

**EFFICIENCY OF MATHEMATICS TEACHERS IN PUBLIC
PRIMARY TEACHER TRAINING
COLLEGES IN KENYA**

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In Partial Fulfillment of the Requirements for the Degree
Master of Education in Educational Administration
And Management

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DECLARATION A

"This thesis is my original work and has not been presented for a Degree or any other academic award in any University or Institution of learning"

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Name and signature of the candidate

28.08.2011

Date

DECLARATION B

"We confirm that the work reported in this thesis was carried out by the candidate under our supervision".

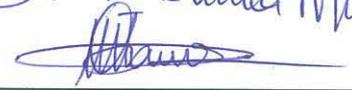
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APPROVAL SHEET

This thesis entitled "**Efficiency of mathematics teachers in public primary teacher training colleges in Kenya**" prepared and submitted by **Okoth S Ondolo John** in partial fulfillment of the requirements for the degree of masters in Educational Management and Administration has been examined by the panel on oral examination with a grade of PASSED.

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DEDICATION

I would like to dedicate this thesis to my parents Min Owino Nyaganyumba, Woud Okal, Rev. Stephen Ondolo and my elder brother Absalom. Their clear, strict, honest and spiritual upbringing has brought me this far.

God bless you abundantly!

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ABSTRACT

The central problem of this study is that despite the critical role of mathematics education in promoting numerical literacy, students' performance in this subject is not up to standard. Factors leading to this dismal performance have not been adequately investigated and well understood, hence hindering development of mathematics education in the country of Kenya. The purpose of this study was to determine the efficiency of mathematics teachers in the primary teachers training colleges in Kenya. The study sampled mathematics students in their final year of study in each of the public primary teachers training colleges in the country. Purposive sampling technique in the form of female and male mathematics students this ended with an equal number of 16 students per college, yielding to 262 respondents. The main instrument used had 16 itemed closed ended question Likert scaled using a five point scale, where 1 = strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly agree. The chosen students rated each of the items by indicating the extent to which they agree or disagree. Data was collected using questionnaire for each of the students and was analyzed using frequencies, percentage distributions, SPSS's descriptive statistics showing mean and t-test.

The major finding was that the student rated their teacher's efficiency as satisfactory to the rate of 3.68 out of 5. The items that came out as not satisfactory were, the teachers do not supervise and correct student's work in time, and that they do not have enough time for individual correction. Based on these findings, it is recommended that, more investigation should be done to ascertain why teachers do not have enough time to supervise individual students work. Mathematics requires individual attention for better understanding and with this finding the cause of our poor performance in the subject right at primary stage.

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CHAPTER ONE

THE PROBLEM AND ITS SCOPE

Background of the Study

According to Hanushek [2007], efficiency in mathematics is measured by comparing education expenditures with education outcomes. Governments make expenditures at all levels of education, and two of the most basic efficiency questions are whether government is spending the appropriate amount on each level or type of education?, and whether government is making the appropriate choices on quantity versus the quality of education?. These questions are answered by looking at the success that the graduates of different levels of mathematics in education have in the labor market relative to the costs of their education. This is called the external efficiency of the educational system

According to Ouko, (2004), Newton and Tarrant, (1992) performance of Mathematics in the Kenya Certificate of Secondary Education Examination (KCSEE) has consistently given out poor results, yet it is a key subject for various careers. It is required for entry into different careers and training institutes. Many employers also demand good performance in mathematics for selection purposes. Developed countries such as the United Kingdom have had their share of poor performance in the subject despite having more advanced in-service education and training (INSET) compared with developing countries such as Kenya and Zimbabwe (SMASSE, 2002).

There is public outcry every time the Kenya National Examination Council, (KNEC) releases results showing poor performance in mathematics

(Njoroge, 2004). In the last 10 years, the Kenya Certificate of Secondary Education (KCSE) results mean grade in mathematics has been D, or below 30% (Ouko, 2004; Otieno, 2005). This is the second lowest grade in a grading system that ranges from A to E. Three authors (Aduda, 2005; Kituku, 2004; Otieno, 2005) noted that, of the registered candidates for the KCSE, in 2000 and 2002, 40% and 30% respectively scored a mean grade of D, while in 2003 and 2004 many of those candidates with the mean grade of D in mathematics were absorbed in primary teacher training colleges. They were therefore not expected to perform any better at this level either.

The Director, Quality Assurance and Standards in the Ministry of Education, in his 2006 Primary Teachers Education (PTE) pre-service examination report observed that of all the subjects, Mathematics registered the lowest percentage of student pass of 70% passing while the other subjects registered higher percentage passes of between 90% and 100%. The mean grade for the subject was 5.6 in a grading system that ranges from 1 to 8, where 1 and 2 are distinctions, 3,4,and 5 are credits, 6 and 7 are passes while 8 is failure (Kenya National Examination Council (KNEC) PTE report, 2006). He then appealed to the subject teachers to urgently intervene and alleviate the continued poor performance in the subject in primary teacher training colleges.

The baseline survey in Science and Mathematics in Secondary School Education (SMASSE), undertaken in 2007 showed that most mathematics lessons were considered to be barren and boring by many students. The content taught was considered abstract and learning was seen in terms of memorizing facts, logarithms, procedures and formulae

ready for regurgitation during examinations (Wemali and Ngeny 2007). The poor results in the Kenya Certificate of Primary Education (KCPE) and Kenya Certificate of Secondary Education (KCSE) are of course carried forward into other institutions of higher learning such as the primary teacher training colleges. These colleges enroll students for a two year course with an entry requirement of C plain regardless of scores in individual subjects.

Despite all the interventions by SMASSE and other in-service programs, the result is still poor. The applicants are not specially selected to join any of the colleges, that is, the applicants with both poor and good scores in mathematics are admitted, yet, some colleges do register relatively better performance. In 2007 and 2008, for instance, one college attained mean grades of 4.9 and 3.97 respectively (Kenya National Examination Council (PTE) reports). The pass rate in mathematics was 100% in 2008 and the college ranked as number one nationally. The Director, Quality Assurance and Standards while congratulating the colleges that did relatively better, encouraged the teachers to double their efforts and improve further on the grades. He urged other colleges to emulate them and improve on their performance.

Statement of the Problem

Even though the mean grade scored by the best college in 2008 PTE national examination was 3.97, it was nevertheless not a good enough achievement in mathematics at that level (Kenya National Examination Council 2009 report). The students are required to pass mathematics in examinations and also acquire the necessary skills, attitudes, and content to teach mathematics in primary schools. Since the

primary school is the foundation of education, a great deal of effort is required to avoid vicious cycle of poor performance in mathematics at all levels of the education system. In view of the foregoing, it is therefore important to determine the efficiency of Mathematics teachers in public primary teachers' training colleges in Kenya, if it can help to improve the mathematics performance in the country.

Purpose of the Study

The research was guided by the following;

1. To validate the theory of Jean Piaget (1964) in which the study was underpinned.
2. To test the hypotheses;

No significant difference in the level of efficiency between male and female mathematics' teachers in public primary teachers training colleges in Kenya.

No significant difference in the perceived level of mathematics teachers' efficiency between male and female students in public primary teachers training colleges in Kenya.

3. To come up with new knowledge based on the findings of the study to improve the level of efficiency in public primary teachers training colleges in Kenya.

Specific objectives

1. To determine the profile of mathematics students in terms of age, gender, year of study, qualification before joining the college and the gender of their mathematics teachers in public Primary Teachers Training Colleges in Kenya.
2. To determine the level of mathematics teacher's efficiency in public Primary Teachers Training Colleges in Kenya.
3. To compare the level of efficiency between male and female mathematics teacher's in Public Primary Teachers Training Colleges in Kenya.
4. To compare the perceived level of mathematics teachers' efficiency between male and female mathematics students in Public Primary Teachers Training Colleges in Kenya.

Research Questions

1. What are the profiles of mathematics in terms of age, gender, year of study, qualification before joining college and the gender of their mathematics teachers in Public Primary Teachers Training Colleges in Kenya?
2. What is the level of mathematics teacher's efficiency in Public Primary Teachers Training Colleges in Kenya?
3. What is the difference in the level of efficiency between male and female mathematics teachers in Public Primary Teachers Training Colleges in Kenya?
4. What is the difference in the perceived level of mathematics teachers' efficiency between male and female mathematics students in Public Primary Teachers Training Colleges in Kenya.

Hypotheses

1. There is no significant difference in the level of efficiency between male and female mathematics teachers, in Public Primary Teachers Training Colleges in Kenya.
2. There is no significant difference in the perceived level of mathematics teachers' efficiency between male and female students in Public Primary Teachers Training Colleges in Kenya.

Scope

Geographical Scope

The study was conducted on the level of mathematics teachers' efficiency in all the 16 Public Primary Teachers Training Colleges in Kenya.

Content Scope

The study researched on all the factors that contribute to efficient way of teaching mathematics in the Public Primary Teachers Training Colleges. They include aspects of the teachers' time management in class, the teachers' mastery of the content, the use of different reference materials to prepare their lessons, the different pedagogical skills used to deliver the lessons and whether they are practical or not?, and the use of different instructional materials to teach the lessons.

The study also researched on the implementation of the syllabus through the curriculum implementation and performance standards well, using new methods of teaching mathematics, in time. The study also looked into the integration of new technology in teaching and assessing mathematics, the use of students' performances assessment techniques

and the teachers' understanding of the individual students learning abilities and problems in time.

The research also found out the amount of work that teachers give after every mathematics lesson. Do they give enough assignments?, are they supervised and corrected in time?. And finally do the teachers have enough time for the individual correction?

Theoretical Scope

This study is based on Jean Piaget's theory (1964) of the mathematics student's cognitive development which the teacher intends to improve when teaching mathematics.

Time Scope

This study took four months to complete from the month of April to August 2011.

Significance of the Study

The findings of the study would benefit the following groups of people;

The Teachers

The study would help provide more information to the teachers on how efficient they are in teaching mathematics in Public Primary Teacher Training Colleges in Kenya. This would give them the challenge to improve on areas that they are deficient in and hence improve mathematics education.

The College Principals

The study would help the Public Primary Teachers Training College's administrators to understand their mathematics teachers' level of efficiency and put in more efforts in capacity building them in their areas of weaknesses.

The Educational Planners and Policy makers

The study would help the educational planners and policy makers in Kenya to identify areas of weakness in mathematics teaching and plan policies that can improve them. They would also have to do more research in the areas of weaknesses and find the way forward.

The Mathematics Students

The Public Primary Teachers Training College Mathematics Students would understand that there is no significant difference in the level of efficiency between male and female mathematics teachers, in Public Primary Teachers Training Colleges in Kenya and therefore should not discriminate the teachers of mathematics in terms of gender. They should give both genders equal attention. They would also learn that no gender has a superior way of understanding mathematics and therefore both males and females have similar chances of succeeding in the subject.

The Researcher

The researcher would add to the experience of this researcher in research work and would have very little problem in using it later to solve any arising problem in future.

The study would help to boost the related literature in the library of Kampala International University as a point of references to future researchers.

Operational Definitions of Key Terms

This section involves the definition of the various concepts as used in this study by the researcher.

Efficiency

In general describes the extent to which time or effort is well used for the mathematics lesson. The length of time a mathematics teacher uses to make students understand a concept is important in this study. Those who take shorter time to deliver a mathematical concept effectively are more efficient than others in this case. Thus, higher the number of students who pass in your class the more efficient the teacher will be.

Pedagogical Approaches

This is a way in which prepared contents is delivered in a mathematical lesson to adult learners. There are many types of teaching methods used in primary teachers training colleges, depending on what information or skill the teacher is trying to convey. They include class participation; demonstration, practical, and field trips. When a teacher is deciding on their method, they need to be flexible and willing to adjust their style according to their students. Student success in the classroom is largely based on effectiveness of the teaching methods, practicality and should come in different approaches.

Teaching and Learning resources:

These are tangible and visual materials which both the teachers and students use to deliver and receive prepared mathematics contents respectively in a lesson. In primary teachers training colleges, they include counters, prepared charts, models, real objects, equipments for measurements such as rulers, protractors and many more others. There

are many types of teaching and learning resources used in primary teachers training colleges, depending on what information or skill the teacher is trying to deliver. The level of efficiency is determined by the variety used, relevance to the content, attractiveness to the student and its effective use to deliver the content.

The teaching and learning materials in this context also mean the reference materials used to prepare the lessons such as text books, log tables and calculators, how the teacher uses all these and their number determines the level of efficiency in mathematics lessons at the teachers' primary teachers training colleges.

Mastery of the contents

This is the ability to recall, analyze and apply mathematical concepts as they come. The level of success is determined by the teacher's ability to solve and explain various mathematical problems to the pupils in and outside mathematical classrooms.

Assignments

This are the mathematical exercises which are given at the end of every lesson to help the student practice and master the concept learnt. The teacher should always give enough exercises correct and give the feedback in time to enhance a higher level of efficiency.

Supervision

This is the checking of the students work to ensure that it is done in the expected way. In the primary teachers training colleges, teachers should always be available to their mathematics students to oversee their

work for any correction and/or encouragement. The teachers should also have enough time for the individual students' correction. This will enhance a high level of efficiency.

Individual Learners Ability

This refers to the learner's ability to understand the concept in a mathematics lesson. There are slow, moderate and fast learners, all of them will take different time spans to internalize a concept. The primary teacher training college teacher should know his learners well and treat them at their own paces.

Integrates New Technology into the Mathematics Lesson

All the mathematics teachers in the college should be having enough knowledge in the information technology apply it in the mathematics teaching. This will raise the level of efficiency.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Concepts, Ideas and Opinions of Authors / Experts

Efficiency

In general describes the extent to which time or effort is well used for the intended task or purpose. It is often used with the specific gloss of relating the capability of a specific application of effort to produce a specific outcome effectively with a minimum amount or quantity of waste, expense, or unnecessary effort. www.wikipedia.com.

According to the international Webster's comprehensive dictionary efficiency means the ratio of work done or energy expended by an organization or machine to the energy supplied in form of food or fuel. It also means bringing one's ability to bear promptly on the things to be done.

Efficiency is a measurable concept, quantitatively, determined by the ratio of output to input. Wood, (1988).

Efficiency can be expressed as a percentage of what ideally could be expected with 100% as ideal case Bitterman, (1983).

Teaching pedagogy

Teaching method is defined as the types of principles and methods used for instruction. There are many types of teaching methods, depending on what information or skill the teacher is trying to convey. Class participation, demonstration, recitation, and memorization are some of the teaching methods being used. When a teacher is deciding on their method, they need to be flexible and willing to adjust their style according

to their students. Student success in the classroom is largely based on effective teaching methods Gilbert Highet, (1950).

It refers to any of the various manually organized systems that presents educational material in a series of steps designed to enable each adult student to learn at a rate commensurate with his abilities (international Webster comprehensive dictionary)

Wood (1988) defines teaching pedagogy as the correct use of instructive strategies to teach adult humans using their background knowledge and experience, situation and environment.

Teaching and Learning resources:

Tools for teachers and students to think, connect, create and share SMASSE (1998) .The quality of education process is enhanced by the availability of teaching and learning materials like textbooks and curriculum. As schools become more adept at producing their own whole school development plans for acquiring textbooks and other materials that will stimulate teaching and learning process. In order to introduce a reliable income stream for essential no salary expenses at school level.

The international Webster comprehensive dictionary defines teaching and learning resources as that which is resorted to for aid or support.

Wood (1988) says that teaching and learning resources refers to a school utility driven by a qualified specialist which contains several information, techniques which the teacher directly deals with to acquire searching skills of information analyze and evaluate in order to build a new knowledge and experience.

Education

In the largest sense it is any act or experience that has a formative effect on the mind, character or physical ability of an individual. In its technical sense, education is the process by which society deliberately transmits its accumulated knowledge, skills, and values from one generation to another. UNESCO, (2008).

The international Webster comprehensive dictionary defines education as the systematic development and cultivation of the natural powers by inculcation.

It also defines it as the instruction and training in an institution of learning, where education becomes the knowledge and skills resulting from such instruction and training.

Supervision

According to Wikipedia, a supervisor is one who oversees the work or tasks of another. His roles include regulation and controlling behavior by rules or restrictions set by the organization.

Wood (1988) defines supervision as a tutorial, that is, a meeting between a student or small group of students and a teacher. They also says that in child care and general use, supervision means to watch over, and is often used in the context of an adult watching children to ensure they are attended, acceptably behaved and safe.

Bitterman (1983) says permission means "looking from above" that is keep a general eye on their activities and usually help to direct.

The international Webster comprehensive dictionary defines supervision as the authority to direct.

Integrating New Technology into the Mathematics lesson

Wood (1988) says that many non-traditional education options are now available and continue to evolve. One of the most substantial uses in education is the use of technology. Classrooms of the 21st century contained interactive white boards, tablets, Mp3 players, Laptops etc. teachers are encouraged to embed these technological devices in the curriculum in order to enhance student learning and meet the needs of various types of learners.

Individual learners' ability

This is the state of being able, physically, mentally, legally or financially to acquire new or modified existing knowledge, behaviours, skills, values, or preferences and may involve synthesizing different types of information at different rate.

Theoretical perceptive

This study is based on JEAN Piaget's (1964) theory of cognitive development which is the aspect of a student's development which a teacher intends to improve when teaching. This aspect deals with thinking, problem solving, intelligence and language development (Black and Pucket, 1996). It begins with the primitive reflexes and motor coordination of infancy and extending to the thinking and problem solving of adolescents and adults. This study would focus on how the college teachers have harnessed their students' mathematic abilities to produce specific outcomes effectively within a minimum amount or quantity of waste, expense or unnecessary effort. It would verify the extent to which the college teachers have imparted the necessary experiences which help the individual students adapt well to the environment of mathematics.

The theory's developmental stage which states that; learning is developmental and the individual children may take different lengths of time and thus requires different experiences to complete their development is tested. The college teachers are assessed on whether they give their learners the individual different attention they require. The theory's fourth stage of development that learners differ in capability, probably due to variations in their physical and mental experiences is also observed in the study. That is study determines to what extent are teachers in primary teachers training colleges follow the Jean Paige's theory to produce the best in mathematics students.

Related studies

Efficiency of teachers towards Mathematics

According to Kamau and Ndiithi (2004), performance in mathematics and sciences in national examinations has remained generally poor compared to other subjects. Historically, these subjects have been considered to be difficult and for that reason, many students have shied away from them. A study done by SMASSE (1998) found that some reasons given for the negative attitude includes low marks at admission, influence by the senior colleagues, belief that these subjects are hard, lack of facilities, bad examples from teachers, lack of motivation to the learners, harsh teachers and failure by the teachers to attend classes regularly. Ouko (2004) also reported that several teachers have negative attitude on teaching the subject and therefore put little or no effort in preparation to teach it. The present study will examine the attitude of tutors towards teaching the subject at the colleges and how it affects student's performance.

According to Herzberg, the understanding of each individual independently and identifying a correct stimuli/ switch for him/ her and so is criticized of being method bound. The key to meeting these is increasing the workers freedom/self control on the job. The assumption is that without the chance to use their abilities to their fullest, workers cannot be satisfied. The work that is done suffers while the person remains unfulfilled. By making efficiency of teachers in primary training teachers colleges will be by giving they pay that matches inflation, job tenure, improved teaching facilities, promotion opportunities, managerial responsibilities and administrative support. Monappa (2000:23). The education managers should therefore provide an environment those teachers that their ideas and contributions are important for the overall organizational efficiency and effectiveness

Mastery of Content

Birch and Veroff (1999), insist that people who are not good at doing things will inevitably experience failure while those who are more competent will experience success. These authors agree that entry qualifications and teacher qualifications have an influence on the efficiency. They confirm that those who have low entry qualifications in mathematics usually perform below par in final examinations and can therefore not be expected to be efficient in teaching the subject at the College. Thus the teaching of the subject should be left to those who qualify highly.

Owolabi, (1986) found that on the whole, teachers' effectiveness is influenced by age, academic and professional qualifications, teaching experience and other personal characteristics. He noted that teachers

must not only be academically qualified but should also be professionally qualified with that pedagogical content knowledge. Thus they are categorized as qualified or unqualified academically and trained or untrained professionally. He expects teachers to be better educated than their students, "A teacher can not bring students to the exact level of her own academic standard by her teaching alone".

Wemali and Ng'eny (2007) found that, 40% of the mathematics teachers in the primary teachers' training colleges in Kenya, had master's degree in various fields of mathematics education while others had only bachelor's degree in mathematics secondary education. None of the mathematics teachers had professional qualifications in mathematics primary teacher education. They suggested upgrading of teachers through workshops yet,

National statistics have shown that teachers receive far less on the job training in technology than any other professional group. The business community knows that for every dollar spent on hardware and software, another dollar must go towards staff development. But on average school districts spend only about five percent of their technology budget on teacher training. research@gtce.org.uk

Owolabi (1986) also noted that, the longer one stays at carrying out a routine activity, the better one becomes at performing that activity. He then concluded that the quality of the knowledge disseminated, is always inferred from the profiles of staff qualifications and staff experience. This study would therefore establish the qualification and experience of the tutors at these colleges and their efficiency.

A different type of efficiency question concerns the use of resources in producing the outcomes of education, which is called the internal efficiency of the educational system. Assessments of internal efficiency are typically done for a specific level of education, say primary education, and the simplest indicator of internal efficiency is the unit cost of producing one unit of educational output, which may be a student enrolled, a graduate of that level of education, or a student who has attained some minimum level of knowledge. Other things equal, an educational system which can produce a unit of output at lower unit cost than another educational system is said to be more efficient. Hanushek and Woessman (2007).

The great development of this activity in the field of Mathematics Education has led to an important production of terms, theoretical frameworks, models and methodological tools. Thus, the need of convergence of the different theoretical perspectives /approaches in the research is recently raised in the community of M.E. In 1996, Sierpiska and Lerman in their article "Epistemologies of Mathematics and of Mathematics Education" attempted to present the various theories that exist or are under development in the scientific field of Mathematics Education Sierpiska & Lerman, (1996). Moreover, in 1998, an ICMI Study pinpointed a number of important theoretical questions concerning the aims, the objects, the specific theoretical questions and the research results in Mathematics Education Sierpiska & Kilpatrick, (1998). A similar attempt was made in the Research Forum of PME26 "Abstraction: Theories about the emergence of knowledge structures", although it was more focused on the "description of processes during which new mathematical knowledge structures emerge" Dreyfus & Gray, (2002).

Teacher competence

Lots of research efforts have been directed on teaching competency but unfortunately much attention of research is not drawn to correlate teaching competency in relation to Teacher Job Satisfaction. Rao, R.B. (1989) says that 'the quality or effectiveness of teachers is considered to be associated with his satisfaction towards his profession, his satisfaction with his values. Fontana, D. (1986) regarded that 'if the teacher is too rigid or has a doctrinaire belief of that his methods are right and those of any one who disagrees with him are wrong, then he will be depriving his children of a range of possible learning experiences, to their disadvantage and to his own'. Thus, it is clear that an effective and competent teacher will achieve the desired learning outcomes, provided if he satisfied in his profession. But no significant efforts are found to study the competency in relation to job satisfaction among teachers.

Teaching Methods

Education economists define internal efficiency as comprising "the amount of learning achieved during school age attendance, compared to the resources provided,... the percentage of entering students who complete the course is often used as its measure" Wolff, (1984). This is the measure that we have used in this study. Oyuga, Waibochi and Washuma (2006), on a baseline survey conducted on the teaching of mathematics and science found that students' performance is related to their perception of statistics as challenging. This finding is similar to the Kenya National Examination Council (KNEC) report of 2005 which indicated that learners do not understand the basic concepts in most of the topics resulting in poor performance.

Oyuga et al (2006) also found that teachers or tutors, also found statistics challenging to teach. They merely teach them the procedures of solving the statistical problems but attach no meaning to the concepts. The students end up working out the problems mechanically. SMASSE (2004) reported that some science and mathematics teachers are using lecture methods and students are given rigidly formulated statements, which they had to memorize and reproduce when required by their teachers. There was little emphasis placed on students understanding of concepts probably because of the paucity of teaching and learning materials.

They concluded that the methods of teaching could only impair the purpose of learning statistics. They suggested using teaching methods that give meaning to the concept through practice. Obura (1991) observed that, there is consistent increase in literacy scores among students when teachers use basic pedagogical skills to impart knowledge.

This is similar to Eshiwani's (1981) findings on the teaching of mathematics in secondary schools. A teacher of mathematics, according to him, should relate the mathematics taught to local problems. For instance, the teacher should show the application of statistics to farming, running a shop, or taking records in a clinic. The classroom teacher should be particularly concerned with the stimulation of curiosity and a critical outlook, and the material should always be presented in a way that interests pupils and encourages them to think for themselves. He further noted that discovery should be encouraged in teaching of mathematics since it encourages clear identification of concepts to be learnt and solved; as such skills are useful to the learner. Scopes (1973) concurred that such skills should be acquired as they serve as motivation to the learner. Bruner (1961, P.22) observed that whether one speaks to

mathematicians or physicists or historians, one encounters repeatedly an expression of faith in the powerful effects that come from permitting a student to put things together for himself to be his own discovery.

Because most teachers hardly use this discovery method, Bruner observes that, majority of learners in Secondary School level, have not acquired enough knowledge and skills of making connections in mathematics concepts. They are unable to understand how mathematical ideas inter connect and build on one another to produce a coherent whole by lacking skills of inquiry as an ability and culture to be learned and practiced. Algebraic operation skills which are fundamental to the wider knowledge of understanding mathematics from primary to higher levels of learning is less emphasized in today in the classroom interaction.

A report by UWEZO – Tanzania identified, teacher centered classroom instruction, as another serious problem to effective teaching and learning of mathematics in the classroom. Teachers need to activate the students during classroom interaction so as to motivate the lesson for positive outcomes in the end. The school inspector's report (2002/2003) has indicated that lecture method prevails in classroom instruction by an average of 68% at all levels. This method implies students learn through memorizing taught concept, copying material in notebooks and are heavily tested through factual questions there by making the subject at very boring to them. As a result majority of children from a very early stage of learning hate mathematics even though in real life they will use ideas in a variety of ways.

A summary of the findings of these studies shows that, discovery method, practice with interactive methods of teaching mathematics have a positive effect on students' performance. The studies have therefore provided a strong support for an examination of the extent to which the

college administration provides support to their staff to enable them use these methods and become efficient.

Teaching and Learning Resources

SMASSE (1998) has showed that schools in Kilifi district, Kenya, were handicapped by shortage of textbooks in both mathematics and science. The ratio of text books to students ranged from 1:2 in a few established schools to 1:27 in others. It also reported that most mathematics and science teachers lacked teachers' guides, laboratories and even where laboratories existed were not well equipped. Furthermore, some head teachers were uncooperative in supplying textbooks and science materials.

The report further showed that most school managers also have wrong priorities when it comes to management of school resources. A high percentage of funds were devoted to non academic activities such as school houses, school buses and seminars, while essential facilities such as laboratories, textbooks, log tables, calculators were either in short supply or not at all available. The report confirmed a strong significant relationship of the availability of teaching and learning resources and the performance in mathematics, therefore the need find out whether the college administrators had their priorities right when it came to requisition of teaching and learning resources in mathematics.

SMASSE (2004) found that, many science and mathematics teachers complain about lack of teaching and learning resources, even though they have failed to efficiently use what was available in their environment. In addition, they ignored the fact that, with improvisation, they could organize numerous meaningful and focused activities in project work, local field trips, laboratory experiments and group discussions for

their students within their local environment. Even though lack of textbooks, teachers' models and laboratory equipments had contributed to the poor performance in mathematics in Kenya Certificate in Secondary Education, the report showed that improvisation and scaled down experiments could have filled in part of the vacuum. This study would therefore establish whether the college tutors were able to improvise and effectively use the available teaching and learning resources. And also find out if adequate time was available to conduct mathematics' lessons through project work, field trips and group discussions. Even though the report was based on studies undertaken in secondary schools, it provides a strong support for the present study whose focus is on the performance in mathematics in primary teachers colleges.

Pupils' Evaluation and mathematics teachers' efficiency

Alcantara (1999) stated that evaluation on the pupils/students mathematics progress is not adequate in the country and went ahead to observe that during an individual lesson teachers should evaluate to find out if the learners are understanding and learning the concepts or skills they are teaching. They should also evaluate to discover specific problem, learners may have in skill development and find ways of rectifying the problems noted. In addition evaluation may help the teachers to determine which learners are in the top, middle, or lower part of the class. The evaluation will help the teacher to plan better for the teaching and learning of the subject. He finally cited inspection report which show that majority of teachers are not evaluating student's progress on the subject of mathematics adequately.

During an individual lesson teachers should evaluate to find out if the learners are understanding and learning the concepts or skills they are

teaching. They should also evaluate to discover specific problem, learners may have in skill development and find ways of rectifying the problems noted. In addition evaluation may help the teachers to determine which learners are in the top, middle, or lower part of the class. The evaluation will help the teacher to plan better for the teaching and learning of the subject. Inspection report show that majority of teachers are not evaluating students progress on the subject. This study therefore would try to establish to what extent the mathematics teachers in the college evaluate their students' work and also find out if this is done in time. The study would also establish whether the college's mathematics teachers have time for the individual correction of their students' work.

Teachers' Efficiency in Supervision

Yadar (2001) intimated that in the world of education, there can be no effective teaching without an effective teacher. Teachers' effectiveness is mainly used to refer to the result a teacher gets or the amount of progress the students make towards specified goals as a result of teachers' instruction. Poor performance in school subjects including mathematics can thus be attributed to among others ineffective teaching and poor supervision.

The annual Report from the Ministry of Finance, Planning and Economic Development, Uganda, (2006) noted that teachers on government payroll are poorly remunerated. As a result, most of them take up part time employment or private business in order to make ends meet. Their commitment to work, such as marking and correcting exercises, is therefore doubtful. Owuor (1995) reported that poor performance by students was as a result of teachers' lack of dedication to their duties since some of them resort to trading and drinking. According

to him, mathematics and science subjects require more contact hours to guarantee quality performance. This study would therefore establish the extent to which the administration of these colleges ensures effectiveness and supervision of mathematics classes.

Bolin (1987) stated that, teachers who were mostly female and disenfranchised were seen as bedraggled troop, incompetent and backward in outlook. Balliet (1894) suggested that, the only way to reform schools was to secure a competent administrator and allow him to reform the incompetent teachers who could be reformed and bury the rest who were dead. Thus, the only teachers who can be relied on for effective supervision were the competent ones. This study would therefore establish the involvement of the mathematics teachers in primary teachers training colleges in the supervision process and to what extent are they efficient.

Integrating New Technology into the Mathematics lesson

Wood (1988) says that many non-traditional education options are now available and continue to evolve. One of the most substantial uses in education is the use of technology. Classrooms of the 21st century contained interactive white boards, tablets, Mp3 players, Laptops etc. teachers are encouraged to embed these technological devices in the curriculum in order to enhance student learning and meet the needs of various types of learners. This study would find out if the mathematics teachers in the public primary teachers' training college are engaging their students in these technological devices meant to enhance learning and to what extent.

Comparing of mathematics teacher's efficiency between male and female

For some years concern has been expressed about females' lower participation rates in higher level mathematics courses and in their lower achievements in high cognitive level mathematics tasks. In addition to a range of broader societal factors (see Leder, 1990a, for an overview), a number of affective variables have been identified as possible contributors to both. Confidence in learning mathematics, or mathematical self-concept, is one of the most important of these affective variables (Reyes, 1984).

Confidence in learning mathematics has also been linked to classroom processes (Reyes, 1984). Teachers have been found to interact more frequently with males in year 7 mathematics classes than with females (Leder, 1989b, 1990b); in this same study, a greater percentage of the boys than girls rated their achievements in mathematics above average. Koehler (1990), assuming "that differential treatment led to differential achievement" (p.131), outlined several studies at primary level in the United States which indicated that differential treatment was accorded students in mathematics classrooms according to their gender; boys received more attention than girls, received more higher level questions, initiated more contact with teachers and volunteered or called out more frequently in class. Parsons, Kaczala and Meece (1982) found that certain patterns of teacher/student interactions and past performance in mathematics were predictors of high confidence in mathematics.

The Gaps in the Literature Reviewed

Most of the studies cited in this work tend to focus on the content and curriculum areas. They dealt with how best to deliver the content to

the learners, but this study will specifically focus on how efficient are the teachers in primary teachers training colleges implement these curriculum activities and how best to handle them. The researcher has also noted that most of the studies were done in secondary and primary schools, but this research will be carried out in public primary teachers training college.

CHAPTER THREE

METHODOLOGY

Research Design

The researcher used descriptive survey research design. This is a descriptive comparative design which was used for this particular study to differentiate the level of efficiency between male and female mathematics teachers in the public primary teachers training colleges in Kenya. The researcher compared the teaching of mathematics, as described by the students, to rate their teachers' efficiency in the public primary Teachers Training Colleges. The existing situation in the colleges was used to evaluate the efficiency of the mathematics teachers.

Research Population

The researcher surveyed 16 public Primary Teachers' Training Colleges in the country. The researcher targeted a population of 760 students who are currently studying mathematics in second year at the Colleges to offer information about their mathematics teacher's efficiency.

Sample size

The sample size of 262 mathematics students out of a population of 760 mathematics students. The second year students were given preference since; they were specializing in the subject and had done it longer than their counter parts in first year. The researcher therefore assumed that they were capable of assessing their teachers' efficiency in a better way.

The respondents were determined using slovens' formula;

$$S = \frac{P}{1 + P(0.05)^2} \quad \text{Where } P = 760$$

$$S = \frac{760}{1 + 760(0.05)^2}$$

$$S = \frac{760}{2.9} = 262$$

Sampling Procedure

Census sampling was used to select the mathematics students in public primary teacher training colleges in Kenya. Purposive sampling was used based on the following criteria; either male or female mathematics students in their second year of study. The simple random sampling was employed to select the sample size out of the qualified respondents.

Research Instruments

The research tools used in this study was a questionnaire to determine the level of mathematics teachers' efficiency. The questionnaire was standardized and adopted from R. L. Partin (1996) and composed of 23 items to be answered by the students ; and categorized as follows: part 1, involves a face sheet of students profile and the gender of their mathematics teacher while in part 2, (items 1-16) were on the level of mathematics teachers efficiency. The respondents for all the questions were the same. The items of 16 questions with each question Lirkert skilled using five points response mode (strongly agree, agree, not sure, disagree, and strongly disagree) in the same terms of scoring (5,4,3,2,1), description and interpretation were (very satisfactory, satisfactory, not satisfactory, fair and poor).

Reliability of the instrument

Pre-testing was conducted to ten people who were not part of the respondents listed, but possessed the same qualification as the respondents, and were found out to be effective. The people were immediate former mathematics students at the public primary teachers' training college in Kenya. Their responses were then discussed with the supervisor and the ascertained as consistent with objectives of the study.

Data Gathering Procedures

Before the administration of the questionnaires

The researcher got an introductory letter from the School of Post Graduate Studies and Research of Kampala International University which was presented to Primary Teachers Training Colleges in Kenya. The letter outlined the objectives of the study and the scheduled days that were set for data collection. After processing all the necessary information and documentation for the study, the researcher proceeded to heads of mathematics department with copies of the endorsed introductory letter and was given the permission to carry out the research in the deferent Primary Teachers Training Colleges in Kenya.

During the administration of the questionnaires

The researcher distributed the questionnaires to heads of mathematics department in different primary teachers training colleges and enlightened them about the purpose of the study and the key issues in the questionnaire. The heads of department then assisted the researcher to identify the respondents who were guided on how to fill the questionnaire. They then filled them and handed them over to the researcher.

In some colleges the researcher found when they had sent their second year students on teaching practice and had to follow them to their teaching practice schools. The researcher accessed the respondents through the schools head teachers.

After administering the questionnaires

The researcher arranged, organized and analyzed the data after collecting it from respondents.

Data Analysis

Frequency tables and percentage distributions were used to determine the profile of the respondents as to age, gender, year of study in the college, their level of education before joining the college, and the gender of their mathematics teachers. Means and standard deviation were also used to determine the level of mathematics teachers' efficiency, and finally a t-test was employed to test a significant difference in the level of efficiency between male and female mathematics teachers and also the significance difference in the perceived level of mathematics of mathematics teachers efficiency between male and female students in the public primary teachers training colleges in Kenya.

Ethical Considerations

The researcher showed the respondents' letter of clearance of ethics committee stating that any information shared shall be treated with utmost confidentiality. They were also made to read an informed consent showing them that the research was voluntary and the result would be given to them if they ask for. The researcher promised to enhance their privacy anonymity and confidentiality. This has been kept to date.

Limitations of the Study

The research progressed without any limitation worth mention.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

Profile of mathematics students in Primary Teachers Training Colleges in Kenya

This study was carried out among students in primary Teachers Training Colleges in Kenya and they were described according to their year of study, gender, qualification before joining the college and age. In each case, college students were asked through closed ended questions to provide their relevant profile information by ticking the appropriate option. They also gave information on the gender of their mathematics teachers. Their responses were summarized using frequencies and percentage distributions as summarized in table 1 below;

Table 1; Profile of Respondents

Category	Frequency	Percent
Year of study		
Year 2	262	100
Gender of students		
Male	145	55
Female	117	45
Total	262	100.0
Qualification before joining the college		
Certificate in other courses	16	3
O-level	245	96
A-level	1	1
Total	262	100
Age		
18 – 33	243	93
33 – 41	19	7
Total	262	100
Gender of their teachers		
Male	184	70
Female	78	30
Total	262	100

Table 1 results indicate that the male students (55%) slightly dominated the female (45%). This implies that although the number of male students in the college is greater than that of female students, the gap is not big, indicating a sign of some gender equality.

Regarding qualification before joining the college, most students showed that they joined the college after O-Level (94%) and a few joined with certificates from other courses and others after A-Level. These results correspond with the general minimum requirement for one to join a college in Kenya, which is completing and passing form four (O-Level).

Concerning age of college students, most of them were between 18–33 years (93%). This implies that most students in Kenyan colleges are those in their early adulthood. This is true because this is the age when most youth have finished their secondary education and so they have to join the colleges. Beyond this age bracket, most of them are either working or have joined universities for higher education.

Finally, as regards the gender of mathematics teacher in the college, results indicate that most of them are male (70%), while female teachers were only 30%. This indicates a gender imbalance in the distribution of mathematics teachers by gender disfavoring the female. This disparity is also reflecting the long mentioned gender imbalances education and as these results proved, the imbalance is worse in science related subjects as compared to arts.

Level of mathematics teacher's efficiency in Primary Teachers Training Colleges in Kenya

The independent variable in this study was efficiency of mathematics teachers in Primary Teachers Colleges and the second objective was set to determine level of mathematics teacher's efficiency in Primary Teachers Training Colleges in Kenya. Efficiency of teachers was measured using 16 questions in the questionnaire, with each question Likert scaled using a five points scale, ranging from one to five, where 5 = strongly agree 4 = Agree 3 =Not sure, 2= Disagree 1 = strongly disagree. In each case, college students were required to rate each item by indicating the extent to which they agree or disagree with each item. Their responses were analyzed using SPSS's descriptive statistics showing the means, as indicated in table 2 below;

Table 2; Level of Teacher Efficiency

Indicators of Teacher Efficiency	Mean	Interpretation	Rank
Exhibits good mastery of Mathematics content.	4.21	Satisfactory	1
Uses different reference materials to prepare.	4.02	Satisfactory	2
The teacher keeps time always	4.00	Satisfactory	3
Uses practical pedagogical skills in teaching Mathematics.	3.92	Satisfactory	4
Implements the curriculum and performance standards well.	3.90	Satisfactory	5
Uses different instructional materials.	3.80	Satisfactory	6
Implements new methods of teaching Mathematics.	3.74	Satisfactory	7
Uses different pedagogical approaches.	3.69	Satisfactory	8

Gives enough assignments after every lesson.	3.63	Satisfactory	9
Syllabus is completed in time.	3.62	Satisfactory	10
Understands students' problems in time.	3.60	Satisfactory	11
Uses students' performance assessment techniques.	3.60	Satisfactory	12
Understands individual students learning ability	3.53	Satisfactory	13
Integrates new technology in teaching Mathematics.	3.52	Satisfactory	14
Supervises and corrects students' work in time.	3.28	Not satisfactory	15
Has enough time for individual correction.	2.89	Not satisfactory	16
The average efficiency	3.68	Satisfactory	

Results in Table 2 indicate that college students rated mathematics teacher efficiency as satisfactory for most of the items in Table 2 (Most means ≈ 4), which falls under satisfactory on the Likert scale. For example, students rated their mathematics teachers' efficiency as satisfactory on the following items; exhibiting good mastery of Mathematics content (mean=4.21), using different reference materials to prepare (mean=4.02), time keeping (mean=4.00) and so on. However, students rate their mathematics teachers' efficiency as unsatisfactory on two items in Table 2 and these concern about supervising and correcting students' work in time (mean=3.28) and sparing enough time for individual correction (mean=2.89). to get an overall picture on how college students rated their mathematics teachers' efficiency, an overall mean for all the 16 items in Table 2 was computed, which turned out to be 3.68, which falls

under satisfactory on the Likert scale, confirming the view that the efficiency of mathematics teachers in Kenyan colleges is satisfactory.

Difference in the level of efficiency between male and female mathematics teachers

The third objective in this study was to establish whether the level of efficiency of mathematics teachers differs significantly according to gender, for which the researcher hypothesized that the level of efficiency of mathematics teachers does not significantly differ according to gender. To test this null hypothesis, the Students' samples t-test was used results of which, are shown in table 3 below;

Table 3; Difference in the level of efficiency between male and female mathematics teachers in different Primary Teachers Training Colleges in Kenya.

Variable	Gender	Mean	T	Sig.	Interpretation	Decision on Ho
Efficiency	Male	3.67	-0.794	0.428	No significant difference	Accepted
	Female	3.74				

The t-test results in Table 3 indicate that the level of teacher efficiency does not significantly differ according to gender ($t=-0.794$, $sig. = 0.428$). However, results indicated that although not statistically big, the level of efficiency for female teachers is slightly higher than that of male. This contradicts most reports on gender inequality in academic ability, which indicates women as less efficient as compared to men.

The researcher was also interested in establishing whether the mean perceptions as regards teacher efficiency for male and female college students differ significantly. To do this, the researcher tested a null hypothesis that the mean perceptions for the male and female students do not significantly differ. To test this null hypothesis, the Students' samples t-test was used results of which are shown in table 4 below;

Table 4; Difference in the Perceived level of mathematics teacher's efficiency between male and female Students in different Primary Teachers Training Colleges in Kenya

Variable	Gender	Mean	T	Sig.	Interpretation	Decision on Ho
Efficiency	Male	3.66	-0.624	0.533	No significant difference	Accepted
	Female	3.72				

The results in Table 4 suggest that the perceptions of male and female college students regarding efficiency of mathematics teachers do not significantly differ ($t=-0.624$, sig. = 0.533). This indicates that both male and female college students understand efficiency in the same way and that is why they rated their teachers' efficiency in the same way. These results led to acceptance of the stated null hypotheses, leading to a conclusion that the level of mathematics teachers efficiency does not significantly differ according to gender and that both male and female college students perceive efficiency in the same way. These results are true because efficiency is efficiency no matter it is viewed by either a male or a female student.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Introduction

This chapter shows the summary of major findings, conclusions and recommendations. The areas for further research are also indicated here.

Summary of Findings

The major purpose of this study was to determine the efficiency of mathematics teachers in primary teacher training colleges in Kenya. It was guided by four specific objectives which include establishing i) the profile of mathematics students in these colleges in terms of year of study, gender, age and qualification before joining the college. It also established the gender of their mathematics teachers in the colleges, ii) efficiency of mathematics teachers in primary teachers training colleges in Kenya a, iii) difference in the level of efficiency between male and female mathematics teachers in primary teacher training colleges in Kenya, and lastly, iv) to compare the perceived level of mathematics teachers level of efficiency between male and female mathematics students in public primary teachers training colleges in Kenya.

Students' profiles and the gender of their mathematics teachers

This objective's data was analyzed using descriptive statistics which included frequency and percentage. The analysis revealed that all the mathematics students' respondents chose mathematics in their second year of study; this is because the subject is an elective at this level of

education. Those who chose the subject were able to progress on it for further studies. The gender that chose the subject had, male as 55% and female 45%. This showed that, the female students are increasingly becoming confident in handling the subject although, the number of male students doing mathematics is still higher than that of females. However the female numbers have come up contrary to an expression that was made about females lower participation rates in higher level mathematics course and low confidence in learning mathematics,(Reyes 1984). Probably this could be true if, primary teacher training colleges is considered to be a lower level. But the Reyes observation is confirmed when the gender of the mathematics teachers in college is observed to vary as males are at 70% to females at 30%. The college teachers are expected to have university degree which is a higher level.

The dominant age of the student is between 18-33 years at (93%) and only a few students are in between 33-41 years (7%). This was the expected age after completing both secondary and primary education successful. The expected qualification before joining the college is O-level certificate of 96%, only 1% was A-level certificate and 3% had done other certificate courses before joining the college. They are not only expected to complete the education system but also to pass with a mean grade of C plain and above. This agrees with Piaget's theory (1964) of cognitive development in its second stage of progression, which states that, individual children may take different lengths of time and needs different experiences to complete their development (Orodho, 2005).

Their teachers gender had it that male were more at 70% in respective to the female teacher who were 30%. This proved the general notion that males dominate the science related subjects at higher levels of learning (Leder 1990). The college mathematics teachers must be a university

graduate which is a higher level of education and the female mathematics teachers proved to be fewer as compared to their male counter parts at the same level.

The level of efficiency of the mathematics teachers

On the efficiency of the mathematics teachers, 16 questions in the questionnaire with each question Likert scales using five points scale ranging from one to five, where 1=strongly disagree, 2= disagree, 3=not sure, 4=agree and 5= strongly agree. In each case the college students were required to rate each item by indicating the extent to which they agree or disagree. Their responses were analyzed using SPSS's descriptive statistics showing the mean as below; i) the teacher exhibiting good mastery of the content had the highest mean of 4.21, this was followed by the teacher's use of different reference materials at a mean of 4.02, next was the teacher's time keeping in class always at a mean of 4.00. The teacher's use of practical pedagogical skills in teaching mathematics followed at 3.92, the implementation of the curriculum and performance standards well followed at 3.90, use of different institutional material was next at 3.80, next was the implementation of new methods of teaching at 3.74.

The use of different pedagogical approaches followed at 3.69, and then giving of enough assignment after every lesson was at 3.63. The completion of the syllabus in time scored 3.62 followed by the teacher's understanding of the student's problems in time at 3.60 which was also shared by the item on use of students' performance techniques. Understanding individual students learning ability was at 3.53 followed by integration of new technology in teaching mathematics at 3.52. The supervision and correction of students work in time was analyzed as

second last at 3.28 and lastly was whether the mathematics teachers had enough time for individual student's correction at 2.89.

In a performance index of between 1 to 5 and an interpretation scale of 1- 3.49 for not satisfactory, 3.5 - 4.49 being satisfactory and 4.5-5.0 being very satisfactory. None of the sixteen items scored very satisfactory while all except two items scored satisfactory. The two items that scored not satisfactory had something to do with the teacher's devotion of his time on supervising student's work. However, to get an overall picture on how college students rated their teachers' efficiency, an overall mean for all the 16 items was computed to be 3.68 out of 5 which fall under satisfactory on the Likert scale, confirming the efficiency of mathematics teachers as satisfactory. This was slightly above the bar for satisfactory as the scale pegged it as from 3.5. Of the 16 items indicating the teacher efficiency, all of them except two, registered satisfactory scale, but it is worth noting that none of them registered very satisfactory results. This means that, the teachers are barely efficient.

Mastery of the mathematics content

Higher efficiency of the college teacher was noted on the indicator of mastery of mathematics content. These findings agree with Birch and Veroff (1999) that people who are not good at doing things will inheritably experience failure while those who are more competent will experience success. Owolabi (1986) expects teachers to be better educated than their students. Thus, the college mathematics teachers came out as teachers who are knowledgeable in their areas of responsibility. The learners observed that most of their teachers of mathematics have no problem solving mathematics problem. The study therefore confirms that the

mathematics teachers in the primary teachers college have the content to teach at this level, and this enhances their efficiency.

The use of different reference materials to prepare and deliver mathematics lessons

The study found out that, the college mathematics teachers use different references materials to prepare as well as different instructional materials to teach their lessons. This is contrary to SMASSE (2004) findings that many science and mathematics teachers have failed to efficiently use what was available in their environment to prepare for their lessons. The teachers of mathematics at the colleges are found to use various reference materials and instructional materials to prepare and deliver their lessons. They seem to have implemented from SMASSE (2004) recommendation to improvise and use what is locally available to prepare and deliver their lessons well.

The student rated their teachers' use of different reference materials and instructional materials to prepare and deliver their lessons as second and sixth respectively out of the sixteen items. This showed a good level of efficiency.

The use of practical pedagogical skills to teach the mathematics lessons

The study also realized that the teacher of mathematics satisfactorily used different practical pedagogical skills as well as new methods of teaching mathematics. They seem to have improved from Obura's (1991) findings that there is consistent increase in literacy scores among students when teachers use different basic pedagogical skills to impart knowledge, which was also what Eshiwani (1981) recommended

that a teacher of mathematics should relate their teaching to local problems e.g. running a shop, or taking records in a clinic to statistics lesson. The students rated their teachers use of different practical pedagogical skills as satisfactory showing that most of the lessons taught are practically oriented.

But this finding differs greatly with what Oyuga et al (2006) found that teachers of mathematics just teach the procedures of solving statistical problems without attaching any meaning to the concept. This leads to students working out statistical problems mechanically. SMASSE (2004) also found out that science and mathematics teachers use lecture methods and give students rigidly formulated statements to memories and reproduce when required by their teachers. The Tanzanian school inspectors' report (2002/2003) indicated that lecture methods prevailed in classroom instruction by an average of 68% at all levels. This showed that the teachers are making their lessons ineffective and the learners become passive. This study confirms that teachers of mathematics at the college have improved and are now using practical and varied pedagogical skills at least to the satisfactory level.

Time management by the mathematics teachers

The study also found out that the teachers of mathematics in the college keeps time always which makes them complete syllabus in time and satisfactorily gives enough assignments after every lesson. These findings is an improvement from what Owuor (1995) found out that poor performance by students in mathematics was as a result of teachers lack of dedication to their duties since some of them resort to trading and drinking during working hours. The annual report from the ministry of finance, planning and economic development, Uganda (2006) noted that

teachers on the government payroll are poorly remunerated and as a result take up part time employment or private business in order to make ends meet. This definitely makes them late for their lessons and cannot complete their syllabus coverage. These college mathematics students have rated their teachers' syllabus coverage and time keeping as satisfactory. The college mathematics teachers in Kenya seem to have found a way of balancing between personal commitment and time in classroom.

The giving of assignment after every lesson

The mathematics students rated their teacher as satisfactory on giving enough assignments after every lesson which follows a recommendation by Eshiwani (1981) who observed that discovery in mathematics should be encouraged since it encourages clear identification of concepts to be learnt and solved. Alcantara (1999), observed that evaluation on the student mathematics progress is not adequate in his country, Tanzania and observed that during an individual lesson teachers should evaluate their learners to find out if the learners are understanding and learning the concepts or skills they are teaching. This has been established in this study to be observed well up to the point of giving enough assignments after every lesson.

Understanding the students' problems and individual learners' ability

However the mathematics teachers in the college scores satisfactory lowly of 3.6 and below in understanding student's problems in time and their individual learning ability. This gives little effort to the Jean Piaget's theory (1964) that individuals should be seen and treated as unique and should be allowed to develop progressively at their own rates.

Alcantara (1999) adds that learners should be evaluated individually to discover specific problems learners may have in skill development and find ways of rectifying them. Even though they have scored satisfactory low in this study, it could be a contributor to the low or average performance in mathematics as students differ in capability, probably due to variations in their physical and mental experiences. This is one area that has lowered the teacher's efficiency as mathematics requires individual attention.

Supervision and correction of individual students work

This study found out that even though teachers give out enough assignment after every lesson, they hardly have enough time to supervise and correct that work in time. The teachers scored low on supervision and correction on individual students work in time which is interpreted to be not satisfactory. This confirms what Owuor (1995) observed in his annual report that, poor performance by students was as a result of teachers' lack of dedicating their time to students' work as some of them resort to trading and drinking. Alcantara (1999) added that teachers should evaluate their students to determine which learners are in top, middle, or lower part of the class. It also helps the teacher to plan better for the teaching and planning. The study concludes that the poor scores registered by mathematics students in college are as a result of poor supervision, lack of corrections to student's work in time and lack of time to attend to individual corrections. Yadar (2001) underscores these facts well that in the world of education, there can be no effective teaching without an effective teacher. Teachers effectiveness is mainly used to refer to the result the teacher gets or the amount of progress the student make towards specific goals as a result of teachers' instructions. This poor

performance in school subjects including mathematics can be attributed to among others ineffective teaching and poor supervision.

The integration of new technology in the teaching of mathematics at the college

Lastly the mathematics teachers are not left behind in the challenge of using new technology in teaching mathematics in the college. Much as it is on the lower end of 3.52 when the bar is at 3.5, the teachers are trying but not many of them have adapted to this new technology. This supports what Wood (1988) observed that many non-traditional education options are now available and continue to evolve. Classrooms of the 21st century contained interactive white boards, tablets, mp3 players, laptops etc. he encouraged the teachers to embed these technological devices in the curriculum in order to enhance student learning and meet the needs of various types of learners.

The level of mathematics teachers' efficiency between male and female

The study confirms that the female teachers who teach mathematics at the college levels have a higher efficiency than their male counterparts. The same is replicated in the study of how both genders perceive the efficiency of mathematics teachers at the same level. This is contrary to what other scholars had observed that, Confidence in learning mathematics has always been linked to the males than females (Reyes, 1984). Teachers have been found to interact more frequently with males in year 7 mathematics classes than with females (Leder, 1989b, 1990b); in this same study, a greater percentage of the boys than girls rated their achievements in mathematics above average. Koehler (1990), assuming

"that differential treatment led to differential achievement" (p.131), outlined several studies at primary level in the United States which indicated that differential treatment was accorded students in mathematics classrooms according to their gender; boys received more attention than girls, received more higher level questions, initiated more contact with teachers and volunteered or called out more frequently in class. Parsons, Kaczala and Meece (1982) found that certain patterns of teacher/student interactions and past performance in mathematics were predictors of high confidence in mathematics.

Data analyzed by use of t-test, tested the third objective which is, the difference in the level of efficiency between male and female mathematics teachers in different colleges. Although the mean showed that the females had 3.74 which was slightly higher than their male counterparts at 3.67, the t-test showed no significant difference in the level of efficiency of the teachers according to gender ($t=0.794$, significance =0.428)

The perceptions of the male and female students as regards to teacher efficiency in mathematics

The researcher was also interested in establishing the perceptions of the male and female students as regards to teacher efficiency in mathematics which is the fourth objective of the study. The t-test mean was used and showed that there was no significant difference as ($t=0.624$, significance=0.533) although the mean showed the female students perception at 3.72 and the male mean perception at 3.66, this showed that the affirmative action which Kidero (2003) observed are in place prominently in the public primary teachers training colleges. The

females have come up in mathematics and are now matching the males in mathematics in perception at the teachers training colleges.

The study showed that the few female students that chose mathematics at public primary teachers training colleges in Kenya perceived their mathematics teachers in the same way as their male counterparts. This shows that they are enjoying every moment of learning the subject as well as their male counter parts.

Conclusions

This study was carried out based on three main purposes namely; to validate the theory of Jean Piaget (1964) of cognitive development, to test the hypotheses that there is no significant difference in the level of efficiency between male and female mathematics teachers and that no significant difference in perceived level of mathematics teachers efficiency between male and female mathematics students in public primary teachers training colleges and also to come up with new knowledge based on the findings. Have analyzed and summarized the findings of the study. The researcher would wish to conclude as follows;

The theory of Jean Piaget (1964) of cognitive development

This theory has that aspect of development which deals with thinking, problem solving, intelligence and language especially on children (Black and Pucket, 1996). In Paiget's view, cognitive development is a combined result of the maturation of the brain, the nervous system and the experiences that help individuals to adapt to the environment. In this theoretical argument scientific and mathematical abilities are stressed (Orodho 2005).

He proposed four progression stages which all learners must pass through; the first stage is that learning is developmental and no child should skip a step, this step is validated by this study that all the primary teachers training college students must have passed O-level stage without skipping any. All the respondents either joined the college with O-level or A-level certificate.

The second stage of his theory is of more concern to this study, that individual children may take different lengths of time and need different experiences to complete their development and the fourth, which states that learners differ in capability, probably due to variations in their physical and mental experiences gives a proper test to the teachers level of efficiency. Orodho (2005) observes that learners should be seen and treated as unique individuals. The study asked the learners to rate their teachers' efficiency on understanding their individual learners' ability in mathematics and the response recorded a low satisfaction of 3.53 out of 5.

The researcher concludes here that as much as the rating is satisfactory, understanding individual learners' ability is so crucial to the learning of mathematics content that, the teachers should give it a better rating than this rate. This stage of the theory explains why learners do not perform well in the subject and the teachers of mathematics should try more to improve on this aspect of understanding individual learners' ability.

The teachers' efficiency in having enough time for individual learners' correction was rated last which was interpreted as not satisfactory by the students. It is clear from this study that the mathematics teachers in the colleges do not have time for individual work and only teach the learners as a group. They do not see and treat them

as unique individuals as the theory suggests. The students are not allowed to develop mathematics skills at their own rates and therefore the theory is not validated. The researcher concludes that this is a possible cause of poor or low performance in mathematics at the colleges.

The hypotheses;

The null hypothesis of the study that there is no significant difference in the level of efficiency between male and female mathematics teacher in public primary teachers training college in Kenya is confirmed as true. This shown in table three of this study (see page40), that the level of mathematics teacher efficiency does not differ according to gender ($t = 0.794$, sig. = 0.428). However these result, indicate that, although the significance is not statistically big, the level of efficiency for female teachers is slightly higher than that of the male. This contradicts most reports on gender inequality in mathematics ability. This study found out that the few female teachers that teach mathematics at college level are slightly more efficient than their male counterparts.

The second null hypothesis that, there is no significant difference in the perceived level of mathematics teachers efficiency between male and female students in public primary teachers training colleges in Kenya is confirmed true by the findings. This is shown in table four of this study (see page 41) that the perception of male and female public primary teachers training college students regarding their mathematics teachers do not significantly differ ($t= 0.624$, sig. = 0.533). This study concludes that both male and female students understand the teaching of mathematics in the same way.

New knowledge

From the analysis of the finding of this study, which was mainly to determine the level of mathematics teachers efficiency in public primary teachers training college, the teachers do carry out all the other indicators of efficient teaching correctly, but do not have time to supervise and correct students work in time. That they do correct them, but not early enough to correct or confirm a concept learnt, before the next concept is taught to enhance learning effectively. If this anomaly is corrected such that all the exercises are corrected early enough, then mathematics performance will improve tremendously.

That, the teachers do not have enough time, to spare for individual learners' correction. Most of the learners do not have the teachers long enough to correct their work at their own paces. Even if they have individual consultations to make, in most cases they do not have that time. This, shows that the teacher do not give students time other than during class work. If this corrected in public teachers training colleges, then mathematics performance will improve.

Recommendations

Basing on the findings and conclusion of this study, the researcher recommends that, more effort should be directed at encouraging the girl child to embrace mathematics education at higher levels, since they have shown a good improvement at the primary teachers training college. The respondents almost matched the males at this level however the female teachers have a better mean on efficiency than their male counterparts. Thus the female teachers who have chosen mathematics at university levels have done the mankind proud, hence more should be encouraged to emulate them.

The college administration should find a way of ensuring and encouraging the mathematics teachers to treat students as individuals in order to understand their learning abilities and understand their problems in time. Once this is achieved every student will be assisted effectively and the performance will also improve.

Further study should be conducted to ascertain why the teachers who are satisfactorily efficient in most of the teaching aspects do not have enough time to correct students' work in time and also do individual corrections. The learners need to be corrected in time where they have not gotten right as well as encouraged where they have gone right. All these should be done at individual level for the learning to be effective. The college administration and the whole education fraternity as a whole should come up to find out the cause of this failure.

REFERENCES

- Alcantara, D. A (1999), Implementation of curricular development in the three districts of west Mindano, Saint Vicente College, Publications.
- Anghileri, J. (2002). Scaffolding practices that enhance mathematics learning. In A.D. Cokburn & E. publishers
- Ary, D., Jacob, L.C and Razavieh, A. (1990). *Introduction to research education*. Fort Worth Harcourt Brace College Publisher
- Balbwena, E. S (2002), Pre-service teachers performance relation to their cognitive and non cognitive qualities, Jose Rizal memorial State, Publisher.
- Bilbao, P.P 2005) the teaching profession, Lorimar Publisher Co. Inc
Birch, and Veroff, (1999), *Effectiveness in teaching sciences*, World Bank. UK.
- Bitterman, (1983) *Classical conditioning of proboscis extension in honeybess (Apis mellifera)*.
- Chitwa, A. and Njung'e, J. (2004) *ASEI movement and PDSI approach*, SMASSE, Nairobi, SMASSE.
- Corpuz, Brenda, and Salandanau, G.G, (2003) *Principles and strategies of teaching* Lorimar Publishers co. inc.

- Eshiwani, G.S (1981). *The teacher of mathematics in secondary school*. An occasional paper. B.E.R, Kenyatta University.
- Kamau, E. W. and Ndiithi, B. G.(2004). *Attitude towards mathematics and Science*. SMASSE project. Nairobi, Kenya
- Kochhar, S.K. (1996) *Secondary school administration*, New Delhi, sterling Publishers, India.
- Owuor, (2006) *Ministry of finance planning and economic development*, (2006) annual report, Uganda.
- Newton, C and Tarrant, T. (1992) *Managing change in schools: a practical hand book*. London. Routeledge.
- Obura, A. P. (1991) *Changing images: portrayal of girls and women in Kenya*, Technological Study Press, Nairobi.
- Orodho, A. J (2005), *Techniques of Writing Research Proposal and Reports In Education And Social Sciences*. Kanezja hp ent. Pub. Nairobi
- Ouko, C. (2004), SMASSE, *An Initiative to improve mathematics and science learning in secondary schools*. Journal of teachers' image. Vol 9,P.23.
- Owolabi, O.S (1996), *School mapping and facilities analysis*, University of Ibadan publishers, Ibadan.

Owuor, C. (1995), *Poor performance of students in secondary schools:*
World Bank Policy Review News Letter.

Oyuga, J., Waibochi N. and Washuma J. (2006). *Causes on mathematics' poor performance in secondary schools.* Baseline survey
SMASSE, Nairobi Kenya.

research@gtce.org.uk

Skinner, Q. (1985), *The return of grand theory in human science*, London,
Cambridge University Press.

SMASSE(www.google.co.ke) (1998). www.sciDev.net.htm *Baseline studies on the effective use of teaching and learning resources in secondary school*, Nairobi, Kenya.

Wikipedia, the free encyclopedia

Askew, M., Brown, M., Rodhes, V., William, D., & Johnson, D. (1997).
Effective teachers of numeracy in UK primary schools:
Teachers' beliefs, practices and pupils' learning. In H.
Pekhonen (Ed.), *Proceedings of the 21st PME International Conference*, 2, 25-32.

Barkai, R., Tsamir, P., Tirosh, D., & Dreyfus, T. (2002). Proving or refuting arithmetic claims: The case of elementary school teachers. In A.D. Cokburn & E. Nardi (Eds.), *Proceedings of the 26th PME International Conference*, 2, 57-64.

Beswick, K. (2004). The impact of teachers' perceptions of student characteristics on the enactment of their beliefs. In M.J. Høines & A.B. Fuglestad (Eds.), Proceedings of the 28th PME International Conference, 2, 111-118.

Nardi (Eds.), Proceedings of the 26th PME International Conference, 2, 49-56.

Wemali, E.N.C and Ngeny K.E (2007), *Findings and recommendations on the status of mathematics and science education in primary teachers' training colleges*. Baseline survey, Nairobi. Kenya.

Wood, D. C. (1988). *Habituation in stentor produced by mechanoreceptor channel modification*. Journal of Neuroscience

Yadar, K. (2001), *Teaching of life science*, (New Delhi). Anmol Pub., Pvt Ltd, India.

APPENDIX 1
TRANSMITTAL LETTER

KAMPALA INTERNATIONAL UNIVERSITY
SCHOOL OF POST GRADUATE STUDIES AND RESEARCH
MASTERS PROGRAM

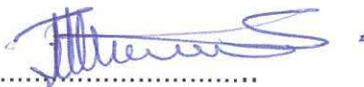
Dear Sir/Madam,

I am a master's student at Kampala International University and currently pursuing a thesis entitled, **TEACHERS' EFFICIENCY IN MATHEMATICS IN PRIMARY TEACHERS TRAINING COLLEGES IN KENYA**. In view of this empirical investigation, may I request you to be part of this study by answering the questionnaires? Rest assured that the information that you provide shall be kept with utmost confidentiality and will be used for academic purposes only.

As you answer the questionnaire, be reminded to respond to the items in the questionnaires thus not leave any item unanswered. Further, may I retrieve the filled out questionnaires within 5 days from the date of distribution?

Thank you very much in advance.

Yours faithfully,



Mr. Okoth S. Ondolo John

APPENDIX II
CLARENCE FROM ETHICS COMMITTEE



Ggaba Road - Kansanga
P.O. Box 20000, Kampala, Uganda
Tel: +256- 41- 266813 / +256- 41-267634
Fax: +256- 41- 501974
E- mail: admin@kiu.ac.ug,
Website: www.kiu.ac.ug

OFFICE OF THE CORDINATOR OF EDUCATION
SCHOOL OF POSTGRADUATE STUDIES AND RESEARCH (SPGSR)

May 1, 2011

Dear Sir/Madam,

RE: REQUEST FOR OKOTH S.ONDOLO JOHN MED/18726/71/DF
TO CONDUCT RESEARCH IN YOUR ORGANIZATION

The above mentioned is a bonafide student of Kampala International University pursuing a Masters of Education in Education Management and Administration. He is currently conducting a field research of which the title is "**Efficiency of Mathematics Teachers in Primary Teacher Training Colleges in Kenya.**"

Your organization has been identified as a valuable source of information pertaining to his research project. The purpose of this letter is to request you to avail him with the pertinent information he may need.

Any information shared with him from your organization shall be treated with utmost confidentiality.

Any assistance rendered to him will be highly appreciated.

Yours truly,


Ms. Kyolaba Sarah
Coordinator Education, (SPGSR)

APPENDIX III
INFORMED CONSENT.

I am giving my consent to be part of the research study of Mr. Okoth S. Ondolo John that will focus on **teachers' efficiency in mathematics.**

I shall be assured of privacy, anonymity and confidentiality and that I will be given the option to refuse participation and right to withdraw my participation anytime.

I have been informed that the research is voluntary and that the results will be given me if I ask for it.

Initials: _____

Date: _____

APPENDIX IV

RESEARCH INSTRUMENT

FACE SHEET

Code # _____

Date Received by Respondent _____

PART 1: RESPONDENT'S PROFILE

Gender _____

Age; **(1)** 18—33 **(3)** 33—41 **(4)** 41—50 **(5)** Over 50 years

Year of study _____

Qualification before joining the college _____

Gender of your mathematics teacher _____

PART 2: LEVEL OF MATHEMATICS TEACHER EFFICIENCY.

Direction: Please write your rating on the space before each option which corresponds to your best choice in terms of your qualities as a teacher.

Kindly use the scoring system below:

Score	Response	Mode	Description
	Interpretation		
5	Strongly Agree	You agree with no doubt at all	Very satisfactory
4	Agree	You agree with some doubt	Satisfactory
3	Not Sure	You neither agree nor disagree	Not satisfactory
2	Disagree	You disagree with some doubt	Fair
1	Strongly Disagree	You disagree with no doubt at all	Poor

Part II of the questionnaire

- 1. The teacher keeps time always
- 2. Syllabus is completed in time
- ___ 3. Implements the curriculum and performance standards well
- 4. Integrates new technology in teaching Mathematics
- __ 5. Uses different reference materials to prepare
- __ 6. Exhibits good mastery of Mathematics content
- 7. Uses students' performance assessment techniques
- 8. Implements new methods of teaching Mathematics
- 9. Uses different pedagogical approaches
- 10. Uses different instructional materials
- __ 11. Uses practical pedagogical skills in teaching Mathematics
- 12. Understands students' problems in time
- 13. Understands individual students learning ability
- 14. Gives enough assignments after every lesson
- ___ 15. Supervises and corrects students' work in time
- 16. Has enough time for individual correction

RESEARCHER'S CURRICULUM VITAE

Personal Profile

FIRST NAME: OKOTH
OTHER NAME: ONDOLO JOHN
DATE OF BIRTH: 12 DEC, 1970
NATIONALITY: KENYAN
MARITAL STATUES: MARRIED
GENDER: MALE
ADDRESS: P.O.BOX 1981 KISUMU KENYA
TEL: +254720401573
EMAIL: okothndolo@yahoo.com

Educational Background

PERIOD	INSTITUTION	AWARD
2007-2011	KIU	MED ADMN & MGT
1990-1996	MOI UNIVERSITY KENYA	BED (SCIENCE) UPPER SECOND
1986-1989	MAKASEMBO SEC. SCHOOL	KCSE
1978-1985	NYAKONGO PRI. SCHOOL	KCPE

Work Experience

PERIOD	INSTITUTIONS	POSITION
2009-DATE	ALUOR SECONDARY SCHOOL	DEAN OF STUDIES
2001-2009	BONDO TEACHERS COLLEGE	TUTOR MATHEMATICS
1997-2001	GARISSA TEACHERS COLLEGE	ASS. DEAN OF STUDENTS
1996-1997	MORAKO SEC. SCHOOL	TEACHER OF MATHEMATICS

Other Relevant Data

PERIOD	INSTITUTION	POSITION
2010	KENYA REFERENDUM	PRESIDING OFFICER
2007	KENYA GENERAL ELECTION	PRESIDING OFFICER
2005	KENYA REFERENDUM	PRESIDING OFFICER
1992	KENYA GENERAL ELECION	CLERICAL OFFICER
1998-2007	PTE	NATIONAL EXAMINERS
2002-DATE	KCSE	NATIONAL EXAMINER
2009-date	GEM DISTRICT ATHLETICS	TECHNICAL ADVISOR