# TEACHER FACTORS INFLUENCING USE OF QUESTIONING TECHNIQUE ON STUDENTS' ACHIEVEMENT IN MATHEMATICS IN PUBLIC SECONDARY SCHOOLS IN MWALA SUB-COUNTY, MACHAKOS COUNTY, KENYA

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## DECLARATION

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

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## DEDICATION

I dedicate this thesis to my spouse, Regina Mutisya, sons, Augustine Muthusi, Nicholas Musyimi and Stephen Mulei and daughters, Rabeccah Kalondu and Irene Kanini, for their support for the duration of my research.

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## ABBREVIATIONS AND ACRONYMS

| | | |
|---|---|---|
| **IEBC** | **:** | Independent Electoral and Boundaries Commission |
| **KCSE** | **:** | Kenya Certificate of Secondary Education |
| **KNEC** | **:** | Kenya National Examination Council |
| **KNBS** | **:** | Kenya National Bureau of Statistics |
| **SPSS** | **:** | Statistical Package for Social Sciences |

## ABSTRACT

Mathematics teachers play an important function in coaching necessities in arithmetic and in making sure that scholars sign in desirable grades. This is completed with the resource of adopting a couple of additives of wondering strategies. However, in Mwala Sub-county, the scenario is specific with many school students registering low success in arithmetic. Thus, the cause of this look at have become to evaluate trainer elements influencing use of thinking technique on school students' achievement in arithmetic in public secondary schools in Mwala Sub-county, Machakos County, Kenya. The objectives were: to assess the have an impact on of varieties of mathematics questions, teacher training, experience and thoughts-set in the direction of questioning technique on school students' fulfillment in arithmetic in public secondary schools. The study changed into guided by using the learning principle. This examine followed blended technique and concurrent triangulation research layout. The look at population became 268 respondents comprising 67 principals and 201 teachers from which a pattern of 160 respondents modified into decided the use of Yamane's Formula. Stratified sampling has become used to create 8 wonderful strata primarily based totally honestly on the form of zones in Mwala Sub-county. From each place, one essential and 19 mathematics teachers had been determined on the usage of purposive sampling. This way enabled the researcher to pattern eight principals and 152 mathematics teachers. Questionnaires had been used to accumulate quantitative records from arithmetic teachers while interview courses have been used to collect qualitative records from principals. Piloting became finished amongst sixteen

respondents from a sample of schools in Mwala Sub-county to check the validity and reliability of studies gadgets. Validity changed into hooked up through judgment thru using specialists in verbal exchange era and school supervisors. Reliability end up hooked up using cut up-half of method. A reliability index of r = 0.847, have turn out to be acquired the usage of Cronbach Alpha Method which indicated immoderate inner reliability. Qualitative information was analyzed thematically based totally on check dreams and provided in narrative shape. Quantitative statistics have been analyzed using descriptive information and inferentially the use of linear regression evaluation in Statistical Package for Social Sciences (SPSS Version 23) and supplied using tables. The observe installed that many mathematics teachers use high-quality easy diploma kinds of questions and disregard complex and application questions which rely on teachers' schooling, revel in and mind-set which has negatively affected school students' achievements in mathematics. Thus, the study recommends that mathematics teachers ought to be aware about the forms of questions and how they must area them in the course of high school students. Mathematics teachers ought to go through in-company training in a manner to decorate the questioning approach abilities. Mathematics teachers interact more with professional colleagues by using the use of the usage of attending seminars and workshops designed to enhance their revel in and levels of publicity to particular techniques of wondering. Mathematics teachers must increase the remarkable mindset towards the use of questioning techniques.

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background to the Study

Mathematics is widely used in numerous fields and protecting a large type of activities and is one of the topics taught in secondary schools. Singh, Granville and Dika (2012) posit that giving secondary schoolers a strong basis in early math literacy is essential to their future academic achievement, now not to mention how important it is to every day functioning. Singh et al (2012) aver that it's far specially right given the stepped forward needs of the mathematics curriculum in secondary schools these days. This affirms that if a student attends secondary school, it is anticipated that greater emphasis is positioned on training secondary school mathematics. However, the decline in arithmetic fulfillment is of terrific venture.

Fraser and Kahle (2014) aver that many secondary school students in India occur a decline in arithmetic requirements frequently furnished in their assessments. Among the motives of the decline in mathematics achievement in schools is due to the fact secondary school students hold in mind mathematics as a hard and boring hassle (Fraser & Kahle, 2014). Hence, teachers need to adopt instructional techniques and techniques collectively with questioning method which kills monotony, receives rid of boredom and improve success of secondary school students in arithmetic' check rankings. According to Bloom (1956), the art work of asking the right questions at the right time isn't innate. Bloom's taxonomy of studying categorizes cognitive degrees into several

domains (Bloom, 1956). Questions that elicit responses inside the information, comprehension, and application domain names are regularly considered lower-order questions, on the identical time as questions inside the evaluation, synthesis, and evaluation domains are considered better-order questions. Higher-order questions elicit deeper and important thinking; consequently, teachers are endorsed to invite questions in these domain names. Bloom (1956) posits that teachers are expected to invite inquiries to deal with all cognitive domains so long as the popular getting to know final consequences is saved in thoughts and a top-notch mixture of questions is used for the period of each education consultation.

Given that the learning targets in most subjects, teacher schooling and education are frequently supposed to stimulate excessive order cognitive strategies, one might possibly expect that higher-order questions may attain achievement throughout encounters amongst school students and teachers. Unfortunately, observations of test room-based totally absolutely teachers have time and again proven that decrease-order questions are a way greater often used (Bloom, 1956).

Perhaps, teachers do now not value better-order questions and enjoy they're no longer effective, or possibly a loss of formal schooling on a manner to formulate inquiries to stimulate mastering is the muse reason (Bloom, 1956). By the equal token, the extent to which teachers use questioning approach in an effort to beautify secondary school students' fulfillment in mathematics is

however to be really interrogated. Classroom questioning is one of the maxima regularly employed training strategies.

In reality, questioning is taken into consideration with the aid of using many to be the maximum vital device that teachers have for assisting school students assemble an information and to inspire school students to reflect on consideration on and act upon the cloth they may be learning. It is one of the number one and maximum influential training talents that teachers can use (Cotton, 2012). In Germany, teachers' questions had been located to be a crucial a part of school room interaction this is essential in that it lets in teachers to gauge what school students realise and look at (Edwards & Bowman, 2014).

Teachers' primary academic techniques encompass the usage of precise styles of inquiries to decide whether or no longer school students understand what they're getting to know. However, consistent with Sahin, Bullock and Stables (2012), teachers use high-quality types of talents in the course of their schooling and that they will not generally be aware about which skills assist school students have a look at and apprehend thoughts in mathematics properly. In an assessment of school students' basic overall performance in mathematics in schools in Kuala Lumpur, Flippione (2011) asserts that, however the fact that the teacher makes use of inquiries to tough high-quality meanings from school students, the scholars may additionally moreover understand the questions in any other case.

In extraordinary phrases, teachers ask many questions, however are not certain what their intentions are in asking questions or whether or not they'll be aware of why they may be the usage of specific wondering strategies. This manner that one of the most important responsibilities of an arithmetic check room teacher is to sell concept and encourage inquiry in school students and one powerful manner of doing this, is thru right wondering in the school room. This is every day with the assertions of Caram and Davis (2012) who stated that after teachers' questions are used successfully, they might beautify student getting to know by manner of growing vital questioning abilties, reinforcing student information, correcting student false impression and imparting feedback for school youngsters. Caudron (2010) additionally notes that teachers' questions represent a primary method of attractive school students' interest, selling verbal responses and comparing school students' development.

However, the effectiveness of teachers' questioning approach is based totally upon in large part on a multiplicity of dynamics which consist of; the varieties of questions, teachers' schooling, experience and mindset toward use of thinking method in schooling arithmetic. To lend credence to those viewpoints, Croom and Stair (2011) assert that one of the measures to be taken for the development of teachers' thinking capabilities could be to assess how teachers ask questions in arithmetic lessons. According to Croom and Stair (2011), lecture room questions are terrific used as test gear to help suggest school students' educational development or to assess school students' critical questioning.

In many countries in Sub-Saharan Africa, questioning technique is appeared as one of the strategies of coaching mathematics. For example, in Nigeria, Oderinde (2012) opinions that questions can assist to make connections to in advance reading and might stimulate cognitive growth. According to Oderinde (2012), suitable and expert examine room questions which is probably well advanced and based totally completely can have interplay school students in a real exploration of the content material they're gaining knowledge of. In one of a kind phrases, questions additionally allow them to demonstrate their facts of the standards, while unskilled classroom questions from teacher's attention on quick answers, low stage questions which sincerely take a look at for school youngsters' information. Oderinde (2012) further asserts that mathematics teachers with ok training, some years of enjoy, positive mindset and hobby within the use of wondering approach are capable of make certain that the students broaden ok private self-guarantee and appropriate individual closer to the analyzing of mathematics.

These perspectives corroborate the assertions of Oshodi (2010) that, in view that mathematics teachers do now not very own a robust content material fabric know-how or do now not have a deeper record of mathematical principles, they have got troubles in making prepared questions for school children. In Kenya and Mwala Sub-county particularly, school students' typical overall performance in arithmetic is low. For example, a report by Ministry of Education (2018) shows that secondary schools in Mwala Sub-county

registered 19.7% in arithmetic in 2017 KCSE examinations in opposition to a country huge aggregate which stood at fifty seven.9%.

Ministry of Education (2018) blames this dismal ordinary usual performance on academic strategies and techniques followed through teachers. Cognizant of these assertions, Rudhumbu (2014) posits that the trouble associated with teachers' wondering approach in mathematics is loss of enjoy and proper education to in shape the questions they ask with school students' capacity. A record via the use of KNEC (2017) to show learner's achievement in literacy and numeracy had revealed that best 52% of secondary school students were incompetent in fixing mathematics problems. By the identical token, a survey finished through Musau (2015) had observed out that seven out of ten school students in form III could not perform a form one mathematical obligations. Musau (2015) further determined that 60% of the scholars in public secondary schools do not have the simple mathematical talents, on the identical time as 34% of the scholars couldn't carry out clean duties that display essential arithmetic' skills.

Musau (2015) recommends that teachers need to undertake training techniques which may be learner-centered. In preserving with these assertions, many mathematics teachers have followed wondering method as a mitigant to low grades in mathematics. According to Rudhumbu (2014), that is because of the reality, the questions teachers ask are frequently not nicely prepared and not effective in strengthening students' information of requirements in mathematics. Rudhumbu (2014) in addition suggests that, to make education of

mathematics powerful among secondary school students, teachers have adopted wondering technique.

According to Rudhumbu (2014), wondering has modified lecture rooms from being teacher-centered in which the point of interest is on the teacher providing understand-a way to the students to secondary school learner-targeted wherein the secondary school students are predicted to take a livelier detail in their private gaining knowledge of. This shows that asking questions in arithmetic' training requires facts of the varieties of questions, strategies and the art of questioning. However, a lousy lot however had to be executed to interrogate the amount to which mathematics teachers' use of questioning method have an effect on school students' performance in arithmetic in public secondary schools, therefore the need for this observe.

**1.2 Statement of the Problem**

Mathematics teachers play a crucial characteristic in coaching of thoughts in arithmetic and ensuring that students check in first rate grades in assessments. This is completed through adopting a myriad of coaching strategies which embody cooperative reading approach. However, in Mwala Sub-county, the situation is different with many school students registering low success in arithmetic. As said in the heritage, KNEC (2017) reviews that 52.0% of students are incompetent in fundamental arithmetic' competencies. In addition, a report with the aid of manner of Musau (2015) additionally suggests that 60.0% of school students in Mwala Sub-county are not capable of carry out primary operations in standards in arithmetic check rankings which has brought

about low usual overall performance in mathematics in countrywide examinations.

Efforts consisting of induction of teachers on use of a multiplicity of training techniques to mitigate those demanding situations have no longer yielded an awful lot and feature did now not check in incredible progress. Despite those statistics, few empirical researches have interrogated the elements influencing teachers' use of thinking techniques as a way for enhancing students' overall performance in arithmetic in public secondary schools.

### 1.3 Purpose of the Study

The purpose of the study was to assess factors influencing teachers' use of questioning technique on students' achievement in mathematics in public secondary schools in Mwala Sub-county, Machakos County, Kenya.

#### 1.3.1 Objectives of the Study

i. To establish the influence of types of mathematics questions on students' achievement in mathematics in public Secondary Schools in Mwala Sub-county.
ii. To determine the influence of mathematics teachers' training on use of questioning technique on students' achievement in mathematics in public secondary schools in Mwala Sub-county.
iii. To find out the influence of teachers' experience in using questioning technique on students' achievement in mathematics in public secondary schools in Mwala Sub-county.

iv. To examine the influence of teachers' attitude towards questioning technique on students' achievement in mathematics in public secondary schools in Mwala Sub-county.

### 1.3.2 Research Hypotheses

**$H_{01}$:** There is no statistically significant influence of types of mathematics questions on students' achievement in mathematics in public Secondary Schools in Mwala Sub-county.

**$H_{02}$:** There is no statistically significant influence of mathematics teachers' training on use of questioning technique on students' achievement in mathematics in public secondary schools in Mwala Sub-county.

**$H_{03}$:** There is no statistically significant influence of mathematics teachers' experience in using questioning technique on students' achievement in mathematics in public secondary schools in Mwala Sub-county.

**$H_{04}$:** There is no statistically significant influence of mathematics teachers' attitude towards questioning technique on students' achievement in mathematics in public secondary schools in Mwala Sub-county

## 1.4 Significance of the Study

The study would benefit policymakers in enhancing mathematics literacy to graduates in several tiers of schooling in Kenya and one-of-a-type countries. The training administrators might additionally benefit from the have a look at findings in utilizing the generated understanding to improve the reputation of mathematics. Teachers, mother and father and other education stakeholders ought to experience the have a look at in improving learner retention of mathematics' requirements, guide one in every of a type studying desires and

devise techniques for inclusion of novices who might otherwise not have had the opportunity to take part. Mathematics teachers may want to benefit from the look at in acquiring new notions to their records of training and learning mathematics in secondary schools.

The broader school community needs to enjoy the study in sharing the findings to encourage attention, engagement, and motion. This ought to, in flip, lead them to go back collectively in raising requirements of arithmetic' performance for school youngsters and school in popular. The findings of this study ought to assist teachers of arithmetic to enhance their wondering strategies within the take an examine room. The study would also assist textbook writers and curriculum developers to encompass precise tiers of questionings in arithmetic teaching and allow teacher educators to enhance the questioning capabilities of student-teachers of arithmetic in secondary schools. The findings of this examine might also permit mathematics' syllabus designers, setters of mathematics very last exam query papers, arithmetic curriculum designers and text ebook writers to decorate their thinking techniques.

The study would advocate what teacher educators have to do to beautify the questioning abilities of teachers of mathematics. Policy makers should benefit from this examine in making and implementing new pointers on provision of perfect belongings which useful resource arithmetic' education and studying. This study might form a foundation for academicians who can be worried to conduct a examine in a comparable area.

**1.5 Delimitations and Limitations of the Study**

In this section, the study highlighted the delimitations and limitations of the study.

### 1.5.1 Delimitations of the Study

The study centered on the types of mathematics questions, teachers' training, experience and attitude students' success in mathematics. The study was carried out in public secondary schools in Mwala Sub-county. Data for this study were accumulated from mathematics teachers and principals. The study was undertaken between January and March, 2019.

### 1.5.2 Limitations of the Study

The results of the study couldn't be generalized to different secondary schools in other areas considering that there might be special precise dynamics which have an effect on students' achievement in mathematics other than teachers' use of questioning technique. In this situation, the take a observe advocated that further research be executed on academic success in mathematics among school students, but with cognizance on specific coaching techniques and dynamics other than use of questioning techniques. The sampled respondents couldn't be consultant of the complete purpose populace. In this case, the researcher come to be as inclusive as viable to guarantee maximum example.

## 1.6 Assumptions of the Study

i. That mathematics teachers in public secondary schools in Mwala Sub-county use questioning technique in education mathematics.

ii. That kinds of mathematics questions, teachers' training, enjoy and mind-set closer to use of questioning approach in coaching mathematics affect school students' achievement in mathematics in public secondary schools.

iii. That all respondents sampled would be co-operative and provide reliable responses.

iv. That all sampled respondents were aware about the teacher factors which impact use of thinking approach and their have an effect on school students' achievement in mathematics.

### 1.7 Theoretical Framework: The Learning Theory

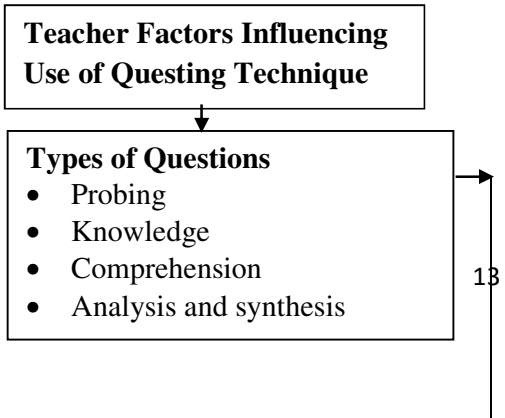
This study was based on the learning theory which was postulated via Jorg Voigt (1992). This idea was premised on the notion that mathematical reading and coaching are related thru study room interplay which calls for negotiation of which means. Voigt (1992) defines the phrase "negotiation of which means" as the appropriate approach of school room interactions with the aid of the use of which teachers and school students shape reviews, criticize, provide a reason behind, take a study, refine thoughts and techniques in mathematics training. One of his critical concerns changed into to make clear the manner via which the trainer and school students superior a basis for mathematical verbal exchange via thinking.

In the context of this study, this principle is applicable in that it underscores the truth that teachers have intentions to use several varieties of questions in an effort to negotiate which means that with school students, which leads to pupil analyzing. During the negotiation of that means, questions serve several key capabilities: they allow teachers to diagnose students' previous know-how or misconceptions, probe for information, manual scholar questioning, particularly even as there may be a trouble or misunderstanding and informally assesses student dreams in mathematics.

### 1.8 The Conceptual Framework

The conceptual framework was based on the objectives of the study. The teacher factors reflected through types of questions, teachers' training, experience and attitude constituted the independent variables whereas students' achievement in mathematics constituted the dependent variable. The intervening variables were; availability of instructional resources, principals' instructional supervision and stakeholders' support as shown in Figure 1.1:

**Independent Variables** **Dependent Variable**



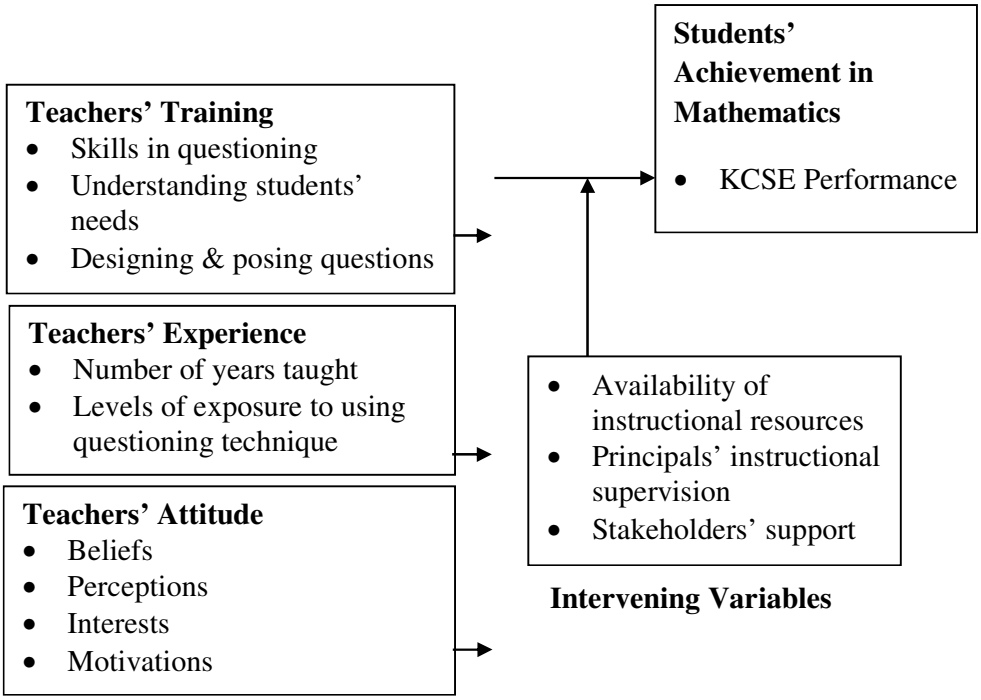



***Figure 1.1*: Teacher Factors Influencing Use of Questioning Technique on Students' Achievement in Mathematics**

From the Figure 1.1, the independent variables are the trainer elements influencing use of thinking approach that have an effect on school students' fulfillment in mathematics this is the established variable. When the teachers are nicely educated on the manner to apply wondering technique in mathematics' practise, have lengthy enjoy in using questioning approach and take vicinity high-quality thoughts-set closer to use of questioning technique in coaching, school students register amazing grades in mathematics in KCSE, joint and ridicule examinations. The intervening variables are availability of tutorial resources, principals' instructional supervision and stakeholders' assist. The intervening variables are really hypothetical and are there to reveal the hyperlink most of the independent variable and the based variables. When the instructional belongings are to be had, principal's behavior effective

instructional supervision and stakeholders provide the important aid, then school students are capable of sign up excellent improvements in mathematics.

### 1.9 Operational Definition of Terms

**Mathematics achievement:** refers to the results which students sign in after venture mathematics' examination. In this case, school students' KCSE overall performance modified into the focal point of the study.

**Teacher factors:** refers to elements that directly relate to the mathematic teachers which allow them use wondering method for mathematics' preparation. These consist of; training, revel in and attitude.

**Teacher training:** refers to the process of imparting teaching techniques which incorporates wondering skills to mathematic teachers.

**Teachers' attitude:** it refers to the ideals, perceptions, pursuits or motivations which mathematics teachers occur inside the direction of use of thinking technique as a coaching strategy.

**Teachers' experience:** refers to the amount of years mathematics teachers had been the usage of wondering approach for the duration of mathematics instructions.

**Types of questions:** refers to types of questions in mathematics which teachers ask school students all through coaching and studying. These include; probing, knowledge, comprehension, analysis and synthesis.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

This chapter highlights the literature associated with the topic of the study. The researcher offers divergent perspectives which can be crucial to high-quality authors who raised numerous variations related to the issues being investigated. The evaluate is based mostly on the idea of school students' fulfillment in mathematics, the idea of trainer factors influencing use of thinking technique and the influence of types of mathematics questions, teachers' schooling, enjoy and mind-set towards wondering technique on school students' fulfillment in

mathematics in public secondary schools. It also gives a summary of the literature examine citing the research gaps diagnosed sooner or later of the study.

### 2.3.1 Types of Questions

Types of questions teachers ask plays an essential position inside the gadget of schooling and learning arithmetic. However, Anderson, David and Krathwohl (2009) posit that for the reason that thinking is used so regularly, teachers might not even understand the sorts or remarkable of the questions they use. In retaining with those assertions, Stigler and Hiebert (2012) element out that it is the excellent of questioning, smooth connections and depth of perception anticipated that contribute to the space in scholar fulfillment in mathematics. To corroborate those viewpoints, McGrail (2012) performed a take a look at inside the Netherlands which cautioned that teachers needed to comprise all ranges of Bloom's Taxonomy into education, checks and assignments. By the usage of pretty a variety of questions that attraction to all the school students it turns into extra non-public to them (McGrail, 2012). Not only must Bloom's Taxonomy of the cognitive area be addressed in assignments and assessments but they need to be included moreover in elegance bodily sports and duties to be accomplished in mathematics (McGrail, 2012). These findings are ordinary with the assertions of Good and Brophy (2003) that lack of expertise of techniques of questioning in arithmetic can also need to make teachers alternate excessive degree questions into low stage elegance.

This has to arise on the same time as teacher's solution the questions they ask or write solutions for school youngsters without giving school students

sufficient time to answer the questions. This shows that mathematics teachers who like answering their non-public questions deny school students the possibility to reply questions and percentage ideas with their pals, discourage them from doing any wondering, making them no longer to be busy because of the minimal interaction in the examine room.

In a examine undertaken in Venezuela, Hill, Ball and Schilling (2011) hooked up that mathematics teachers' lack of know-how of the taxonomy of questions can also furthermore restrict their ability to diversify their use of ranges of questions constant with the wishes and desires they set for the splendor. However, Hill et al (2011) suggested teachers not to rely on the taxonomy an excessive amount of due to the truth normal with them, as a shape, the taxonomy is not a effective way of making plans and asking questions. Just like Morgan and Saxton (2012), Hill et al (2011) described that to comply with the hierarchy of form inside the taxonomy from easy bear in mind to the complex evaluation need to distort the region of questions in schooling.

For instance, the view that teachers have to ask questions at better stages exquisite whilst they may be extremely good that their school students have understood and may perform at decrease degrees is unrealistic. This is steady with the foundational postulations of Bloom (1956) encouraged the use of complex and important questioning talents.

The 1956 Bloom's version proposed classifications of thinking within the cognitive location (Bradley, 2007). There are six degrees of Bloom's Taxonomy of the cognitive region and questions at every stage require school students to reply the use of a extraordinary form of idea technique. The stages

are: know-how, comprehension, software program, evaluation, synthesis and evaluation (Cooper,2006). Knowledge degree is the functionality to maintain in mind previously positioned facts. Students are required to outline, bear in mind, understand and repeat a few matters that that that they had learnt.

Consistent with this, Enu, Agyman and Nkum (2015) completed a look at in Ghana which hooked up that, on the understanding diploma, school students aren't requested to manipulate statistics, however truely to maintain in mind it truely as it emerge as learnt. According to Enu et al (2015), statistics questions are used to promote school room participation. They are important to all exclusive ranges of questioning and reasoning for the truth that scholars can't be asked to count on at better ranges inside the event that they lack crucial records (Enu et al, 2015). This elements to the truth that exceptional wondering for facts makes a specialty of identification and take into account of facts and allows the teacher to survey the knowledge degree of a whole elegance and successfully pass on with the lesson. According to Enu et al (2015), comprehension degree is the capability to apprehend previously determined out substances, statistics and figures. In a take a look at done in faculties in KwaZulu Natal Province in South Africa, Seah and Andersson (2015) also said that comprehension questions require school students to pick those records which can be applicable to answer the question with the resource of describing, evaluating or contrasting. To solution comprehension questions, school students ought to skip beyond the memorization or go through in thoughts of particular facts, facts, mind or techniques (Seah & Andersson, 2015).

In the terms of Cooper (2006), the student has to reveal off a non-public maintain close of the material through using manner of being able to rephrase it to offer an define in his or her very non-public terms and to use it in making comparisons. During arithmetic' commands, comprehension questions require school students to interpret through way of the use of making comparisons, displaying relationships among thoughts and offer statistics provided within the shape of charts, graphs and tables (Seah & Andersson, 2015).

In many secondary faculties in Kenya and Mwala Sub-county mainly, Lilian (2015) asserts that mathematics teachers adopt comprehension questions which may be pretty appropriate on the same time as school students are required to art work on corporation and preference of facts and thoughts, for instance at the same time as considering techniques which encompass assume, pair and percentage which lets in school students to collaborate and percent their information. Lilian (2015) notes that there also are software program and evaluation degree questions. According to Lilian (2015), utility diploma is the capability to use received records, know-how and skills to new situations or problems. Giving school students the possibility to connect their studying via trouble-primarily based absolutely assignments offers possibilities to apply software program application stage wondering.

In a examine finished in Machakos County, Mutuku, Muasya, Njuguna and Ogola (2017) set up that, on the identical time as a pupil answers in vicinity of commenting, the teacher can invite different school students to connect or enlarge the previous answer given. Examples of software application questions in arithmetic include: to use the know-how learnt to treatment a hassle of real-

lifestyles state of affairs, make up a puzzle interest in mathematics using mind from the content being located out and to use mathematical mind to remedy tremendous related issues in fantastic subjects like physics or chemistry (Mutuku et al, 2017).

On the opportunity hand, assessment diploma questions, in keeping with Mutuku et al (2017), is the capability to pick out, examine and recognize the detail components and shape of material. Analysis method of decreasing a complicated challenge count number or substance into smaller elements to gain better expertise. Mutuku et al (2017) said that questions that lead school students to cognitively method a complicated concept into less hard extra possible factors permits the student to peer relationships and generalize studying.

In precise phrases, some topics in mathematics frequently require evaluation questions to correctly complete an venture or answer test questions in mathematics. This manner that allowing school students to do artwork on graphical paintings which have a study the constructs of a complicated hassle or concept are not optionally to be had in which assessment is involved inner a lecture room. Mutuku et al (2017) in addition referred to that synthesis diploma is the capability to apply acquired expertise, information and skills to make bigger new mind, strategies or answers. Just like Cooper (2006), Mutuku et al (2017) indicated that such better order questions require school students to carry out unique and modern-day wondering.

According to Mutuku et al (2017), mathematics teachers need to apply questions to assist school students produce real communications, make

predictions and treatment issues. This method that synthesis is setting collectively facts in a one-of-a-kind manner with the aid of reconstructing facts in a contemporary-day-day courting or figuring out particular relationships. Despite these observations, plenty in spite of the truth that needs to be carried out for the reason that Mutuku et al (2017) as did specific empirical research have now not interrogated the quantity to which forms of arithmetic questions have an effect on school students' fulfillment in mathematics.

2.Three.2 Influence of Mathematics Teachers' Training in Using Questioning Technique on Students' Achievement in Mathematics in Schools

Teacher training is a very important step in teacher education because it entails equipping teachers with pre-needful competencies for powerful study room pedagogy. According to Henderson (2014), education equips teachers with training techniques and assessment talents to be followed on the equal time as schooling. However, in Germany, Moore (2014) asserts that a chief setback in effective use of thinking technique is the trouble of unqualified teachers. In one-of-a-type terms, thinking approach and its factors are designed in a manner that requires well-knowledgeable manpower to translate the factors into reality in a mathematics' splendor.

Cognizant of this reality, Harris and Tim (2013) finished a take a look at inside the United States which installed that there stays an acute shortage of knowledgeable teachers for Introductory Technology, Creative and Cultural Arts, Local Crafts, which may be manifested within the awful use of wondering technique. In a study done in Nigeria, Amugo (2013) set up that availability of expert teachers influences on adoption of wondering technique

in secondary faculties. Amugo (2013) in addition set up that there exists a huge dating some of the deliver of knowledgeable situation teachers and use of questioning technique in coaching capabilities in arithmetic to high school school students in Nigeria.

Similar argument changed into posited with the useful aid of Ajibola (2014) who additionally said that maximum of the academics are not licensed to encompass using wondering approach in every day schooling. These findings are indicative of the truth that the most essential man or woman inside the use of wondering method is the professional mathematics trainer. In exquisite phrases, with their information, enjoy and competencies, teachers are important to the usage of questioning approach in education mathematics to highschool students.

By the identical token, Akinoglu (2014) moreover underscores the truth that teachers who are maximum informed approximately the exercising of the usage of wondering approach in schooling mathematics are liable for adopting each detail of questioning approach in splendor so one can enhance school school students' success in abilities in arithmetic. Thus, the essential thing to getting teachers dedicated to an innovation is to enhance their know-how of the programme. This manner teachers want have a look at and workshops should be prepared for professional improvement. Unfortunately, in any use of wondering technique manner now not all teachers may also additionally furthermore have the gain of such publicity.

In a take a look at completed in KwaZulu Natal Province in South Africa, Cobb (2014) suggests that the maximum common technique is to have one-day

workshops given with the resource of specialists with the wondering technique being the dominant pedagogical method in arithmetic elegance. In Kenya, teachers are appeared as technicians, but they're not often professional on use of thinking approach in their teacher education programmes. Certainly, an specific sufficient teacher education programme need to encompass factors of wondering technique each in idea and workout; if training of abilities in mathematics in secondary schools is to be a profession and if educational possibilities for school children are really to be advanced.

In a test executed in Narok Sub-county, Shinali and Ng'ethe (2018) set up that it's miles important for teachers to understand every the philosophies on the decrease lower lower back of each schooling approach collectively with thinking method and the effectiveness of such strategies in education mathematics.

Shinali and Ng'ethe (2018) stated that teacher education curriculum has to introduce content material fabric in thinking strategies and make teachers apprehend the goals and elements of wondering technique properly that lets in you to use it correctly in education arithmetic to highschool students. However, Shinali and Ng'ethe (2018) referred to that the best trouble is probably to be encountered while teachers are required to alternate their academic techniques to train abilities in arithmetic to highschool students using thinking technique.

By the identical token, Wachira (2010) furthermore posits that teachers argue that such picks are probable to have profound consequences on the success of using thinking approach in education mathematics in secondary schools. According to Biama (2014), in Machakos County, teachers fail to adopt

questioning method for the reason that, in keeping with them, it is possibly to waste time, cash and strive because of the truth the favored consequences will no longer be finished. This approach that a fulfillment use of thinking method in education mathematics goals greater than only a trainer who has enough pedagogical and content material cloth information thinking about maximum elements of the thinking approach cope with the teaching of values and teachers whose behavior is perceived thru school school students as beside the hassle are not capable of gain achievement facilitators of thinking approach.

In exceptional phrases, use of wondering method has not been smooth with teachers' competency, professional adequacy, professional hobby, motivation and expert competence being added into hobby. However, Biama (2014) as did specific empirical studies have not interrogated the amount to which teacher schooling have an impact on use of questioning approach in schooling arithmetic on school school students' ordinary regular performance in arithmetic in secondary schools; consequently, the need for this check.

2.Three.Three Influence of Mathematics Teachers Experience in Using Questioning Technique on Students' Achievement in Mathematics in Schools

Most experienced mathematics teachers having interacted with situation depend quantity and severa study room reviews for an prolonged time are probably to have a tremendous effect on use of questioning technique in education arithmetic (Cooney, 2010). Ryan (2010) observes that the start teacher but, seeks a gentler control style. This impact negatively at the trainer frequent usual usual overall performance and therefore learner fulfillment in skills in mathematics. In an evaluation of learner fulfillment in talents in

mathematics and drop out in a pattern of California essential schools, Fetler (2011) placed that faculties whose dropout charges have been immoderate, had extra new teachers than did schools with low dropout expenses.

A entire evaluation through Greenwald, Hedges and Laine (2012) of 60 research determined an top notch courting amongst years of trainer revel in and adoption of questioning approach as an method for training abilities in mathematics in secondary schools. Similarly, the Texas schools challenge data confirmed that scholars of professional teachers attained significantly better degrees of achievement in mathematics than did school students of new teachers who had no revel in inside the usage of thinking approach, this is, human beings with one to 3 years of revel in (Rivkin, Hanushek & Kain, 2013).

To corroborate the ones assertions, Muller and Alexander (2014) carried out a examine on trainer certification and education strategies in in the Netherlands located that students taught thru manner of certified teachers scored higher on fulfillment take a look at than those taught thru uncertified teachers. In maximum nations in Sub-Saharan Africa together with Nigeria, South Africa and Kenya, enjoy of mathematics teachers it truly is determined through the training that teachers undergo and the duration in their training extensively determines their normal performance in the use of questioning approach as a palms-on technique for boosting school students' fulfillment in arithmetic.

In Kenya, function of teachers enjoys and exposure to apply of questioning method can not be overemphasized. For example, in a look at accomplished in Nairobi County, Jepsen (2012) set up that arithmetic teachers with few years of

education revel in and use of hands-on techniques collectively with questioning technique are an awful lot a lot much less possibly to train correctly and assure a success use of thinking method in training mathematics. This suggests that the quantity of years mathematics teachers has in training determines the amount to which they use questioning approach in education arithmetic to high school students.

In preserving with those assertions, Biama (2014) finished a have a examine in Machakos County which observed that teachers' revel in in using wondering approach to train mathematics is virtually correlated with better learner achievement. According to Biama (2014), years of schooling experience are a ordinary predictor of higher take a look at ratings in mathematics among school school students.

However, Biama (2014) as did unique empirical research failed to signify the high-quality sort of years which teachers need to must be powerful in the use of questioning approach for boosting school school students' success in talents in mathematics.

2.Three.4 Influence of Mathematics Teachers' Attitude within the course of Questioning Technique on Students' Achievement in Mathematics in Public Secondary Schools

Attitude of arithmetic teachers performs a vital characteristic in adopting any method of training in a arithmetic' beauty. According to Abrami, Poulsen and Chambers (2014), teachers' mindset can be visible as more or a good deal less incredible. A pleasant thoughts-set inside the course of arithmetic displays a notable emotional disposition almost about the problem and, in a similar

manner, a horrible thoughts-set within the course of mathematics relates to a awful emotional disposition (Abrami et al, 2014). These emotional inclinations have an impact on a teachers' conduct for the reason that teacher is probably to undertake a way of schooling that she or he enjoys, has self-assure in or famous beneficial (Abrami et al, 2014).

This indicative of the reality that teachers' high remarkable mind-set inside the path of arithmetic' educational strategies are suitable thinking about they'll have an effect on his or her willingness to apply it to educate and make certain that students recognize extraordinary instructional grades in Mathematics. Questioning method isn't always any exception and successful use of this technique is primarily based upon on mathematics teachers' mind-set. According to Gillies and Boyle (2010), if teachers apprehend wondering approach as neither pleasurable to their needs nor their school students' goals, it's miles probable that they'll no longer undertake the technique in schooling arithmetic. Farrow (2012), in a have a study completed amongst 11 teachers in Indonesia, located out that some of the elements that have an effect on successful adoption of thinking method in education of number one mathematics abilties is teachers' thoughts-set and ideals. In one-of-a-type terms, if teachers' thoughts-set is high-quality in the route of using thinking method, then they are capable of without trouble provide beneficial perception about its use in education school students.

Danh (2016) achieved a comparable have a look at on teachers' thoughts-set inside the course of use of thinking technique in Vietnam. The take a look at placed that in spite of the reality that limitations together with lack of hardware

and software program program existed, teachers' great mind-set closer to questioning approach become an vital determinant to a success adoption of thinking technique in education mathematics, syllabus insurance and superior school students' success in arithmetic. In the identical vein, Tan, Lee and Sharan (2016) completed a survey on pre-business corporation teachers' mind-set inside the route of use of questioning approach in secondary schools in Singapore.

A pattern of 139 pre-business enterprise teachers modified into assessed for his or her mind-set toward questioning method the use of questionnaire with four elements: have an impact on (liking), perceived usefulness, perceived manipulate and behavioral aim to apply the approach. However, Tan et al (2016) observed that teachers have been masses lots lots less notable about their attitude closer to thinking technique and the motive to use it to teach mathematics in secondary faculties and as an approach for reinforcing educational success in mathematics' test scores amongst school students.

This factors to the truth that learner-orientated pedagogical approach, tremendous mindset inside the path of wondering technique, exposure and personal entrepreneurship of the teacher have a right away first-class impact on the modern use of questioning technique thru the trainer. In maximum worldwide locations in Sub-Saharan Africa, research has confirmed that mathematics teachers' thoughts-set in the route of wondering technique have an impact on their recognition of the usefulness of questioning method in education of arithmetic in secondary schools (Worth, 2010).

In Ethiopia, Mikre (2011) asserts that teachers' thoughts-set is a key determinant in teachers' use of the elements of wondering approach in schooling mathematics. Mikre (2011) asserts that the resistance to the willingness to use questioning method in observe room is regularly stated to be primarily based completely completely at the danger of teachers losing effect over the values and commands of observe room interest. In the equal breath, a have a look at done in Egypt via using way of Cavas, Cavas, Karaoglan and Kisla (2010) hooked up that teachers who've wonderful mind-set toward any training method collectively with use of thinking approach had their school school students carry out well in simple numeracy talents.

In a similar have a examine finished in Tanzania, Broussard and Garrison (2011) established that the extra experience teachers have with education strategies which includes thinking approach, the much more likely that they'll show effective thoughts-set toward it. That is, notable mindset is expected to foster teachers' use of wondering technique in schooling of arithmetic in secondary schools.

Kenya is not an exception and Broussard and Garrison (2011) posit that effective use of questioning method is counting on the academics' intentions, non-public beliefs and thoughts-set inside the route of training and learning of mathematics. In Kenya, Kamau (2015) and Ngui (2018) finished research which decided out that a large massive type of teachers preserves horrible thoughts-set in the route of hands-on education strategies which incorporates thinking approach as a method for boosting academic fulfillment in mathematics amongst school students.

Such components range from avoidance of wondering method, anxiety, self-efficacy, enthusiasm, self-guarantee, liking and value of questioning approach. In Mwala Sub-county, the scenario is the identical with research indicating that teachers' mind-set inside the course of wondering technique drastically affects its use in teaching and reading of arithmetic. In a check finished in Machakos County, Mutuku et al (2017) stated that teachers' thoughts-set and beliefs closer to training and reading strategies are most of the dynamics which have an effect on an fulfillment use of questioning technique for training in schools as a way for curriculum implementation.

This approach that if arithmetic teachers' thoughts-set is high remarkable inside the path of using academic questioning method, then they may without issues provide beneficial perception approximately the adoption of thinking method into training and reading strategies. In specific terms, horrible mind-set in the path of thinking technique as a substitute among teachers is a key obstacle to a achievement use of questioning method as a manner for enhancing school school students' fulfillment in mathematics.

However, Musau (2015) as did distinct reviewed empirical research have now not indicated how teachers' favorable or unfavorable mind-set within the path of components of questioning approach have an effect on academic fulfillment in arithmetic among school school students; therefore, the need for this have a look at.

## 2.4 Summary of Literature Review and Research Gaps

From the literature, teachers play an critical characteristic within the utilization of thinking approach in training arithmetic. Literature evaluation has moreover

determined that there can be a multiplicity of teacher-based completely elements which influencing the quantity to which arithmetic teachers use questioning approach as a technique for improving school school students' achievement in arithmetic. However, the evaluate has determined numerous studies and expertise gaps. For instance, on forms of mathematics questions, Mutuku et al (2017) asserts that arithmetic teachers need to apply inquiries to assist school students produce actual communications, make predictions and treatment problems. However, Mutuku et al (2017) as did one-of-a-type empirical studies have no longer interrogated the quantity to which forms of mathematics questions have an impact on school students' achievement in arithmetic.

On teachers' education on use of questioning method, Biama (2014) as did different empirical research have not interrogated the quantity to which teacher education effect use of thinking approach in training arithmetic on school school students' common ordinary overall performance in arithmetic in secondary schools. On mathematics teachers' enjoy inside the use of wondering technique, Biama (2014) posits that years of schooling enjoy are an regular predictor of better take a take a look at ratings in arithmetic among school students.

However, Biama (2014) as did remarkable empirical research failed to signify the specific kind of years which teachers must need to be powerful inside the usage of thinking approach for boosting school school students' achievement in talents in arithmetic. On mathematics teachers' mind-set inside the course of wondering technique, Musau (2015) notes that teachers' thoughts-set and

beliefs inside the direction of education and reading strategies are some of the dynamics that have an impact on successful use of wondering approach in some unspecified time in the future of curriculum implementation in schools. However, Musau (2015) as did one of a kind reviewed empirical studies have not indicated how teachers' favorable or horrible thoughts-set inside the path of additives of wondering approach have an effect on instructional success in mathematics among school students. These have been the research and understanding gaps which this have a take a look at sought to address.

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1 Introduction

In this chapter, the study outlines the technique which the study followed. It explains the research layout, study variables, vicinity of the study; goal populace; sampling techniques and sample length; statistics collection devices; strategies of finding out the validity and reliability of devices and the records series techniques. It additionally presents facts analysis and ethical issues.

### 3.2 Research Design

The study adopted a mixed methodology which followed each quantitative and qualitative strategy. According to Creswell (2014), in the quantitative approach, the researcher asks precise questions and collects quantifiable data from a big massive kind of individual. In this situation, statistics have been accumulated the usage of questionnaires. At the identical time, qualitative records changed into amassed through relying on the views of members and collecting statistics consisting in large a part of phrases from the people. In this situation, records had been accrued the use of interviews. Thus, the look at followed concurrent triangulation design as it ends up unmarried-segment format wherein the researcher carried out the quantitative and qualitative techniques sooner or later of the equal time-body and with identical weight. According to Creswell (2014), this layout typically consists of the concurrent, however separate, series and assessment of quantitative and qualitative statistics just so the researcher may moreover fine recognize the research hassle. The researcher merged the 2 records gadgets through bringing the separate consequences together within the interpretation. This layout changed into suitable for this study because it enabled the researcher to build up every quantitative and qualitative statistics. It must incorporate collections of

quantitative information that can be tabulated alongside a continuum in numerical shape. This format enabled the gathering of records that defined events after which prepared, tabulated, depicted and described the statistics collection. This changed into additionally followed through in-intensity and narrative descriptions of small numbers of cases.

### 3.2.1 Study Variables

There have been three ranges of variables for this study. They included; the independent variable, dependent and intervening variables.

#### 3.2.1.1 Independent Variable

The independent variable was the teacher factors which included; types of mathematics questions, teacher training, experience and attitude towards questioning technique.

#### 3.2.1.2 Dependent Variables

The dependent variable of the study was students' achievement in mathematics whose indicators were mathematics' academic performance in KCSE.

#### 3.2.1.3 Intervening Variables

The intervening variables of the study have been availability of instructional assets, principals' educational supervision and stakeholders' assist

### 3.3 Location of the Study

The study was undertaken in Mwala Sub-county in Machakos County. The sub-county has an approximate populace of 163, 032 humans and covers a place of 1018 km2, that is, a populace density of 161 folks according to km2 with 74.Nine% of the population dwelling beneath the poverty line (KNBS,

2009). The main monetary sports activities in Mwala Sub-county embody; sand harvesting, mango fruit farming, livestock husbandry and commercial trade amongst others. In Mwala Sub-county, many students in public secondary schools sign up low achievement in mathematics. KNEC (2017) reviews fifty two.0% of students are incompetent in primary mathematics' abilities. In addition, a document through Musau (2015) moreover indicates that 60.Zero% of school students in Mwala Sub-county are not capable of carry out primary operations in standards in mathematics check scores which has brought about low usual overall performance in mathematics in country wide examinations. Despite this information, few empirical researches have interrogated the teacher factors influencing use of questioning technique and their have an impact on school students' achievement in mathematics; because of this, the focus on Mwala Sub-county because the region of the study.

### 3.4 Target Population

Target population comprised 67 principals and 201 mathematics teachers all totaling to 268 respondents as shown in Table 3.1;

**Table 3.1: Target Population of the Study**

| **Respondents** | **Target Population** |
|---|---|
| Principals | 67 |
| Mathematics teachers | 201 |
| **Total** | **268** |

**Source: Mwala Sub-county Education (2019)**

### 3.5 Sampling Techniques and Sample Size

In this section, the study highlighted the sampling strategies which were followed and the tactics of willpower of the sample size and the sampling techniques.

#### 3.5.1 Sampling Techniques

The study used Yamane's Formula for sample length determination to calculate the sample size for this observe. The manner is as shown beneath:

$$N0 = \frac{N}{1 + N\,(e2)}$$

Where, N0 = favored sample size at ninety-five% self-assurance interval

N= Target Population

e = Confidence level of five% (decimal equal is 0.05)

Thus, preferred sample may be:

$$N0 = \frac{268}{1 + 268(0.05)2}$$

$$N0 = 160$$

Stratified sampling was used to create eight awesome strata based definitely at the sort of zones in Mwala Sub-county. From each sector, one maximum essential and 19 mathematics teachers had been determined on the usage of purposive sampling considering secondary schools which have registered low and high overall performance in mathematics in 2017 KCSE exam. This sampling approach enabled the researcher to recognise a pattern of eight principals and 152 mathematics teachers as shown in Table 3.2;

**Table 3.2: Sampling Frame**

| Respondents | Target Population | Sample Size | Sampling Techniques |
|---|---|---|---|
| Principals | 67 | 8 | Purposive sampling |
| Mathematics teachers | 201 | 152 | Purpose sampling |
| **Total** | **268** | **160** | |

**Source: Researcher (2019)**

### 3.6 Research Instruments

These are gear that have been used to build up statistics about the precise set difficulty subjects of research objectives. These included questionnaire for arithmetic teachers and interview publications for principals.

#### 3.6.1 Questionnaire for Mathematics Teachers

The researcher applied a questionnaire with closed-ended gadgets to accumulate quantitative data from mathematics teachers. This is due to the truth ordinary with Morse (2000), a questionnaire is a studies device which consist of a series of questions and distinctive turns on for the purpose of accumulating records from respondents and is regularly designed for statistical assessment of the reaction. The questionnaire changed into divided into five sections. The first section consisted of information on respondents' demographic profiles on the identical time as the second component contained 5-aspect Likert Scale form of questions based at the research dreams. Section B accrued quantitative statistics on varieties of questions; phase C on arithmetic teachers training; section D on revel in of arithmetic teachers and section E on mind-set of mathematics teachers and their have an impact on school students' fulfillment in mathematics.

### 3.6.2 Interview Guide for Secondary School Principals

Interviews can be unstructured, directional or non-directional. In this have a examine, the researcher used mounted interviews with open-ended check objects to acquire qualitative records from secondary school principals. Structured interviews had been critical for this take a look at due to the fact they enabled the researcher to ask probing and supplementary questions.

### 3.7 Pilot Study

Piloting of studies devices modified into achieved amongst sixteen respondents from a pattern of secondary schools from Kathiani Sub-county for the reason that in line with Kothari (2005), pilot sample want to represent 10% of the study sample (10.Zero% of 160). The purpose of piloting became to check on suitability and the clarity of the questions about the units designed, relevance of the records being sought and the appropriateness of the language used. The results of the piloting were used to pre-test the research devices so you can validate and verify their reliability.

### 3.7.1 Validity of the Research Instruments

To make sure face validity of the studies devices, supervisors from the University who're specialists in the place of instructional communique and technology assisted in validation. Their feedback, pointers and views had been used to restructure and revise the gadgets. The researcher tested the studies devices for appropriateness of gadgets so that you can understand any ambiguous and uncertain objects. Such objects have been restated to ensure that the respondents clearly understood them. The researcher improved the

exceptional of the devices via using changing vague questions with more suitable ones.

### 3.7.2 Reliability of the Research Instruments

In order to decide the reliability of the equipment, the researcher, with the assist of the school supervisors, significantly assessed the consistency of the responses on the pilot questionnaires to make a judgement on their reliability. Split-1/2 of approach modified into used to installation reliability of the test gadgets. In this example, the study objects had been administered as quickly as to a group of respondents after which divide the scores into classes referred to as 'halves'. Cronbach Alpha Method have end up used to set up the reliability index many of the 2 'halves'. The closer the Cronbach Alpha Coefficient is to1, the higher internal consistency of the check gadgets within the scale. In this examine, Cronbach Alpha Coefficients, r1 = 0.856, r2 = 0.968, r3 = zero.688 and r4 = 0.876 which yielded, r = 0.847, for all the four dreams, have been obtained which indicated excessive inner reliability and turn out to be consequently, perfect.

## 3.8 Data Collection Techniques

The researcher acquired an introductory letter from The School of Postgraduate Studies of Machakos University and Authorization Letter and Research Permit from National Commission for Science, Technology and Innovation (NACOSTI). The researcher moreover searched for an authorization letter from The County Commissioner and County Director of Education, Machakos. After acquiring studies allows and letters of authorization, the researcher then booked appointments with the respondents to administer questionnaires and

conduct interviews to accumulate prerequisite information for the look at. The questionnaires had been administered to the respondents to accumulate quantitative facts with the help of a studies assistant who have become educated for 5 days on the contents of the questionnaire. The duly crammed questionnaires had been accumulated and punctiliously saved for information evaluation. At the same time, the researcher carried out interviews to principals in character. The interviews have been achieved to gather qualitative facts at a time reachable for the interviewees. The contributors had been confident of confidentiality.

### 3.9 Data Analysis Procedures

Data analysis started out by means of identifying common subjects. The applicable data became damaged into phrases or sentences, which pondered a single, precise idea. The responses to the close to-ended objects have been assigned codes and labels. Frequency counts of the responses had been received to generate facts approximately the respondents and to illustrate the general trend of findings on the various variables that had been under research. Qualitative facts had been analyzed thematically alongside the study dreams and furnished in narrative forms on the equal time as quantitative information were analyzed descriptively using frequencies and possibilities and inferentially the use of linear regression assessment with the assist of Statistical Packages for Social Science (SPSS Version 23) and supplied the usage of tables and charts.

### 3.10 Logistical and Ethical Considerations

Ethical considerations in research involve outlining the content material fabric cloth of research and what come to be required of contributors, how informed consent modified into received and confidentiality ensured. The researcher ensured that any information given through manner of the respondents that touches on their non-public existence have been saved personal.

The respondents had been assured that no figuring out statistics about him or her is probably observed in written or one in every of a type communication.

# CHAPTER FOUR

# RESEARCH FINDINGS AND DISCUSSIONS

## 4.1 Introduction

This chapter offers the findings of the study. For clarity and chronology, it is arranged consistent with the four study hypotheses that the study sought to reply. In the primary segment, background facts approximately the respondents are offered, because it is probably pertinent in decoding the statistics that they furnished.

## 4.2 Response Rates

In this study, 152 questionnaires for Mathematics teachers were administered. Out of those,140 questionnaires were filled and returned and 8 principals were interviewed. This yielded response rates shown in Table 4.1;

**Table 4.1: Response Rates**

| **Respondents** | **Sampled Respondents** | **Those Who Participated** | **Achieved Return Rate (%)** |
|---|---|---|---|
| Principals | 8 | 8 | 100.0 |
| Mathematics teachers | 152 | 140 | 92.1 |
| **Total** | **160** | **148** | **92.5** |

**Source: Field Data (2019)**

From Table 4.1, principals and Mathematics teachers registered a response fee of ninety two.Five%. This is within the suited or advocated reaction costs of 75.Zero% (Creswell, 2014) and end up good enough to allow for generalization of the results to the target population.

### 4.3 Respondents' Demographic Information

The research instruments solicited demographic information of the respondents. These included gender and level of education.

#### 4.3.1 Gender of the Respondents

Information about the distribution of the respondents by gender was collected and the results as shown in Table 4.2:

**Table 4.2: Distribution of the Respondents by Gender**

| Gender | Principals | | Mathematics Teachers | |
|---|---|---|---|---|
| | **f** | **%** | **f** | **%** |
| Male | 6 | 75.0 | 84 | 60.0 |
| Female | 2 | 25.0 | 56 | 40.0 |
| **Total** | **8** | **100** | **140** | **100** |

**Source: Field Data (2019)**

Table 4.2 shows that 3-quarters 6(seventy five.Zero%) of the principals have been male while a quarter (25.Zero%) had been female. In the same vein, 84 (60.0%) of the Mathematics teachers have been male with 56(forty.0%) being lady. These information screen that there has been true enough gender disparity the least bit stages of the study and that the amount to which teachers' use of questioning approach as a pedagogical tool in a mathematics' elegance

influences school students' fulfillment in mathematics in public secondary schools is of extremely good scenario to all male and woman stakeholders.

### 4.3.2 Respondents' Level of Education

The research instruments also elicited information on level of education of Principals and Mathematics teachers. The results are shown in Table 4.3;

**Table 4.3: Respondents' Level of Education**

| Educational Qualifications | Principals | | Mathematics Teachers | |
|---|---|---|---|---|
| | f | % | f | % |
| Diploma | 0 | 0.0 | 11 | 7.9 |
| Bachelors | 5 | 62.5 | 98 | 70.0 |
| Postgraduate | 3 | 37.5 | 31 | 22.1 |
| **Total** | **8** | **100** | **140** | **100** |

**Source: Field Data (2019)**

Table four.3 indicates that majority, five(sixty two.5%) of the principals had Bachelors' Degrees whilst 3(37.Five%) had postgraduate qualifications. By the identical token, majority, 98(70.0%) of the Mathematics teachers had Bachelors' Degrees, 31(22.1%) had postgraduate qualifications while a paltry, 11(7.Nine%) had Diplomas. This information indicates that the respondents met the minimal qualification to be teachers and have been therefore, predicted to be geared up to reply the studies questions on the quantity to which teachers use wondering method as a training method impacts students' achievement in mathematics in public secondary schools.

## 4.4 Influence of Types of Mathematics Questions on Students' Achievement in Mathematics in Public Secondary Schools

The study sought to assess forms of mathematics questions which mathematics teachers use and the extent to which the questions have an effect on students' overall performance in mathematics in public secondary schools. Descriptive information had been amassed from Mathematics teachers and effects are shown in Table 4.4:

**Table 4.4: Views of Mathematics Teachers on the Influence of Types of Questions on Students' Achievement in Mathematics in Public Secondary Schools**

| Test Items | Ratings | | | | |
|---|---|---|---|---|---|
| | **SA** | **A** | **U** | **D** | **SD** |
| | *%* | *%* | *%* | *%* | *%* |
| Mathematics teachers rarely ask probing questions during mathematics' lesson as a way of improving students' achievement in mathematics | 75.0 | 11.5 | 4.5 | 7.5 | 1.5 |
| Mathematics teachers usually use comprehension questions in mathematics' lessons to improve students' achievement in mathematics | 65.0 | 10.5 | 3.0 | 11.5 | 10.0 |
| Mathematics teachers ask students mathematics questions which border on their knowledge of mathematics' concepts in order to improve their performance in mathematics | 75.0 | 10.5 | 2.5 | 9.0 | 3.5 |
| In mathematics' lessons, mathematics teachers rarely adopt use of analytical questions which are key to improving students' achievement in mathematics' | 88.5 | 2.5 | 1.5 | 4.5 | 3.0 |

| | | | | | |
|---|---|---|---|---|---|
| examinations | | | | | |
| Asking students questions which border on synthesis has improved their achievement in mathematics | 65.5 | 11.5 | 4.0 | 13.0 | 6.0 |

**Source: Field Data (2019)**

Table 4.4 shows that majority (75.Zero%) of the Mathematics teachers strongly agreed with the view that mathematics teachers not often ask probing questions in the course of mathematics' lesson as a manner of enhancing school students' fulfillment in mathematics as did eleven.Five% who agreed. However, handiest a paltry 4.Five% of the Mathematics teachers have been not positive, 7.Five% disagreed while 1.Five% strongly disagreed. During the interviews, the principals expressed comparable views that use of probing questions is very unusual among mathematics teachers. Principal, P1, said;

> *In my school, questioning technique isn't always commonly accompanied via mathematics teachers. They determine on other strategies such as concept commands and mission strategies. To them, school students won't reply to questions as rapid as predicted*

This supports Hill et al (2011) who defined that to conform with the hierarchy of shape in the taxonomy from simple keep in mind to the complicated evaluation ought to distort the area of questions in coaching. According to Hill et al (2011), teachers need to ask questions at better degrees most effective while they are fantastic that their school students have understood and may perform at decrease degrees is unrealistic. This implies that, regardless of the contradiction, probing questions play a key position in enhancing school students' mastery of mathematics' thoughts. In different phrases, wondering should begin from the acknowledged to the complex or unknown, this is,

probing should be adopted as a manner of improving students' mastery of thoughts in mathematics, which, in turn, improves their overall performance.

The study additionally discovered out that majority (sixty five.Zero%) of the Mathematics teachers strongly agreed with the view that Mathematics teachers normally use comprehension questions in mathematics' instructions to enhance students' achievement in mathematics. At the equal time, 10.Five% of the Mathematics teachers agreed. However, three.Zero% of the Mathematics teachers have been now not positive, 11.Five% of the Mathematics teachers disagreed even as 10.Zero% of the Mathematics teachers strongly disagreed. Similar perspectives have been expressed by using the principals within the course of the interviews. The principals moreover cited that the most common technique of coaching mathematics is locate of comprehension questions. Principal, P2, placed;

> *In my school, even though mathematics teachers won't formulate their comprehension questions, there may be a sizable appreciation such questions are typically used and are located in textbooks and beyond papers. These questions touch on school students' functionality to govern unique ideas in mathematics to healthy one in every of a type precise situation collectively with issue of formulation*

These findings corroborate the findings of a study carried out in schools in KwaZulu Natal Province in South Africa wherein Seah and Andersson (2015) installed that comprehension questions require students to choose out the ones facts which might be applicable to reply the question with the aid of describing, evaluating or contrasting. According to Seah and Anderson (2015), in the course of mathematics' instructions, comprehension questions require students

to interpret by using making comparisons, displaying relationships among mind and provide records presented inside the shape of charts, graphs and tables (Seah & Andersson, 2015).

This indicates that scholars should screen a non-public hold close of the cloth by using the use of being able to rephrase it to offer an outline in his or her own words and to apply it in making comparisons. In unique terms, comprehension questions are quite suitable whilst school students are required to artwork on commercial enterprise employer and choice of statistics and ideas.

For example, whilst thinking about strategies together with anticipate, pair and percentage which allows students to collaborate and percent their understanding.

The study additionally discovered that 3-quarters (seventy five.Zero%) of the Mathematics teachers strongly agreed with the view that mathematics teachers ask questions which border on their know-how of mathematics' principles if you need to decorate their performance in mathematics. In the equal breath, 10.Five% of the Mathematics teachers agreed. However, 2.Five% of the Mathematics teachers had been no longer sure, nine.Zero% disagreed while 3.5% strongly disagreed. During the interviews, principals replied in prefer of the views that teachers regularly adopt expertise form of questions. Principal, P3, referred to:

> *In my school, mathematics teachers regularly undertake use of understanding-based totally absolutely kind of questions inclusive of the formulae for fixing unique duties in mathematics*

These findings corroborate the findings of a study performed in Machakos County wherein Mutuku et al (2017) hooked up that, at the same time as a student answers in desire to commenting, the trainer can invite other school students to attach or amplify the previous solution given. According to Mutuku et al (2017), teachers apply information learnt to clear up a hassle of real-lifestyles situation, make up a puzzle recreation in mathematics the usage of mind from the content cloth being discovered and to use mathematical ideas to solve distinct associated problems in other topics like physics or chemistry. Thus, the ones findings point to the fact that know-how shape of questions count on school students to display their know-how and application of such talents to new conditions or issues.

In one-of-a-kind phrases, giving school students the possibility to connect their gaining knowledge of through hassle-primarily based assignments gives opportunities to apply knowledge level thinking. Majority (88.Five%) of the Mathematics teachers strongly agreed with the view that, in mathematics' instructions, mathematics teachers hardly ever adopt use of analytical questions which can be key to improving school students' success in mathematics' examinations. A paltry 2.Five% of the Mathematics teachers agreed. At the equal time, 1.Five% have been no longer sure, 2(four.Five%) of disagreed while 3.Zero% strongly disagreed. In the same breath, majority (sixty five.Five%) of the Mathematics teachers strongly agreed with the view that asking students questions which border on synthesis has progressed their achievement in mathematics. Eleven.5% agreed. At the equal time, four.0% were no longer sure, thirteen.Zero% disagreed at the same time as 6.0%

strongly disagreed. During the interviews, the Principals moreover mentioned that many mathematics teachers do now not practice analytical questions in mathematics. Principal, P4, stated:

> *Use of analytical questions in mathematics' commands is an wonderful incidence. Mathematics teachers not often adopt such techniques*

These findings are steady with the assertions through Mutuku et al (2017) that mathematics teachers have to use questions to help students produce particular communications, make predictions and resolve issues. This means that synthesis is putting together records in a distinctive way by means of way of reconstructing facts in an ultra-modern dating or figuring out unique relationships. In precis, those findings are indicative of the reality that there may be a multiplicity of mathematics questions which teachers want to adopt as a manner of improving pupil' fulfillment in mathematics. These encompass; probing, comprehension, information, analytical and questions about synthesis which all border to permitting school students to understand specific concepts in mathematics. To further verify the have an impact on of sorts of questions about school students' achievement in mathematics in public secondary schools, facts were amassed on quantity of mathematics questions teachers ask and the scholars' fulfillment in mathematics in KCSE as shown in Table 4.5.

**Table 4.5: Results of Number of Mathematics Questions Teachers Ask and Students' Performance in Mathematics in 2018 KCSE**

| Number of Mathematics questions Teachers Ask | Achievement in Mathematics in 2018 KCSE |
|---|---|
| 1 | 1.165 |
| 2 | 1.921 |

| | |
|---|---|
| 2 | 2.013 |
| 3 | 3.045 |
| 3 | 3.743 |
| 4 | 5.129 |
| 4 | 7.123 |
| 5 | 8.743 |

**Source: MoE (2019)**

Table 4.5 suggests that the sorts and the quantity of mathematics questions which teachers use determine the overall performance of their school students in KCSE. In different phrases, teachers who undertake use of many awesome forms of questions have their school students check in extraordinary grades in mathematics in KCSE. The results in Table 4.5 were subjected to Linear Regression which generated as shown in Table 4.6:

**Table 4.6: Linear Regression Analysis Showing Relationship Between Number and Types of Mathematics Questions and Students' Achievement in Mathematics in 2018 KCSE**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | Constant) | -1.758 | .836 | | -2.103 | .080 |
| | Number of Mathematics Questions | 1.956 | .258 | .952 | 7.582 | .000 |

a. Dependent Variable: Students' Achievement in Mathematics in KCSE

**Source: SPSS Generated (2019)**

Table 4.6 indicates linear regression evaluation which generated a linear version of the form; Students' Achievement in Mathematics in KCSE = -1.758 + 1.956Number and Types of Mathematics questions. These consequences from the linear regression equation suggests that the coefficient for students'

fulfillment in mathematics in KCSE attributed to the range and forms of mathematics questions is 1.956. This approach that for every increase within the variety and varieties of mathematics questions a teacher poses in the route of mathematics' training, school students' achievement in mathematics in KCSE is expected to boom with the aid of manner of a component of one.956 (high quality coefficient). The fee -1.758 (negative) indicates that students' achievement in mathematics in KCSE does no longer depend on some other detail apart from sorts of questions.

In different phrases, wrong styles of questions may also lead to failure in mathematics amongst students in public secondary schools. Similarly, from the outcomes in Table 4.6, the p-price, 0.000 is much less than 0.05, this is, a low p-rate (0.000< zero.05) indicates that the null hypothesis, **H01**, is rejected.

Thus, there's giant effect of the quantity of mathematics questions about school students' fulfillment in mathematics in public secondary schools. Thus, this affirms that there are numerous types of mathematics questions which teachers need to undertake as a manner of improving scholar' success in mathematics.

## 4.5 Influence of Mathematics Teachers' Training in Questioning Techniques on Students' Achievement in Mathematics in Schools

The study sought to examine how mathematics teachers' training on questioning techniques impact students' achievement in mathematics in public secondary schools. Descriptive data were collected from Mathematics teachers, organized into specific thoughts and results are shown in Table 4.7;

**Table 4.7: Views of Mathematics Teachers on the Influence of Training on Questioning Techniques on Students' Achievement in Mathematics in Public Secondary Schools**

| Test Items | SA % | A % | U % | D % | SD % |
|---|---|---|---|---|---|
| Mathematics teachers have acquired training on questioning technique as a way of improving students' achievement in mathematics | 80.5 | 8.5 | 1.5 | 5.5 | 4.0 |
| Mathematics teachers have not been trained to ask questions which cater for all students' needs as a way of improving their achievement in mathematics | 78.5 | 14.5 | 2.5 | 3.0 | 1.5 |
| Mathematics teachers have been trained how to design questions which has improved students' achievement in mathematics | 69.5 | 12.0 | 2.0 | 10.0 | 6.5 |
| Training of mathematics teachers on use of questioning technique has helped improve students' achievement in mathematics | 74.5 | 17.0 | 2.5 | 3.5 | 2.5 |

**Source: Field Data (2019)**

Table 4.7 exhibits that majority (eighty.Five%) of the Mathematics teachers strongly agreed with the view that mathematics teachers have obtained education on thinking techniques as way of enhancing students' achievement in mathematics as did 8.Five% who agreed. However, simplest a paltry 1.Five% have been unsure, 5.Five% disagreed at the same time as four.Zero% strongly disagreed. Similar views were expressed by the usage of Principals who moreover stated that teachers are often knowledgeable on mathematics' coaching strategies inclusive of questioning technique. Principal, P5, indicated:

> *In education schools and universities, teachers undertake a unit on mathematics' coaching strategies wherein they are expected to collect primary schooling talents on a way to use wondering as a teaching pedagogy*

These findings lend credence to the assertions of Henderson (2014) that education equips teachers with teaching techniques and evaluation abilities to be observed at the same time as coaching. This implies that wondering approach and its elements are designed in a manner that calls for well-educated manpower to translate the factors into reality in a mathematics elegance. The study additionally found out that majority (seventy eight.Five%) of the Mathematics teachers strongly agreed with the view that mathematics teachers have not been trained to invite questions which cater for all school students' desires as a way of enhancing their fulfillment in mathematics.

At the same time, 14.Five% agreed. However, 2.Five% were undecided, three.Zero% disagreed whilst 1.Five% strongly disagreed. On the contrary, principals refuted claims that mathematics teachers aren't trained to invite questions which cater for the wishes of all the school students. Principal, P6, stated:

> *In any teacher education institution, the curriculum is frequently designed to be learner-focused. As skilled specialists, teachers have to adopt education techniques along with questioning strategies which cater for the needs of all students*

These findings lend credence to the assertions of Wachira (2010) who posits that a fulfillment use of questioning technique in coaching mathematics wishes greater than most effective a teacher who has sufficient pedagogical and content material expertise since most additives of the thinking technique cope with the coaching of values and teachers whose behavior is perceived through school students as irrelevant aren't able to acquire achievement facilitators of

wondering approach. In other phrases, use of thinking technique has not been clean with teachers' competency, professional adequacy, professional hobby, motivation and expert competence being delivered into recognition.

Despite these contradictions, these findings factor to how training of mathematics teachers on a manner to undertake questioning strategies in a way that consists of the hobbies, desires and selections of all students. This shows that the most important person within the use of thinking approach is the skilled mathematics trainer. In different phrases, with their know-how, experience and competencies, teachers are essential to use of questioning approach in training mathematics to high school students. The study additionally discovered that majority (69.5%) of the Mathematics teachers strongly agreed with the view that mathematics teachers have been educated on a way to format questions which has progressed school students' success in mathematics. In the identical breath, 12.Zero% agreed. However, 2.Zero% have been not certain, 10.0% disagreed whereas 6.5% strongly disagreed. Majority (seventy four.Five%) of the Mathematics teachers strongly agreed with the view that education of mathematics teachers on use of thinking approach has helped enhance school students' success in mathematics. 17.Zero% agreed. At the identical time, 2.5% were uncertain, three.Five% disagreed even as 2.Five% strongly disagreed. During the interviews, principals additionally indicated that mathematics teachers have an easy training at the way to set and layout kinds of mathematics questions. Principal, P7, found:

> *In many education schools and universities, teachers are trained at the manner to set all of the six degrees of questions primarily based on Bloom's Taxonomy. To me, what hinders such programs of questioning strategies is teachers' attitude and workload*

These findings corroborate the pointers of Shinali and Ng'ethe (2018) who stated that teacher education curriculum must introduce content material in wondering approaches and make teachers apprehend the dreams and factors of questioning technique nicely with the intention to use it efficiently in education mathematics to high school students.

However, Shinali and Ng'ethe (2018) cited that the greatest hassle is likely to be encountered at the same time as teachers are required to alternate their instructional strategies to teach abilities in mathematics to students using thinking technique. This approach that the capacity to set and format mathematics questions which adheres to fundamental necessities inclusive of Bloom's Taxonomy are able to undertake every detail of wondering approach in class in case you want to enhance school students' fulfillment in skills in mathematics. To further ascertain the have an impact on of teachers' education on school students' success in mathematics in public secondary schools, data were gathered on style of in-issuer trainings which mathematics teachers have undertaken and school students' success in mathematics in KCSE. The outcomes are verified in Table 4.8:

**Table 4.8: Results of Number of In-Service Trainings Mathematics Teachers Have Undertaken and Students' Performance in Mathematics in 2018 KCSE**

| Number of In-Service Trainings Teachers Have Undertaken | Achievement in Mathematics in 2018 KCSE |
|---|---|
| 0 | 1.165 |
| 0 | 1.921 |
| 2 | 2.013 |
| 2 | 3.045 |
| 3 | 3.743 |
| 4 | 5.129 |
| 5 | 7.123 |
| 6 | 8.743 |

**Source: MoE (2019)**

Table 4.8t shows that the extensive kind of in-carrier education a mathematics teacher undertakes determines the overall performance of their school students in KCSE. This implies that mathematics teachers who undertake many in-company trainings have extra abilties to decorate students' fulfillment in mathematics in KCSE. The results in Table 4.8 were subjected to linear regression and results are shown in Table 4.9:

**Table 4.9: Linear Regression Analysis Showing Relationship Between Number of In-Service Trainings Mathematics Teachers Have Undertaken and Students' Achievement in Mathematics in 2018 KCSE**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .867 | .491 | | 1.767 | .128 |
| | Number of In-Service Trainings Teachers Have Undertaken | 1.179 | .143 | .959 | 8.240 | .000 |

a. Dependent Variable: Students' Achievement in Mathematics in KCSE

**Source: SPSS Generated (2019)**

Table 4.9 indicates linear regression evaluation which generated a linear model of the shape; Students' Achievement in Mathematics in KCSE = zero.867 + 1.179Number of In-Service Trainings Teachers Have Undertaken. These results from the linear regression equation indicates that the coefficient for school kids' fulfillment in mathematics in KCSE attributed to the variety of in-service trainings mathematics teachers have undertaken is 1.179. This means that for each increase within the huge sort of in-provider trainings mathematics teachers adopt, school students' success in mathematics in KCSE is predicted to growth via a factor of 1.179 (wonderful coefficient). The price 0.867 (tremendous) shows that students' success in mathematics in KCSE does now not exceptional depend upon in-service training, but additionally at the fundamental schooling which mathematics teachers acquired in universities or trainer schooling schools. In different phrases, in-carrier education handiest improves at the form of schooling which mathematics teachers already have from education institutions; all of that have an effect on school students' success in mathematics in KCSE. Similarly, from the effects in Table 4.9, the p-price, 0.000 is a good deal much less than zero.05, this is, a low p-price (zero.000< zero.05) shows that the null hypothesis, **H02**, is rejected. Thus, there is huge have an impact on of mathematics teachers' schooling on students' achievement in mathematics in public secondary schools. Hence, trainer training, whether or no longer fundamental or in-provider, is a totally critical step in teacher training since it consists of equipping teachers with pre-

requisite talents for effective study room pedagogy. Besides, schooling equips teachers with coaching strategies and evaluation talents to be adopted even as teaching.

### 4.6 Influence of Mathematics Teachers' Experience in Using Questioning Technique on Students' Achievement in Mathematics in Secondary Schools

The study sought to establish how experience of mathematics teachers in using questioning technique influence students' achievement in mathematics in public secondary schools. Descriptive data were collected from Mathematics teachers, processed and results are shown in Table 4.10;

**Table 4.10 Views of Mathematics Teachers on the Influence of Teaching Experience in Using Questioning Technique on Students' Achievement in Mathematics in Public Secondary Schools**

| Test Items | SA % | A % | U % | D % | SD % |
|---|---|---|---|---|---|
| Mathematics teachers have not taught mathematics using questioning technique for many years which has not improved students' achievement in mathematics | 59.5 | 15.5 | 4.5 | 11.5 | 9.0 |
| Mathematics teachers' level of exposure in using questioning technique has helped improve students' achievement in | 56.5 | 23.5 | 2.5 | 9.5 | 8.0 |

| | | | | | |
|---|---|---|---|---|---|
| mathematics | | | | | |
| Mathematics' teaching experience has not helped improve students' achievement in mathematics | 51.5 | 8.5 | 7.0 | 22.5 | 10.5 |

Table 4.10 exhibits that a truthful majority (59.Five%) of the Mathematics teachers strongly agreed with the view that mathematics teachers have now not taught mathematics using wondering approach for decades which has now not improved students' success in mathematics as did 9.7% who agreed. However, most effective a paltry 4.5% had been not sure, 11.Five% disagreed whereas 9.Zero% strongly disagreed. During the interviews, Principals moreover concurred that training enjoy is essential in the usage of questioning technique. Principal, P8, cited:

> *In my school, mathematics trainer has high-quality taught for best 12 months. This has no longer translated to advanced overall performance in mathematics amongst my school students*

These findings corroborate the findings of a complete analysis thru Greenwald et al (2012) who hooked up a pleasing relationship among years of trainer experience and adoption of questioning method as a way for training skills in mathematics in secondary schools. The study discovered that a honest majority (fifty six.5%) of the Mathematics teachers strongly agreed with the view that mathematics teachers' stage of exposure inside the use of questioning technique has helped beautify school students' achievement in mathematics whilst 23.5% agreed. However, 2.Five% have been uncertain, 9.Five% disagreed at the same time as eight.Zero% strongly disagreed. The study

additionally located that barely extra than half (51.Five%) of the Mathematics teachers strongly agreed with the view that mathematics' coaching revel in has now not helped improve school students' fulfillment in mathematics. In the identical breath, 8.Five% agreed. However, 7.Zero% had been no longer positive, 22.Five% disagreed whereas 10.Five% strongly disagreed.

During the interviews, the principals moreover concurred with the teachers that exposure to mathematics' coaching has a manner of improving school students' fulfillment in mathematics. Principal, P9, positioned:

> *In my school, we have registered quite low typical performance in mathematics due to the fact our mathematics trainer is reasonably new within the subject and has now not been completely uncovered to a multiplicity of things which have an effect on use of questioning method*

These findings are regular with the assertions of Rivkin et al (2013) who stated that scholars of experienced teachers attained considerably higher stages of fulfillment in mathematics than did school students of latest teachers who had no revel in in the usage of questioning technique, that is, those with one to three years of revel in. This factors to the fact that teachers' experience in the use of questioning approach to educate mathematics is absolutely correlated with higher learner fulfillment. To similarly confirm the effect of teachers' revel in in the use of wondering techniques on school students' success in mathematics in public secondary schools, records had been gathered on range of years mathematics teachers had been using wondering strategies and the

scholars' achievement in mathematics in KCSE. The consequences are confirmed in Table 4.11:

**Table 4.11: Results of Number of Years Mathematics Teachers Have Been Using Questioning Techniques and Students' Performance in Mathematics in 2018 KCSE**

| Number of Years Mathematics teachers Have Taught Using Questioning Techniques | Achievement in Mathematics in 2018 KCSE |
|---|---|
| 1 | 1.165 |
| 3 | 1.921 |
| 5 | 2.013 |
| 9 | 3.045 |
| 12 | 3.743 |
| 17 | 5.129 |
| 21 | 7.123 |
| 28 | 8.743 |

**Source: MoE (2019)**

Table 4.11 suggests that the type of years a mathematics teacher has taught determines the overall performance in their students in KCSE. This manner that training which mathematics teachers have plays a critical enhancing students' fulfillment in mathematics in KCSE. The results in Table 4.11 were subjected to Linear Regression which generated as shown in Table 4.12:

**Table 4.12: Linear Regression Analysis Showing Relationship Between Number of Years Mathematics Teachers Have Taught and Students' Achievement in Mathematics in 2018 KCSE**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .709 | .209 | | 3.389 | .015 |
| | Number of Years | .283 | .014 | .993 | 20.184 | .000 |

| | |
|---|---|
| | Mathematics teachers Have Taught |

a. Dependent Variable: Students' Achievement in Mathematics in KCSE

**Source: SPSS Generated (2019)**

Table 4.12 suggests linear regression analysis which generated a linear version of the shape; Students' Achievement in Mathematics in KCSE = zero.709 + zero.283Number of Years Mathematics teachers Have Taught. These consequences from the linear regression equation indicates that the coefficient for school students' fulfillment in mathematics in KCSE attributed to the wide variety of in-issuer trainings mathematics teachers have undertaken is 0.283. This method that for each increase in the wide variety of years mathematics teachers have taught, students' fulfillment in mathematics in KCSE is expected to increase thru an issue of zero.283 (high best coefficient).

The charge 0.709 (positive) suggests that students' fulfillment in mathematics in KCSE does now not first-rate rely on teachers' experience, however also at the number one education which mathematics teachers obtained in universities or teacher education schools. In distinct terms, coaching experience most effective gives cost to the training which mathematics teachers already have from schooling establishments; all of which impact school students' fulfillment in mathematics in KCSE. Similarly, from the consequences in Table four.12, the p-price, zero.000 is less than zero.05, this is, a low p-cost (zero.000< zero.05) suggests that the null speculation, H03, is rejected. Thus, there may be considerable have an impact on of mathematics teachers' revel in in using questioning strategies on school students' achievement in mathematics in

public secondary schools. This method that revel in in the usage of thinking strategies is essential to students' fulfillment in mathematics. That is, mathematics teachers with few years of teaching revel in and use of arms-on strategies including thinking technique are much less possibly to teach efficiently and assure a fulfillment use of questioning technique in coaching mathematics. This suggests that the variety of years mathematics teachers have in training determines the quantity to which they use questioning technique in training mathematics to school students.

### 4.7 Influence of Mathematics Teachers' Attitude towards Questioning Technique on Students' Achievement in Mathematics in Public Secondary Schools

The study examined how attitude of mathematics teachers towards questioning technique influences students' achievement in mathematics in public secondary schools. Descriptive data were collected from Mathematics teachers, organized into specific thoughts and results are shown in Table 4.13;

**Table 4.13: Views of Mathematics Teachers on the Influence of Teachers' Attitude towards Questioning Technique on Students' Achievement in Mathematics in Public Secondary Schools**

| Test Items | Ratings | | | | |
|---|---|---|---|---|---|
| | SA % | A % | U % | D % | SD % |
| Mathematics teachers believe that using questioning technique in mathematics' instruction improves students' | 78.0 | 11.0 | 2.5 | 5.5 | 3.0 |

| | | | | | |
|---|---|---|---|---|---|
| achievement in mathematics | | | | | |
| Mathematics teachers are interested in using questioning technique in teaching mathematics as a way of improving students' achievement in mathematics | 69.5 | 25.5 | 1.5 | 2.0 | 1.5 |
| Mathematics teachers feel motivated to use questioning technique while teaching mathematics as a way of improving students' achievement in mathematics | 74.5 | 19.5 | 1.5 | 3.2 | 1.3 |
| Mathematics teachers perceive use of questioning technique as the best technique of improving students' achievement in mathematics | 76.5 | 10.5 | 3.0 | 7.0 | 4.0 |

**Source: Field Data (2019)**

Table 4.13 shows that a straightforward majority (seventy eight.Zero%) of the Mathematics teachers strongly agreed with the view that mathematics teachers trust that using questioning method in mathematics' practise improves students' achievement in mathematics. Eleven.Zero% agreed. However, handiest a paltry 2.Five% had been uncertain, five.Five% disagreed while 3.Zero% strongly disagreed. The study revealed that a sincere majority (sixty nine.Five%) of the Mathematics teachers strongly agreed with the view that mathematics teachers are interested in using thinking approach in coaching mathematics as a manner of enhancing school students' success in mathematics. Slightly more than 1 / 4 (25.5%) of the Mathematics teachers agreed.

However, 1.5% had been no longer sure, 2.Zero% disagreed while 1.Five% strongly disagreed. During the interviews, principals, however, disagreed with the teachers. The principals mentioned that many mathematics teachers do not

regard thinking approach because the best pedagogical tool for education mathematics. Principal, P10, mentioned;

> *Mathematics teachers in my school determine on other coaching strategies to questioning strategies. Thy maintain in mind it time wasting and that many students have no potential to apprehend the man or woman of many questions in mathematics. In instances once they deliver questions as assignments; they hardly ever mark them. To them, questioning approach slows their syllabus coverage*

These findings corroborate the assertions of Abrami et al (2014) that mind-set of the mathematics teachers has effect on their conduct due to the fact the teacher is possibly to undertake a method of coaching that he or she enjoys, has self-assurance in or finds beneficial. This indicates that, regardless of the contrasting views from mathematics teachers and principals, effective attitude in the direction of mathematics' educational techniques are suitable due to the reality they will have an effect on his or her willingness to apply it to educate and ensure that scholars understand marvelous instructional grades in Mathematics.

The study moreover discovered that majority (seventy four.Five%) of the Mathematics teachers strongly agreed with the view that mathematics teachers sense encouraged to use questioning method whilst teaching mathematics as a manner of improving school students' fulfillment in mathematics. In the identical breath, 19.Five% agreed. However, 1.Five% have been no longer positive, three.2% disagreed at the same time as 1.3% strongly disagreed.

Table 4.13 shows that a straightforward majority (76.Five%) of the Mathematics teachers strongly agreed with the view that they understand use of

wondering approach because the super method of enhancing school students' fulfillment in mathematics even as 10.Five% agreed. However, most effective a paltry 3.Zero% have been unsure, 7.Zero% disagreed whereas four.0% strongly disagreed. On the alternative, principals advised that many mathematics teachers rarely enjoy precipitated nor do they recognize thinking technique due to the fact the satisfactory pedagogical tool for teaching mathematics.

However, the ones findings contradict the findings of Kamau (2015) and Ngui (2018) who set up that a big variety of teachers maintain awful mindset in the direction of fingers-on coaching techniques which incorporates questioning method as an approach for reinforcing academic fulfillment in mathematics amongst school students. Such additives variety from avoidance of questioning technique, tension, self-efficacy, enthusiasm, self-perception, liking and value of questioning technique. Despite these contradictions, these findings attest to the fact that effective use of wondering method is depending on the teachers' intentions, personal ideals and mindset in the direction of coaching and learning of mathematics.

In precis, mind-set which mathematics teachers have toward questioning technique is critical since it determines the volume to which they use it for coaching mathematics. In distinctive phrases, if mathematics teachers' mindset is satisfactory towards using instructional thinking approach, then they may without issues offer beneficial perception approximately the adoption of questioning approach into coaching and gaining knowledge of methods. To

further ascertain the have an impact on of teachers' mindset within the direction of wondering strategies on school students' success in mathematics in public secondary schools, statistics had been gathered on degrees of attitude amongst mathematics teachers towards the usage of thinking strategies and the scholars' fulfillment in mathematics in KCSE. The consequences are validated in Table 4.14:

**Table 4.14: Results of Levels of Attitude among Mathematics Teachers towards Using Questioning Techniques and Students' Performance in Mathematics in 2018 KCSE**

| Levels of Attitude among Mathematics Teachers towards Using Questioning Techniques | Achievement in Mathematics in 2018 KCSE |
|---|---|
| 1 | 1.165 |
| 1 | 1.921 |
| 2 | 2.013 |
| 4 | 3.045 |
| 4 | 3.743 |
| 5 | 5.129 |
| 5 | 7.123 |
| 5 | 8.743 |

**Source: MoE (2019)**

Table 4.14 suggests that degrees of mind-set among mathematics teachers is crucial in figuring out school students' fulfillment in mathematics in KCSE. This implies that mathematics teachers who have terrible thoughts-set or manifest low motivation stages have their school students check in low grades in mathematics.

The results in Table 4.14 were subjected to Linear Regression which generated as shown in Table 4.15:

**Table 4.15: Linear Regression Analysis Showing Relationship Between Levels of Attitude among Mathematics teachers towards Using Questioning Techniques and Students' Achievement in Mathematics in 2018 KCSE**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | -.250 | 1.236 | | -.202 | .846 |
| | Levels of Attitude among Mathematics teachers towards Using Questioning Technique | 1.292 | .329 | .849 | 3.928 | .008 |

a. Dependent Variable: Students' Achievement in Mathematics in KCSE
**Source: SPSS Generated (2019)**

Table 4.15 indicates linear regression evaluation which generated a linear version of the shape; Students' Achievement in Mathematics in KCSE = -0.250 + 1.292Levels of Attitude among Mathematics teachers toward Using Questioning Techniques. These consequences from the linear regression equation suggests that the coefficient for school youngsters' fulfillment in mathematics in KCSE attributed to the range of in-carrier trainings mathematics teachers have undertaken is 1.292. This manner that for every boom within the degrees of mind-set among mathematics teachers in the direction of the usage of thinking strategies, school students' fulfillment in mathematics in KCSE is predicted to growth with the useful resource of a issue of one.292 (first-rate coefficient).

The fee -0.250 (terrible) suggests that scholars' success in mathematics in KCSE does not is based upon especially at the ranges of motivation or mindset of mathematics teachers toward using wondering strategies. In special phrases, teachers' attitude determines the forms of mathematics questions which they can ask or layout for school kids, which may additionally moreover determine whether or not or no longer students skip or fail in mathematics' check rankings.

Similarly, from the effects in Table 4.15, the p-charge, zero.008 is much less than 0.05, this is, a low p-price (0.008< zero.05) shows that the null speculation, **H04**, is rejected. This similarly indicates that mathematics teachers' fine thoughts-set inside the course of thinking techniques is good because it impacts teachers' willingness to apply it to educate and ensure that scholars recognise exceptional academic grades in Mathematics.

# CHAPTER FIVE

# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## 5.1 Introduction

This chapter presents research findings, conclusions, tips and guidelines for further research as discussed underneath the research targets.

## 5.2 Summary of Findings

This phase gives specific precis of the study findings based totally at the targets of the have a study that included; evaluation of the effect of forms of mathematics questions, mathematics teachers' training on use of wondering techniques, experience in the use of questioning approach and mindset of mathematics teachers in the direction of thinking techniques on students' fulfillment in mathematics in public secondary schools.

### 5.2.1 Influence of Types of Mathematics Questions

The study installation that there are unique kinds of questions which teachers use in mathematics. These embody; probing, comprehension, understanding, analytical and questions about synthesis which all border to permitting students to comprehend distinct standards in mathematics. However, many mathematics teachers use best smooth degree varieties of questions and disregards the complex and application questions. It is also evident that questioning method isn't always typically adopted through mathematics. From the study findings, many mathematics teachers now not frequently study the hierarchy of shape in the taxonomy from smooth keep in mind to the complex evaluation that could distort the vicinity of questions in training.

This suggests that, low school students' fulfillment in mathematics in public secondary schools is a consequence of the sorts of questions teachers use even as coaching concepts of mathematics.

### 5.2.2 Mathematics Teachers' Training on Questioning Techniques

From the findings, it is evident that mathematics teachers have essential schooling on thinking techniques as a way of enhancing school students' fulfillment in mathematics. This means that training equips teachers with coaching techniques and assessment competencies to be adopted even as training. Besides, education of mathematics teachers on a manner to undertake thinking techniques in a way that incorporates the pastimes, goals and choices of all students, is vital for the fulfillment of the usage of questioning as a pedagogical device. Thus, the functionality to set and design mathematics questions which adheres to essential requirements which includes Bloom's Taxonomy are capable of adopt every element of thinking technique in elegance with the intention to enhance school students' success in competencies in mathematics.

### 5.2.3 Mathematics Teachers' Experience in Using Questioning Techniques

Both quantitative and qualitative findings mean that experience within the use of thinking strategies is fundamental to the fulfillment using questioning approach as a mathematics' education method. However, from the have a study finding, most mathematics teachers have now not taught mathematics using questioning technique for many years. This has negatively affected school students' success in mathematics. This shows that the variety of years mathematics teachers have in education determines the amount to which they

use wondering technique in coaching mathematics to school students. From the study findings, school students of experienced teachers attained notably higher levels of achievement in mathematics than did students of new teachers who had no experience in the use of thinking approach, this is, those with one to three years of experience. Hence, mathematics teachers enjoy in the usage of questioning method to educate mathematics is undoubtedly correlated with better learner achievement.

### 5.2.4 Mathematics Teachers' Attitude closer to Questioning Technique

The study additionally installation that mind-set is a prime success issue in teachers' use of thinking approach in education mathematics. However, the study has observed out that many mathematics teachers arise horrific attitude closer to use of questioning approach. Many mathematics teachers do now not trust that the usage of thinking technique in mathematics' education improves school students' achievement in mathematics. They pick different teaching techniques to questioning techniques. Mathematics teachers recollect use of thinking techniques as time losing and that many students don't have any ability to understand the character of many questions in mathematics. In instances when they supply questions as assignments; they rarely mark them.

To them, questioning method slows their syllabus insurance. This indicates that effective use of questioning technique is dependent on the teachers' intentions, private ideals and mindset towards coaching and mastering of mathematics. In summary, attitude which mathematics teachers have toward thinking technique is critical as it determines the quantity to which they use it for training mathematics.

## 5.3 Conclusions

Drawing from the above findings, it's miles apparent that questioning technique is a totally critical coaching tool for mathematics and mathematics teachers use first rate kinds of questions which teachers use in mathematics. These encompass; probing, comprehension, understanding, analytical and questions about synthesis which all border on permitting school students to understand unique concepts in mathematics. However, many mathematics teachers use most effective simple degree sorts of questions and disregards the complicated and alertness questions. It is also glaring that questioning technique isn't always normally accompanied with the resource of mathematics. It is likewise apparent that training plays a vital function in offering competencies at the manner to apply questioning techniques in coaching mathematics in secondary schools.

However, except the number one education from schools and universities, very few mathematics teachers have undertaken in-carrier training to collect new strategies of applying wondering techniques at some stage in mathematics' coaching and beautify school students' success. Experience in using thinking approach as a pedagogical device for mathematics cannot be omitted.

The study set up mathematics teachers with a wealth of experience in teaching mathematics the use of wondering strategies have their students sign on extremely good grades in mathematics' take a examine scores. From the study findings, it's far obvious that mindset is a prime achievement issue in teachers' use of wondering approach in teaching mathematics. However, many

mathematics teachers occur bad mind-set in the direction of use of wondering technique. This indicates that effective use of wondering technique is depending on the teachers' intentions, private ideals and mind-set in the direction of coaching and mastering of mathematics. In precis, mindset which mathematics teachers have in the direction of wondering technique is vital because it determines the volume to which they use it for coaching mathematics.

**5.4 Recommendations**

i. On types of mathematics questions, the study recommends that mathematics teachers have to be privy to the types of questions and the way they need to placed them throughout to school students in a manner for you to stimulate studying of mathematics.

ii. On mathematics teachers' training on use of questioning techniques and school students' fulfillment in mathematics, the have a study recommends that mathematics teachers must try and go through many in-provider trainings on how enhance the questioning technique abilties.

iii. On mathematics teachers' experience on use of questioning techniques and school students' success in mathematics, the study recommends that mathematics teachers interact extra with professional colleagues thru attending seminars and workshops designed to improve their revel in and stages of exposure to unique strategies of thinking.

iv. On mathematics teachers' attitude towards questioning techniques and school students' achievement in mathematics, the study recommends

that mathematics teachers should have advantageous mindset within the direction of use of wondering strategies. This may fit an prolonged in enhancing their tiers of motivation in the route of using thinking techniques to beautify school students' fulfillment in mathematics.

v. The Ministry of Education must create room for extra in-carrier trainings for the newly recruited mathematics teachers. This will pass an prolonged manner in improving their degrees of exposure to new techniques of coaching and gaining knowledge of mathematics the use of questioning techniques.

vi. The Ministry of Education ought to revise teacher schooling curriculum to ensure that questioning strategies adopted thru mathematics teachers are learner-focused.

### 5.3.1 Suggestions for Further Research

i. A study must be completed to assess the have an impact on of the gender of mathematics teachers affect use of questioning techniques in training mathematics in public secondary schools.

ii. A study should be completed to take study how principals' academic supervision affects use of wondering strategies in teaching mathematics in public secondary schools.

iii. A study could be conducted to examine the influence of students' factors on use of questioning techniques in teaching mathematics in public secondary schools.

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## APPENDIX III

## QUESTIONNAIRE FOR MATHEMATICS TEACHERS

**Section A: General Information**

*Instruction: Please tick in competition to your most appropriate solution and fill the spaces furnished.*

1. Gender: Male [ ] Female [ ]

2. Highest diploma of tutorial qualification

Diploma [ ] Bachelors' Degree [ ] Postgraduate [ ]

**Section B: Types of Mathematics Questions and Students' Achievement in Mathematics in Public Secondary Schools**

1. What is the mathematics' meanscore of your secondary school in 2017 KCSE examination?.....

2. How frequently do you operate questioning technique within the route of mathematics' instructions?

Very often [ ]

Sometimes [ ]

Never [ ]

three. Please, tick the maximum commonly used kind of query

Probing [ ]

Knowledge [ ]

Comprehension [ ]

Analysis [ ]

Synthesis [ ]

4. Please, rate the amount to that you agree with the subsequent statements at the effect of the types of questions you generally ask your students on their achievement in mathematics

| Test Items | SA | A | U | D | SD |
|---|---|---|---|---|---|
| | 5 | four | 3 | 2 | 1 |

I rarely ask my probing questions in the course of mathematics' lesson as a way of enhancing my students' success in mathematics

I commonly use comprehension questions in my mathematics' commands to improve my students' achievement in mathematics

I ask my school students mathematics questions which border on their know-how of mathematics' ideas so that you can improve their usual performance in mathematics

In my mathematics' classes, I undertake use of analytical questions that are key to enhancing my students' success in mathematics' examinations

Asking my school students questions which border on synthesis has progressed their success in mathematics

**Section C: Teacher Training and Students' Achievement in Mathematics in Public Secondary Schools**

1. Please, tick abilities you've got been skilled on use of wondering approach

Skills on wondering [ ]

Understanding school students' desires [ ]

Designing questions [ ]

Others (Specify)……

2. Please, charge the quantity to that you consider the following statements at the have an effect on of your education on use of wondering technique on school students' achievement in mathematics

| Test Items | SA | A | U | D | SD |
|---|---|---|---|---|---|
| | 5 | 4 | 3 | 2 | 1 |

I simply have acquired on thinking which has superior my school students' achievement in mathematics

I were skilled to ask questions which cater for all students' desires as a way of improving their achievement in mathematics

I have been skilled a manner to format questions which has superior my university school students' success in mathematics

My schooling on use of questioning technique has helped me enhance my university school students' fulfillment in mathematics

I not regularly have a education at the way to apply wondering technique to enhance university school students' success in mathematics

**Section D: Mathematics Teachers' Experience in Using Questioning Technique and Students' Achievement in Mathematics in Public Secondary Schools**

1. How many years have you been teaching mathematics?.....

2. Please, charge the volume to which you recollect the following statements on the affect of your coaching revel in inside the use of thinking technique on university school students' achievement in mathematics

| Test Items | SA | A | U | D | SD |
|---|---|---|---|---|---|
| | 5 | four | 3 | 2 | 1 |

I have taught mathematics using questioning technique for decades, despite the fact that has now not improved my school students' success in mathematics

My degree of exposure in the use of wondering method has helped improve my school students' achievement in mathematics

My education has now not helped improve my school students' success in mathematics

**Section E: Mathematics Teachers' Attitude toward Questioning Technique and Students' Achievement in Mathematics in Public Secondary Schools**

1. In a scale of one-five, how might you charge your diploma of mind-set towards use of wondering technique in coaching mathematics?

Very High (5) [ ]

High (4) [ ]

Average (3) [ ]

Low (2) [ ]

Very Low (1) [ ]

2. Please, price the extent to which you believe the following statements on the effect of your mind-set toward questioning approach on students' fulfillment in mathematics

| Test Items | SA | A | U | D | SD |
|---|---|---|---|---|---|
| | 5 | 4 | three | 2 | 1 |

I don't forget that the use of questioning technique in mathematics' steerage improves university students' achievement in mathematics

I am no longer interested in using wondering method in training mathematics which has now not superior my school students' achievement in mathematics

I rarely revel in inspired to apply wondering technique at the same time as teaching mathematics as a manner of improving my university students' achievement in mathematics

I do not understand use of questioning technique as the satisfactory approach of improving my school students' fulfillment in mathematics

Thank you,

Muthusi Francis Mutisya

## APPENDIX IV

## INTERVIEW GUIDE FOR SECONDARY SCHOOL PRINCIPALS

Dear respondent,

The researcher is a pupil undertaking a degree route in Master of Education in Educational Communication and Technology at Machakos University carrying out a research on Teacher Factors Influencing Use of Questioning Technique on Students' Achievement in Mathematics in Public Secondary Schools in Mwala Sub-county, Machakos County, Kenya. The records you provide might be treated with confidentiality and genuinely used for features of this study.

**Section A: General Information**

1. Gender:…….

2. Highest level of education…….

**Section B: Types of Mathematics Questions and Students' Achievement in Mathematics in Public Secondary Schools**

1. What is the mathematics' meanscore of your secondary school in 2017 KCSE exam?.....

2. How regularly do your mathematics teachers use thinking technique in the course of mathematics' training?

……

……

3. To what volume has use of diverse styles of questions even as training mathematics improved your school students' achievement in mathematics?

……

……

**Section C: Teacher Training and Students' Achievement in Mathematics in Public Secondary Schools**

1. Which capabilities are mathematics teachers frequently educated on concerning use of questioning technique?

……

…….

2. How do skills on wondering approach received at some point of teacher schooling have an effect on students' fulfillment in mathematics?

……

……

……

**Section D: Mathematics Teachers' Experience in Using Questioning Technique and Students' Achievement in Mathematics in Public Secondary Schools**

1. How many years have your teachers been education mathematics?.....

2. What is the effect of mathematics teachers' experience on school students' achievement in mathematics?

……

……

**Section E: Mathematics Teachers' Attitude in the direction of Questioning Technique and Students' Achievement in Mathematics in Public Secondary Schools**

1. How might you rate the volume of your mathematics teachers' mind-set in the path of use of wondering technique in coaching mathematics?

……

……

2. To what quantity does mathematics teachers mindset affect university school students' achievement in mathematics?

……

……

……

Thank you,

Muthusi Francis Mutisya

**APPENDIX V**

**MACHAKOS UNIVERSITY**
OFFICE OF THE DEAN GRADUATE SCHOOL

Telephone:254-00735247939, (0)723805929
Email:graduateschool@mksu.ac.ke
website:www.machakosuniversity.ac.ke

P.O.Box 136-90100
Machakos,
KENYA

REF.MKsU/GS/SS/012/VOL.1

23rd January,2019

The Director
National Commission for Science, Technology and Innovation
P.O. Box 30623
NAIROBI

Dear SIR,

RE: Francis Mutisya Muthusi – E55/6639/2015

The above named is a master's student in the second year of study and has cleared his course work. The University has cleared him to conduct research entitled: **"Teacher factors influencing use of questioning techniques on students' achievement in mathematics in Public Secondary Schools in Mwala Sub-County, Machakos County, Kenya".**

Kindly assist him with a research permit in order to undertake the research.

Thank you,

DR. KIMITI RICHARD PETER, PhD
AG. DEAN GRADUATE SCHOOL
KRP/anm



**APPENDIX VI**

**NACOSTI**


**NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION**

Telephone:+254-20-2213471,
2241349,3310571,2219420
Fax:+254-20-318245,318249
Email: dg@nacosti.go.ke
Website : www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/19/92144/28522**

Date: **12th March, 2019**

Francis Muthusi Mutisya
Machakos University
P.O. BOX 136 – 90100
**MACHAKOS.**

**RE: RESEARCH AUTHORIZATION**

Following your application for authority to carry out research on ***"Teacher factors influencing use of questioning technique on students' achievement in mathematics in public secondary schools in Mwala Sub-County, Machakos County, Kenya"*** I am pleased to inform you that you have been authorized to undertake research in **Machakos County** for the period ending **12th March, 2020.**

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

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

**GODFREY P. KALERWA MSc., MBA, MKIM**
**FOR: DIRECTOR-GENERAL/CEO**

Copy to:

The County Commissioner
Machakos County.

The County Director of Education
Machakos County.

**APPENDIX VII**

## RESEARCH PERMIT FROM NACOSTI

THIS IS TO CERTIFY THAT:
*MR. FRANCIS MUTHUSI MUTISYA*
of MACHAKOS UNIVERSITY, 0-90141
MASINGA,has been permitted to
conduct research in *Machakos County*

on the topic: *TEACHER FACTORS INFLUENCING USE OF QUESTIONING TECHNIQUE ON STUDENTS' ACHIEVEMENT IN MATHEMATICS IN PUBLIC SECONDARY SCHOOLS IN MWALA SUB-COUNTY, MACHAKOS COUNTY, KENYA*

for the period ending:
*12th March,2020*

.....
*Applicant's Signature*

Permit No : NACOSTI/P/19/92144/28522
Date Of Issue : 12th March,2019
Fee Recieved :Ksh 1000

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

**THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013**

The Grant of Research Licenses is guided by the Science, Technology and Innovation (Research Licensing) Regulations, 2014.

**CONDITIONS**

1. The License is valid for the proposed research, location and specified period.
2. The License and any rights thereunder are non-transferable.
3. The Licensee shall inform the County Governor before commencement of the research.
4. Excavation, filming and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
5. The License does not give authority to transfer research materials.
6. NACOSTI may monitor and evaluate the licensed research project.
7. The Licensee shall submit one hard copy and upload a soft copy of their final report within one year of completion of the research.
8. NACOSTI reserves the right to modify the conditions of the License including cancellation without prior notice.

National Commission for Science, Technology and innovation
P.O. Box 30623 - 00100, Nairobi, Kenya
TEL: 020 400 7000, 0713 788787, 0735 404245
Email: dg@nacosti.go.ke, registry@nacosti.go.ke
Website: www.nacosti.go.ke

REPUBLIC OF KENYA

NACOSTI

National Commission for Science, Technology and Innovation

**RESEARCH LICENSE**

Serial No.A 23544

CONDITIONS: see back page

**APPENDIX VIII**

**RESEARCH AUTHORIZATION LETTER FROM COUNTY COMMISSIONER, MACHAKOS**

# THE PRESIDENCY

**MINISTRY OF INTERIOR AND COORDINATION OF NATIONAL GOVERNMENT**


Telephone: 21009 and 21983 - 90100
Email Address:countycommasaku@gmail.com
Fax No. 044-21999

OFFICE OF THE
County Commissioner
P.O. Box 1 - 90100
MACHAKOS.


When replying please quote:

**REF NO.CC/ST/ADMS/9VOL.11/57** **DATE:** 26th March, 2019

The Deputy County Commissioner
**MWALA SUB- COUNTY**

**RE: RESEARCH AUTHORIZATION: FRANCIS MUTHUSI MUTISYA**

The National Commission for Science, Technology and Innovation has authorized the below named researcher to carry out a research on **"Teacher factors influencing use of questioning technique on students, achievement in mathematics in public secondary schools in Mwala Sub-county, "** ***in*** Machakos County for the period ending **18th December 2019.**

Please be notified and accord him the necessary assistance.

ELIJAH OMOYO
For: COUNTY COMMISSIONER
**MACHAKOS**

COUNTY COMMISSIONER
MACHAKOS
P.O. Box 1 MACHAKOS

**APPENDIX IX**

**RESEARCH AUTHORIZATION LETTER FROM COUNTY DIRECTOR OF EDUCATION, MACHAKOS**

**MINISTRY OF EDUCATION**
**STATE DEPARTMENT OF EARLY LEARNING AND BASIC EDUCATION**

Telegrams: **"SCHOOLING"** Machakos
Telephone: Machakos (
Fax: Machakos
Email –cdemachakos@yahoo.com
**When replying please quote**

OFFICE OF THE
COUNTY DIRECTOR OF
EDUCATION
P.O. BOX 2666-90100,
**MACHAKOS**

**MKS/ED/CDE/U/1/VOL.2/273** **26th March, 2019**

Francis Muthusi Mutisya
Machakos University
P.O BOX 136-90100
**MACHAKOS.**

**RE: RESEARCH AUTHORIZATION.**

Reference is made to the letter from National Commission for Science, Technology and Innovation Ref: **NACOSTI/P/19/92144/28522** dated **12th March, 2019.**

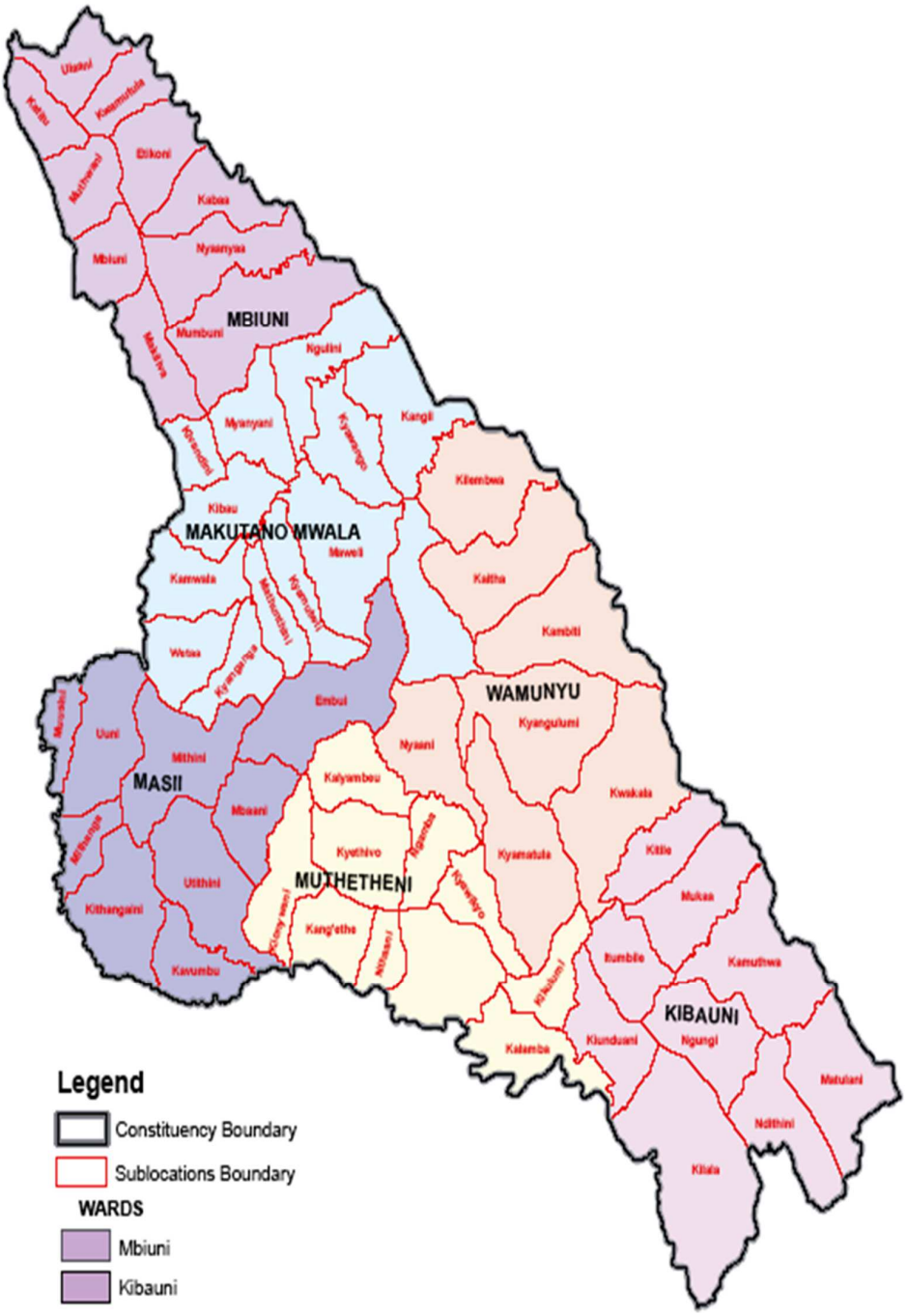
You are hereby authorized to carry out your research on, **"Teacher factors influencing use of questioning technique on students' achievement in mathematics in public secondary schools in Mwala Sub-County, Machakos County Kenya"** for a period ending **12th March, 2020.**

COUNTY DIRECTOR OF EDUCATION MACHAKOS
MINISTRY OF EDUCATION
P.O. Box 2666-90100 MACHAKOS

**NJIRU SIMON**
**FOR: COUNTY DIRECTOR OF EDUCATION**
**MACHAKOS**

## APPENDIX X

## THE MAP OF MWALA CONSTITUENCY SHOWING MWALA SUB-COUNTY




**Source: IEBC (2012)**