, ways of creating and improving school environment.

Procedures to be followed

Participation in this study will require that I ask you some questions and record the responses from the questionnaire.

Participation in this study is voluntary. You have the right to refuse to participate in this study. Please note that your refusal or withdrawal from the study at any time will not jeopardise you in any way.

You may ask any question related to the study at any time. You can leave any question blank if you don't feel comfortable answering it. Your completion of this questionnaire is your consent to participate. You may also stop being part of this study at any time without consequences to the services you receive in any institution or organizations.

Discomforts and risks

Some of the questions you will be asked are on the social aspect and may make you uncomfortable. If this happens, you may choose not to answer these questions. You may also stop the interview at any time.

Benefits

If you participate in this study you will help us know the school environmental factors affecting pupils' performance in mathematics and improve their environment.

Rewards

Teachers who will participate in this study will be given a token for appreciation.

Confidentiality

The interviews will be conducted in your schools and classes. Confidentiality given by the respondents will be upheld by ensuring that they do not write their names on the questionnaire. All information given will be used for academic purpose and all respondents will be told to keep anonymity on the questionnaire. Data collected will not be disclosed outside the school and information gathered will be kept in Kenyatta University and access will be limited to the researcher and the supervisors.

Contact information

If you have any queries/questions you may contact Dr. Nyakwara Begi on 0722250188 or Dr. Mary Ndani on 0723696878/Kenyatta University Ethical Review Committee Secretariat on *kuerc@ku.ac.ke*.

Participants Statement

The above information regarding my participation in the study is clear to me. I have been given a chance to ask question and my questions have been answered to my satisfaction. My participation in this study is entirely voluntary. I understand that my records will be kept private and that I can leave the study at any time.

Name of participants.....

....

Signature or thumbprint **Date**

Investigators Statement

I the undersigned have explained to the volunteer in a language s/he understands the procedures to be followed in the study and the risks and the benefits involved.

Name of the interviewer.....

....

Interviewer signature **Date**

APPENDIX II: STANDARD THREE TEACHERS QUESTIONNAIRE

This questionnaire is aimed at gathering information that will be essential in trying to determine the relationship between infrastructures, pupil-teacher ratio and learning materials on standard three pupil achievement in mathematics. Information provided will be strictly used for the purpose of research, and will be kept confidential. You can leave any question blank if you don't feel comfortable answering it. Your completion of this questionnaire is your consent to participate.

Instruction

Kindly answer the questions in the questionnaire and please do not indicate your name.

Section A

Part 1: Background information

1. Please indicate your gender Male [ ] Female [ ]
2. Please indicate your age bracket?

21-12 [ ] 31-40 [ ] 41- 50yrs [ ] 51-60 [ ] 51-60 [ ] over 60 [ ]

3. For how long have you been in the teaching profession?

1-5yrs [ ] 6-10yrs [ ] 11-15yrs [ ] 15-20yrs [ ] Over 20yrs [ ]

4. Please indicate your highest education qualification

O level [ ] A-Level [ ] P1 [ ] P2 [ ] Diploma [ ]

B.Ed [ ] M.Ed [ ] please specify any other.....

Section B

Part 2: Infrastructure and Quality of Learning

5. Please indicate the availability of the following facilities in your school for **class three pupils**. (tick as is appropriate).

Physical facilities	Available and meet required standard	Available and does not meet required standard	Not available
Furniture (desks			
Pupils desk condition			
Classroom condition			
Availability of classroom (1: 40)			
Availability of Library			
Availability of separate toilets for pupils (B/G) (1:45)			
Classroom observation			
Teachers table and chair			

6. What's the condition of your classrooms?

   [ ] Well maintained [ ] worn out

7. What's the condition of the teachers chair and table in your classroom?

   [ ] Well maintained [ ] Worn out

8. What's the condition of the pupil's desks in your classroom?

   [ ] Well maintained [ ] Worn out

9. Please indicate the desk ratio in your class.

[ ] 1 desk for 2 pupils [ ] 1 desk for 3 pupils [ ]

1 desk for 4 pupils [ ] 1 desk for 5 pupils [ ]

1 desk for over 5 pupils

Part 3: Teacher- pupil Ratio

10. In your school, how many class three pupils are there in a class?

11. What is the size of your class in terms of pupil-teacher ratio?

( ) Spacious ( ) Overcrowded

12. Indicate the pupil-teacher ratio in your class.....

Part 4: Teaching and Learning resources

13. Indicate the availability/suitability of the following materials in your school

Teaching learning materials	Available and meet required standard	Available and does not meet required standard	Not available
Textbook(1:3)			
Charts			
Chalkboard			
Teachers guide			
Syllabus			
Pupils exercise book			

14. What is the condition of your chalkboard?

[ ] Well maintained [ ] Faded [ ] worn out

15. Please indicate the mathematics text book ratio in your class.

[ ] 1 text book for 1 pupil [ ] 1 text book for 2 pupils [ ]

1 text book for 3 pupils [ ] 1 text book for 4 pupils [ ]

1 text book for 5 pupils [ ] 1 textbook for over 5 pupils

Thank you for co-operation

APPENDIX III OBSERVATION SCHEDULE

This is a checklist in which items observed were recorded by the researcher.

Name of school/code_____ Class_____

The following resources and facilities were observed for availability/suitability and adequacy

Physical Facilities	Available and meet required standard	Available and does not meet required standard	Not available
Furniture (desks			
Pupils desk condition			
Classroom condition			
Availability of classroom (1: 40)			
Availability of Library			
Availability of separate toilets for pupils (B/G) (1:45)			
Classroom observation			
Teachers table and chair			
Teaching learning materials			
Textbook(1:3)			
Charts			
Chalkboard			
Teachers guide			
Syllabus			
Pupils exercise book			

Number of students in class.....

Number of teachers in a class.....

Any other classroom observation made (specify).....

APPENDIX IV: PUPILS ACHIEVEMENT PROFORMA

PART A DEMOGRAPHIC INFORMATION

PUPILS NAME.....

CLASS.....

PART B

SCORES IN MATHEMATICS.....

APPENDIX V AUTHORIZATION

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Our Ref: E55/10295/08 Date: 18th April, 2015

The Principal Secretary,
Higher Education, Science & Technology,
P.O. Box 30040,
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR MS. JUDY NGUSA - REG. NO. E55/23423/12

I write to introduce Ms. Ngusa who is a Postgraduate Student of this University. She is registered for a M.Ed. degree programme in the **Department of Early Childhood Studies in the School of Education.**

Ms. Ngusa intends to conduct research for a thesis Proposal entitled, **"Influence of School Environment on Standard Three Pupils Achievement in Mathematics in Primary Schools in Dandora Zone, Nairobi County".**

Any assistance given will be highly appreciated.

Yours faithfully,

MRS. LUCY N. MBAABU
FOR: DEAN, GRADUATE SCHOOL

ST/cao

THIS IS TO CERTIFY THAT:
MISS. JUDY NGINA NGUSA
of KENYATTA UNIVERSITY, 4385-506
NAIROBI,has been permitted to conduct
research in *Nairobi County*

on the topic: *INFLUENCE OF SCHOOL ENVIRONMENT ON STANDARD THREE PUPILS PERFORMANCE IN MATHEMATICS IN PRIMARY SCHOOLS IN DANDORA ZONE,NAIROBI COUNTY*

for the period ending:
4th December,2015

Permit No : NACOSTI/P/15/1801/6228
Date Of Issue : 30th June,2015
Fee Recieved :Ksh 1,000

.....
Applicant's
Signature

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

APPENDIX VI RESEARCH PERMIT

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471, 2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

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

Ref: No. NACOSTI/P/15/1801/6228

Date: 30th June, 2015

Judy Ngina Ngusa
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Influence of school environment on standard three pupils performance in mathematics in primary schools in Dandora Zone, Nairobi County,"*** I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for a period ending **4th December, 2015.**

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

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

DR. S. K. LANGAT, OGW
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Nairobi County.

The County Director of Education
Nairobi County.