MATHEMATICS PERFORMANCE AS A DETERMINANT OF ACADEMIC ACHIEVEMENT AMONG PRIMARY SCHOOL LEARNERS WITH HEARING LOSS IN MERU AND THARAKA-NITHI COUNTIES, KENYA

EUNICE KAGWIRIA MURUNGI

E55/33040/2014

A THESIS SUBMITTED IN THE SCHOOL OF EDUCATION IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTERS OF EDUCATION (SPECIAL NEEDS EDUCATION) OF KENYATTA UNIVERSITY

APRIL, 2025

DECLARATION

I hereby declare that this thesis is entirely my original work with no submissions to other universities or institutions for certification consideration. The sources used to support this research thesis have been appropriately recognised and credited. In accordance with anti-plagiarism regulations and the current APA system, any text, data (including spoken words), photographs, photos, or tables that are derived from other sources such as the internet are appropriately referenced.

Signature_____ Date: _____

NAME: EUNICE KAGWIRIA MURUNGI

REG.NO: E55/33040/2014

Supervisors' declaration

This thesis has been submitted for appraisal with our/my approval as University Supervisor(s).

Signature_____ Date: _____

Dr. Beatrice Bunyasi Awori

Department of Early Childhood and Special Needs Education

Kenyatta University

Signature_____ Date: _____

Dr. Fransicah Irangi Wamocho

Department of Early Childhood and Special Needs Education

Kenyatta University

DEDICATION

I dedicate this research to my family, especially to my parents, siblings and kids, for giving me a calm, harmonious and supportive atmosphere as I endeavored to complete it.

ACKNOWLEDGEMENT

I would like to express my heartfelt gratitude to Almighty God for His unwavering guidance and support throughout my research journey. His strength and inspiration have been pivotal in every step I have taken.

I am deeply thankful to my supervisors, Dr. Beatrice Bunyasi Awori and Dr. Fransicah Irangi Wamocho, whose invaluable insights, encouragement, and expertise have profoundly shaped my work and personal growth. Their dedication to excellence and mentorship has been a source of motivation and enlightenment.

Additionally, I wish to extend my sincere appreciation to my family for their steadfast support, love, and understanding during this challenging process. Their unwavering belief in me has been my anchor, and I am truly grateful for their presence in my life.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS AND ACRONYMS

ANCOVA	-	Analysis of Covariance
ASHA	-	American speech-language and hearing Association
DHH	-	Hard of Hearing
HL	-	Hearing Loss
IEP	-	Individualized Educational Program
KCPE	-	Kenya Certificate of Primary Education
KSL	-	Kenyan Sign Language
MKC	-	Mathematics Knowledge Check
NACOSTI	-	National Commission for Science, Technology and Innovation
SIFTER	-	Screening Instrument for Targeting Educational Risks
SPSS	-	Statistical Packages for Social Sciences
TC	-	Total Communication
TLR	-	Teaching and Learning Resources
UNESCO	-	United Nations Educational, Scientific and Cultural Organization
US	-	United States

ABSTRACT

Education is a fundamental human right that contributes significantly to economic productivity and development. Learners with hearing loss typically fall behind their hearing classmates academically, and mathematics is one of the areas where they struggle to learn. The study sought to explore mathematics performance as a determinant of academic achievement among primary school learners with hearing loss in Meru and Tharaka-Nithi Counties, Kenya. The study objectives were to establish the extent of use of adapted teaching and learning strategies in the teaching of mathematics by learners with hearing loss, to find out the influence of teaching and learning resources on the performance of learners with hearing loss, to determine the influence of the degree of hearing loss on the performance of learners with hearing loss, and to establish the learners' attitude towards teaching and learning mathematics in Meru and Tharaka-Nithi Counties. The study was guided by the Brunner Theory of Instruction. The study adopted a descriptive survey research design. The study was done in two schools, one in Meru County and the other in Tharaka-Nithi County. The study targeted 215 learners with hearing loss from both schools. Additionally, the head teachers of the two schools and grade four, five, and six teachers teaching mathematics were also targeted. The study utilized purposive, stratified and random sampling techniques. A total of 78 respondents were sampled. The study utilized questionnaires, an interview schedule and an observation schedule for data collection. Piloting was done at Njia special School for learners with hearing loss in Meru County. Both qualitative and quantitative data were collected. Quantitative data were analyzed descriptively with the aid of Statistical Packages for Social Sciences version 26 and presented in figures and tables. The qualitative data were analyzed thematically and presented in the form of narratives. The findings show that teachers used various teaching strategies, such as lecturer-based teaching, demonstration and modelling, problem-solving approaches and interactive teaching. The results showed that a resource room, Kenyan Sign language use, Visual aids, projectors, teacher aids, lesson plan, IEP and lesson notes were available. The degree of hearing loss significantly impacts the performance of learners with hearing loss across various domains of their development, including communication skills, educational progress, social and emotional well-being and self-esteem. Learners' attitude towards teaching and learning mathematics play a crucial role in their academic success and their overall perception of the subject. Fostering positive attitude towards mathematics is essential for promoting mathematical literacy and helping learners achieve their full potential in this critical subject. Given that they have been demonstrated to be the most successful in improving subject acquisition and retention, the study advises teachers of mathematics to prioritize group discussions, peer teaching and the implementation of IEP as essential strategies in their mathematics instruction.

CHAPTER ONE

INTRODUCTION AND CONTEXTUALIZATION OF THE STUDY

1.0 Introduction

This chapter covers background to the study, statement of the problem, purpose of the study, objectives, research questions, significance, limitations and delimitations of the study, assumptions, theoretical and conceptual framework work and operational definition of terms.

1.1 Background of the Study

Historically, whenever a civilization placed a great value to mathematics ability, it made extra remarkable progress. Ability in mathematics contributes to advancement in technology and scientific advancement (Algani, 2022). Mathematical knowledge is a collection of facts used for computation, addition, subtraction, rotation and other operations with numbers (Tanridiler et al., 2015). It is a significant tool that helps people navigate the world around them through estimate and precise calculation. It is crucial since it develops ability to think critically, solve problems and logically reason (Sigus & Madamuk, 2014). It is an entry requirement to most careers such as science, engineering and finance.

The majority of education systems worldwide place a high priority in the teaching and study of mathematics. It is seen as a gateway to employment and technical development (Bakker, et al., 2021). It is argued that mathematical accomplishment in a learner's scholastic career lays the groundwork for success in a number of other areas. Additionally, it is said that the way to a wider job market is through the study of mathematics (Kathare, 2020).

The degree of hearing loss might have an adverse effect on a person's growth and academic performance. Although learners with hearing loss have access to various educational options such

as special schools, regular schools with special units, and inclusive classrooms; it has been shown that they often face significant challenges in learning mathematics (Nunes & Moreno, 2002; Tanridiler, Uzuner & Girgin, 2015; Shelton & Parlin, 2016; Adeniyi & Kuku, 2018). This difficulty is not only associated with their hearing loss and language barriers but is also linked to the instructional methods used during the teaching and learning process. Tanridiler et al. (2015) claim that learners with hearing loss may acquire mathematical ideas more slowly than their hearing peers. According to Pagliaro and Kritzer (2005), learners with hearing loss do poorly because they rely heavily on procedural information and rote learning, paying little attention to higher order thinking and real problem solving.

According to Shelton et al. (2016), various factors such as scheduling, curricular integration, training, and resource limitations hinder the teaching and learning of mathematics for learners with hearing loss in the United States. The abstract nature of mathematical concepts poses challenges for these learners, making it difficult for them to understand and apply what they learn. While some learners may possess an intuitive grasp of mathematical ideas, young learners may struggle to draw on their prior knowledge and establish essential connections when confronted with formal mathematics in the classroom, especially if these concepts are not explicitly taught.

In Pakistan, Parvez *et al.* (2019) established that learners with hearing loss employ distinct learning strategies than those of hearing individuals. Since they communicate and learn using total communication (TC) rather than natural language, they must work very hard to master various topics utilizing traditional pedagogies. As a result, assistive technology is desperately needed to increase their comprehension and learning potential.

Adeniyi and Kuku (2020) found that learners with hearing loss in Nigeria have a bad attitude towards mathematics. Poor mathematics' performance was caused by a variety of factors, including lack of teaching resources, teachers' lack of qualifications and a learners' fear of arithmetic. Learners can do better in mathematics by cultivating a good attitude, motivation, appropriate direction and the availability of pertinent educational materials.

The application of interactive teaching techniques has been highlighted in South Africa (Prinsloo, 2000). In this instance, UNESCO (2016) recommends that educators create pedagogies that support diversity and make efficient use of instructors, other human and material resources, and learning assistance in order to ensure that learners participate fully. Unfortunately, many traditional teachers face challenges when it comes to implementing integrated programs in inclusive classrooms, as they often lack the necessary skills and knowledge to do so effectively.

According to Mtuli (2015), there were insufficient training and educational resources available in Tanzania for learners with hearing loss and educators were not effectively trained to handle the country's recent shift to an inclusive education system. Also, despite the implementation and documentation of established teaching approaches across time, learners with hearing loss still struggle to make sufficient mathematical progress relative to their hearing peers of the same age group.

According to research by Adeniyi and Kuku (2018), Ashmore (2017) and Sylvia (2015), learners with hearing loss lag behind their hearing classmates academically in many subjects, including mathematics. Although it has been noted that learners' performance in mathematics has been generally poor, communication problems may have contributed to the low achievement of learners with hearing loss (Kuku, 2019). Ashmore (2017) suggests that learners with hearing loss in middle

and high school may have had difficulty understanding mathematical concepts due to a language barrier.

Kenyan Sign Language (KSL) was selected in 2004 as a medium of instruction for learners with hearing loss (HL) after a number of communication methods were investigated but failed to satisfy the learners' communication demands (Ministry of Education Science and Technology, 2016). It has been proposed that the achievement gap in mathematics among this population is caused by both incorrect use of instructional resources and inefficient teaching practices (Noorian, Maleki, & Abolhassani, 2013). Accordingly, the National Council of Teachers of Mathematics (2016) made the case that teaching methods that assign challenging math problems to learners can improve their performance. Table 1.1 shows the KCPE performance in mathematics for schools A and B in Meru and Tharaka-Nithi counties, respectively, for the last five years.

Table 1.1: Performance in mathematics for school A and B

Year	School A	School B
2018	34.14	27.1
2019	31.95	33.8
2020	34.00	32.5
2021	34.21	34.7
2022	34.90	33.04

Source: KNEC, 2023

The findings displayed in Table 1.1 show that performance in mathematics is low. The academic performance of learners with hearing loss in KCPE in special schools for hearing loss is dismal

and seems to remain below the pass mark. The trend is discouraging and is of great concern to the government of Kenya and other stakeholders in the education sector.

1.2 Statement of the problem

The constitution of Kenya 2010 guarantees right to education for all learners with or without disabilities. Mathematics is a critical subject that improves the ability of an individual to solve problems and think critically. It is also a vital tool in navigation of everyday life through precision and accuracy. All elementary, middle, and high schools in Kenya, including those for learners with hearing loss, are mandated to teach mathematics. Over the past five years, learners with hearing loss have performed poorly on the KCPE. Mathematics is a gateway subject to higher education and science and technology career courses. Poor performance has limited the ability of learners with hearing loss to further their education or join prestigious career courses like engineering and medicine. One way of improving performance for learners with hearing loss is differentiated instruction and modification of teaching strategies. The study is necessary because, according to a review of related literature, there have been many studies on special education issues, but few have examined mathematics performance as a determinant of academic achievement among primary school learners with hearing loss in Meru and Tharaka-Nithi Counties. For a potential solution, it is crucial to look at the degree of hearing loss, the learners' attitudes, and modified teaching and learning methods and resources.

1.2.1 Purpose of the study

The purpose of the study was to explore mathematics performance as a determinant of academic achievement among primary school learners with hearing loss in Meru and Tharaka-Nithi Counties, Kenya.

1.2.2 Objectives of the study

The research objectives include;

i. To establish the extent of use of adapted teaching and learning strategies in teaching of mathematics to learners with hearing loss in Meru and Tharaka-Nithi Counties, Kenya.
ii. To investigate the influence of teaching and learning resources on performance of learners with hearing loss in Meru and Tharaka-Nithi Counties, Kenya.
iii. To determine the influence of degree of hearing loss on performance of learners with hearing loss in Meru and Tharaka-Nithi Counties, Kenya.
iv. To establish the learners' attitude towards teaching and learning mathematics in Meru and Tharaka-Nithi Counties, Kenya.

1.2.3 Research questions

The research questions were;

i. What is the extent of the use of adapted teaching and learning strategies in the teaching of mathematics for learners with hearing loss in Meru and Tharaka-Nithi Counties, Kenya?
ii. What is the influence of teaching and learning resources on performance of learners with hearing loss in Meru and Tharaka-Nithi Counties, Kenya?
iii. What is the influence of degree of hearing loss on performance of learners with hearing loss in Meru and Tharaka-Nithi Counties, Kenya?
iv. What is the learners' attitude towards teaching and learning mathematics in Meru and Tharaka-Nithi Counties, Kenya?

1.3 Significance of the study

Findings in this research may help the ministry of education to organize in-service courses to help improve teaching abilities of teachers teaching learners with hearing loss. It may also be used by teacher training institutions to better improve the way they train pre-service teachers aspiring to be teachers for learners with hearing loss.

1.4 Limitation and delimitation of the study

Discussed below are both the limitation and delimitation of the research.

1.4.1 Limitations of the study

It was initially feared that some teachers may fail to give free and accurate information for fear of victimization or negative perception. The researcher made a good rapport with respondents during preliminary visits to ameliorate the concern.

1.4.2 Delimitations of the study

The research took place in Meru and Tharaka-Nithi counties only. Only two public schools participated in this research. Further, only grade 4,5 and 6 learners and teachers of mathematics were participants of this research.

1.5 Assumptions of the Study

It was considered that participants in this study provided truthful and sincere responses.

1.6 Theoretical and conceptual framework

Discussed below is both theoretical and conceptual framework of the research.

1.6.1 Theoretical framework

The theory of instruction developed by Brunner (1996) served as the study's compass. The subjects of teaching theory encompass what one aims to teach and the most effective ways to facilitate learning.

According to Bruner, effective teaching and learning are impacted by the attitude of learners towards learning, teaching and learning strategies, the presentation of learning materials and the reward of the best learners. Teachers of mathematics can actively create conducive conditions for teaching and guiding learners with hearing loss on how to learn mathematics. A skilled educator will create lessons that assist learners in understanding the connections between small facts and the subjects being covered. The theory goes on to stress that the experiences offered should take account the various cognitive levels of the learners. It is the duty of the instructor to pinpoint the ideas that constitute the fundamental framework of the subject in this example, the variables influencing mathematics performance. This theory was selected because it offers information on how teachers of mathematics should prepare learning materials and the learning process to help learners enhance their cognitive abilities. The theory also directs the teachers in planning and arranging learning tasks, familiarizing themselves with the material beforehand, creating lesson plans and locating teaching materials.

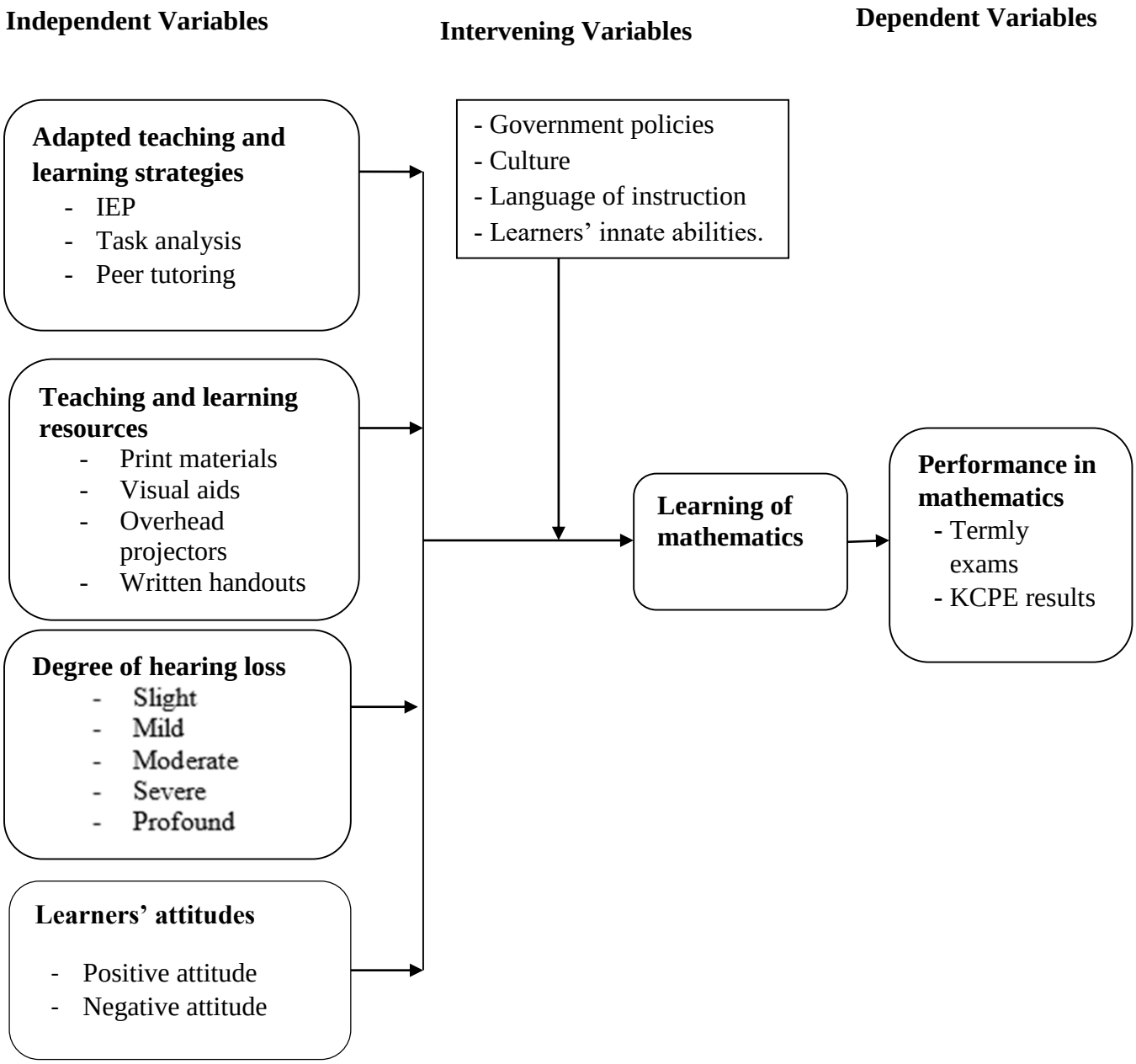
The mathematics curriculum is set out in a spiral and hierarchical way. As a result, the instructor used this information to plan lessons that highlighted the prerequisite ideas and those that would follow later. As a result, the teacher creates a lesson where the concepts are organized hierarchically, which helps the learners grasp the concepts fully by integrating them into their prior understanding of the subject structure. This improved the learners' understanding of the topics and

helped them perform better in the learning tasks in terms of achievement, attitude, and motion sequence, all of which encouraged classroom interaction. More interactions between teachers and learners as well as between learners and resources in the classroom occurred as a result of this.

1.6.2 Conceptual framework

The conceptual framework depicted in figure 1.1 illustrates the link between the independent and dependent variables. The image sheds light on the ways in which a number of factors may directly affect and contribute to the factors that cause learners with hearing loss to have dismal performance in mathematics.

Figure 1.1 Conceptual Framework



Source; Author (2023)

The independent variables consist of teaching and learning strategies, teaching and learning resources, degree of hearing loss and attitude of learners towards teaching and learning mathematics which together determine the performance of learners with hearing loss. The

availability of teaching and learning resources improves learning and general achievement in mathematics. Reduced resources lower the achievement. Use of poor or undifferentiated teaching strategies lead to poor performance in mathematics. If appropriate strategies are used then the achievement remains positive leading to improved academic performance. Negative attitudes lead to poor performance while positive attitude lead to improved performance in mathematics. Factors that may intervene in the above include culture, government policies, culture and language of instruction.

1.7 Operational Definition of Terms

Attitude: This is a sentiment towards or response to a phenomenon.

Degree of hearing loss: This study uses terms like mild, moderate, severe, and profound to describe the various degrees of hearing loss.

Hearing loss: This condition involves the loss or reduction of normal hearing function. In such cases, a specific problem or malformation of the ear can hinder learners' ability to utilize their hearing effectively.

Performance in Mathematics: This indicates the level of achievement of a learner, teacher, or organization in reaching their short-term or long-term learning objectives. This research assesses the academic performance of learners with hearing loss in grades 4 to 6 using termly evaluations.

Teaching and learning resources: These are various types of materials designed to support effective teaching and learning of mathematics for learners with hearing loss, aiding in their knowledge acquisition.

Teaching and learning strategies: These methods are designed to teach mathematics to learners with hearing loss, catering to diverse abilities, skills, and learning styles to facilitate success in the subject.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter, the reviewed relevant literature in alignment with the research objectives. This literature encompasses adapted teaching and learning strategies, teaching and learning resources, the degree of hearing loss, and the attitudes of learners towards the teaching and learning of mathematics.

2.2 Teaching and Learning Resources and Performance in Mathematics

The foundation of teaching and studying mathematics is reasoning and proof. It supports the teaching of mathematics. According to Cakiroglu et al. (2024), it depends on the instructor and the kind of instruction they use. Without the right tools, teaching cannot be done effectively. Typically, resources are divided into two groups. We have human and physical resources. They are both essential for teaching and studying mathematics. The progressive structure of the mathematics curriculum allows learners to combine several scalable themes in a comprehensive way. In order to support their structural enactment and their structural design, instructors employ resources differently (Gustafsson et al., 2023).

According to a report from the World Education Forum in Dakar (2000), inefficient resource management is the fault of educators. The report made note of the fact that there were no fresh skills taught in classrooms and that there was no technology to help learners learn (Visser, Andrea, & Feza, 2015). The findings revealed that, the utilization of digital technology in the classroom enhances learners' engagement and improves teaching and learning activities. According to Githua (2011), inadequate resources and equipment for teaching mathematics, as well as teachers' lack of expertise, are to blame for the learners' dismal performance in mathematics. Learners do not have

the necessary understanding of fundamental mathematical concepts and they are unaware of basic procedures and algorithms (Lashley, 2017). This was a typical flaw that was seen in children and contributed to their scoring poorly in mathematics in the KCSE. This inability to grasp these ideas is a manifestation of other factors that prevent good comprehension of the mathematics topics in public secondary schools, including a lack of appropriate teaching techniques and resources, among others.

Livumbaze and Achoka (2017) examined the effects of teaching and learning resources on learners' academic development in public secondary schools in Hamisi Sub-County, Kenya. The study employed a descriptive survey research approach. Interview schedules, document analysis and structured and unstructured questionnaires were the data collection methods employed. The research uncovered that factors connected to teaching and learning resources (TLR) caused learners to academically regress at the secondary school level. Resources have a direct impact on how well teaching and learning go, thus in order to help underperforming schools, educational authorities need to use these resources to raise learners' levels and competences so that they are prepared for national examinations (UNESCO, 2015). The current study was conducted for learners with hearing loss at a public elementary school.

Learning is complex because of a variety of elements, including the tools utilized in the classroom, curriculum requirements, learner motivation, teacher effectiveness and physical school infrastructure (Lyons, 2012). The standard of instructional materials, including textbooks, is a critical component. Therefore, if fundamental resources like TLR are successfully made available to the school, learners can attain good performance. The school must provide tangible resources, hire enough tutors and auxiliary staff, and outfit itself with enough teaching and learning tools. These facilities include classrooms that are comfortable, labs where experiments are conducted

and libraries that support studying. The instructional materials at hand were connected to the learners' scholastic performance. It was discovered that the material resources had a major impact on the learners' accomplishments. This was due to the fact that the material resources discouraged rote learning by helping the learners to acquire the fundamentals and the concepts that surround them. The results were seen in situations with low TLR and reduced educational attainment, which suggests low academic performance, significant dropout rates, unmet educational goals, unprofessional behavior and inadequate motivation from teachers.

Yusta et al (2016) investigated the linking between mathematics performance and instructional materials in Tanzania. The research focused on learners with dyscalculia in Arusha and examined integrated primary schools. There were two goals for the study. The first was to ascertain which teaching materials were employed by teachers of mathematics in integrated schools. The second goal was to determine if teachers of mathematics in integrated schools were making appropriate use of their teaching resources. The analysis revealed which graphic and regalia resources the teachers utilized most frequently. The study found out that the defined categories of educational resources were insufficient. The auditory, visual aids, audio-visual aids and regalia are the five most common ones. The findings show that the availability of teaching and learning tools affects learners' performance. In addition to the Tanzanian study, a new investigation was carried out in Kenya to close the contextual gaps.

A study on the effects of educational resources on lower primary school learners in the Eastern Zone of Nakuru Municipality was carried out in Kenya by Njoroge (2019). Purposive sampling techniques and standard random sample techniques were combined in the study. Among the instruments used to collect data were questionnaires, an interview schedule, and an observation schedule. According to the study, most of the books in school libraries need to be updated to

match the quickly changing technological landscape. To provide learners more interesting lessons, a teacher might employ teaching and learning materials as additional communication channels. Learning is made interesting and dynamic via the use of teaching and learning tools including graphics, charts and caption videos. However, to address the limitations in this research, the current study was carried out for learners with hearing loss in public elementary schools.

2.3 Adapted Teaching and Learning Strategies

Differentiated instruction is quite paramount if learners with hearing loss have to learn and understand mathematics like other typically developing learners. It denotes to the procedure of adjusting curriculum methods to meet the needs of diverse learners. It improves learning by providing multiple ways for learners to understand and master mathematics curriculum (Reis & Renzulli, 2018). Erbas (2017) looked into the methods teachers employ to encourage the inclusion of deaf and hard-of-hearing learners. The purpose of this qualitative study was to investigate the teaching methods used by general education instructors in inclusive K–6 elementary classes in a small Midwest town. The goal of the study was to learn how these educators supported the inclusion of deaf and hard of hearing (DHH) pupils by using techniques. Three general education instructors were observed and interviewed in order to gather data. The findings showed that by using a variety of tactics, these teachers actively sought to support the inclusion of DHH children. Workstations, varied information representations through technology and visual aids, considerate seating arrangements, the provision of assistive listening devices (like hearing aids) for learners who are hard of hearing, and the use of personal microphones to increase the efficacy of these devices were some of these strategies in three classrooms. This investigation was carried out in Kenya, especially in schools serving pupils with hearing loss, as opposed to a prior study that was done in developed country India.

Abiatal and Howard (2019) conducted a study in Namibia to find out if employing digital assistive technology will improve mathematics performance for learners with hearing loss. Qualitative interviews with the participating instructors and a quantitative experiment using constructivist digital assistive technology provided scientific proof for the study. The hypothesis that constructivist digital assistive technology may have raised the learners' mathematical proficiency is supported by the experiment's outcomes as well as the interviews. This study contributes a valuable and feasible solution to improve the teaching and learning of mathematics for learners with hearing loss, thereby introducing an innovative perspective to the field. While the current research was carried out in Kenya, involving teachers, head teachers, and learners, prior research took place in Namibia, where qualitative data was collected.

A research done in Nigeria by Kuku and Adeniyi (2020) looked at how learning interventions affected the achievement of learners with hearing loss in mathematics. The investigation was conducted in Lagos State's public primary schools. The study population included learners who had hearing loss. A sample of twenty-four learners was chosen using simple and purposeful random sampling techniques. The study strategy used was a quasi-experimental pretest-posttest control group. The Mathematics Knowledge Check (MKC) was used to collect the data, and the analysis of covariance (ANCOVA), mean, standard deviation, and mean difference were employed to analyse the data. The study found that gamification and experiential learning strategies improve arithmetic proficiency in learners with hearing loss. Additionally, the study discovered that the two treatments were beneficial to both male and female learners with hearing loss. It was proposed that gamification and experiential learning strategies be used in mathematics lessons for learners with hearing loss. The present study used several teaching and learning tactics to improve the

generalization of findings, whereas the previous study focused on gamification and experiential instruction methodologies as teaching and learning strategies.

Owino (2011) emphasizes that while teaching mathematics to learners who have hearing loss, the Individualised Educational Program (IEP) must be emphasized. Teachers can enhance the learning results for learners with hearing loss by tailoring their teaching strategies to their individual requirements. The poor mathematical performance of learners with hearing loss is mostly caused by the instructional methods used by the teachers. Teachers use instructional strategies to help learners who are hard of hearing grasp mathematical concepts.

2.4 Degree of Hearing Loss and Performance in Mathematics

Great teachers must put into consideration the degree of hearing loss of learners and how it potentially affects learning and general processing of information. When considering this, it entails adapting a standard education curriculum to accommodate learners with hearing loss of various degrees (Tanridiler et al., 2024). They need to have time and appropriate models to learn how to organize their assignments, work schedules and contacts. The degree of hearing loss is the issue that learners with hearing loss have when learning mathematics, according to Mwololo (2017); as a result, learners who have some residual hearing are taught alongside the deaf using sign language. If they are not given a preferential seat in class, the use of sign language may disadvantage them even though they can still understand what the teacher is teaching. Dementia can exacerbate language issues, and kids who struggle with their speech might struggle academically, particularly in mathematics.

Children with hearing loss have trouble talking, understanding, reading, and/or writing (American Speech-Language and Hearing Association, ASHA, 2007). Ten percent of Americans are thought

to have hearing loss (Centres for Disease Control, 2014). Children with hearing loss struggle to communicate, but by requiring them to wear the appropriate hearing aids, teachers can assist them comprehend what they are teaching. Language teaching should start as early as age three to support learners with hearing loss in communicating successfully in the classroom.

According to the severity of their hearing loss, learners with hearing loss in public primary schools fared differently academically, according to a research by Su et al. (2020). 47 children, ages 7.2 to 9.3, with different kinds and degrees of hearing loss were involved in the research. The children were evaluated by teachers using the Hebrew version of the Screening Instrument for Targeting Educational Risks (SIFTER) (Anderson, 1989). The findings showed that, children with less severe hearing loss as well as ones with unilateral hearing loss performed worse than those with more severe hearing loss. Additionally, learners who wore hearing aids outperformed those who did not. These results imply that, first, educators should explore to raise the availability of essential services and second, professionals should be made more aware of the potential negative impact that a slight or unilateral hearing loss may have on learners' ability to operate in the educational system. The existing study aimed to explore the mathematics performance of learners with distinct hearing loss.

Charema and Charema (2013) studied the impact of verbal language on the mathematical performance of primary school learners with hearing loss in Zimbabwe. The study resulted from conversations with other educators, firsthand experience, and practice observation. The study's sample of children came from Gweru, Zimbabwe's third-biggest city, and Bulawayo, the country's second-largest metropolis. A sample of 20 sixth-grade instructors who were included in the study filled out questionnaires. According to the results, learners with mild hearing loss outperform those with severe-profound hearing loss. Due to their restricted vocabulary, poor comprehension and

ignorance of mathematical concepts, children with hearing loss seem to be more affected by verbal language in their mathematical performance. The existing research aimed to explore the effect of the degree of hearing loss on mathematics performance.

2.5 Learners' Attitude Towards Teaching and Learning Mathematics

Mathematics enjoyment as well and attitude significantly predict learners' performance in schools. It significantly affects their achievement (Wakhata et al., 2022). This is not unique to typically developing learners but those with hearing loss as well. In a research done by Hwang and Son (2021) in China, researchers explored the relationship between learners' attitudes toward mathematics and their performance in the subject within public secondary schools. This investigation utilized data from the 2019 Trends in International Mathematics and Science Study (TIMSS) conducted in Singapore, employing latent profile analysis for their assessments. The results showed that pupils' performance levels and attitudes towards mathematics were positively correlated. In particular, learners are more likely to succeed in mathematics if they (a) enjoy learning the subject and engaging in math-related activities; (b) think that mastering the subject will lead to benefits like improved academic performance and employment prospects; and (c) have confidence in their mathematical abilities. Despite being conducted in Kenya, a poor country, this study makes analogies to previous research conducted in China, a developed country.

In the Philippines, Subia, Salangsang, and Medrano (2018) conducted a study on the correlation between attitude and performance in mathematics for Bachelor of Elementary Education learners. The research used a correlational research design. The results show that the respondents thought mathematics was the hardest subject. They were afraid of mathematics issues and quickly stopped responding when they were unable to solve them. The respondents' general attitude towards mathematics is negative, according to the results. The study yielded noteworthy results that offer

vital insights for curriculum developers, administrators and teachers of mathematics to improve policies and pedagogies related to mathematics instruction. The study was done at a university, concentrating on learners undertaking bachelor courses, while the existing research was done in public primary schools for learners with hearing loss in Kenya.

In Turkey, a study by Akcay (2017) investigated the utilization of mathematics software in teaching mathematics. There were two goals for the objectives. The research's primary goal was to find out how secondary mathematics learners in Quetta, Pakistan, felt differently about mathematics in private versus public schools. The research's second goal was to determine whether attitude towards mathematics differed for female and male learners. The secondary mathematics views of learners attending public and private schools did not significantly differ, as per the research results. Subscale-level results also showed that, with the exception of the subscale "value of mathematics," there were no discernible differences between the public and private programs. The study's findings also showed that there were notable distinctions between male and female learners, with male learners reporting a far more positive attitude towards mathematics than their female counterparts. It's interesting to note that the results for each type of school also showed that male learners reported feeling more positively about mathematics than female learners.

Mazana, Montero, and Olifage's (2019) study in Tanzania looked at learners' perspectives regarding acquiring mathematics in the classroom. Finding the causes of one's like or dislike for mathematics as well as the connection between attitude and performance were the goals. The study looked into learners' attitude towards mathematics and related elements using the ABC Model and Walberg's Theory of Productivity. Using questionnaires, the quantitative and qualitative data were gathered from 419 learners in primary schools, 318 learners in secondary schools, and 132 learners in colleges from 17 schools and 6 colleges in mainland Tanzania. The results show that although

learners initially have a positive attitude towards mathematics, this attitude eventually deteriorates as they go through the educational system. A strong positive-weak relationship between learners' performance and attitude was discovered. While the last research was done in Tanzanian primary, secondary, and college settings, the existing research was done in Kenyan public primary schools for learners with hearing loss.

Githaiga, Mutahi, and Mwenda (2018) investigated the influence of learners' attitudes on their arithmetic performance in public secondary schools located in Kilifi Sub-County, Kenya. The research targeted Form 3 learners from all public secondary schools in the area, as well as mathematics teachers and heads of mathematics departments. A multistage sampling method yielded a sample of 156 participants, which included 12 heads of mathematics departments, 24 mathematics teachers, and 120 learners. Data was collected using questionnaires. The findings revealed that a significant majority of department heads (67%) believed that learners held negative attitudes toward mathematics. Additionally, there was a statistically significant correlation between learners' attitudes toward mathematics and their academic achievement in the public secondary schools of Kilifi Sub-County ($p = 0.00$). The study concluded that learners' attitudes significantly impact their mathematical performance, with particularly detrimental effects arising from their low regard for the subject. While this research focused on Kilifi County and encompassed all public secondary schools, it is worth noting that previous studies were conducted in Tharaka-Nithi and Meru counties, targeting public primary schools for learners with hearing impairments.

2.6 Summary of Reviewed Literature and Study Gaps

According to reviewed research, if teachers employ effective teaching techniques, learners with hearing loss can perform mathematically on par with children who are normally developing. To start with, both physical and human resources are critical in teaching learners with hearing loss. Utilization of digital technology has proved quite critical in teaching mathematics to learners with hearing loss. However, reviewed literature shows that many instructors do not have sufficient resources and others have challenges using technology. Further, some technology is also outdated and some areas lack both electricity and internet.

Many teachers use undifferentiated instructions to teach mathematics to learners with hearing loss. Effective strategies include use of visual illustrations, communicate in different ways, check to ensure there is attention, use assistive technology, maximize technology and provide plenty of opportunities for learners to participate. Further, many teachers fail to use appropriate inclusive education strategies. Collaboration and use of multidisciplinary team is also critical but many instructors have failed to utilize the strategies leading to poor academic achievement in learners with hearing loss.

The degree of hearing loss has a detrimental impact on how well learners with hearing loss do in mathematics. Certain treatments, such the use of loud microphones, hearing aids, and qualified interpreters, may help learners with hearing loss do better in mathematics. In this case, preferential teaching arrangements are also crucial. Although this is the case, a lack of finance and resources or a lack of expertise have prevented many instructors from using it effectively.

Learners with hearing loss perform worse in mathematics when teachers and learners have a negative attitude. Conversely, learners with hearing loss do better in mathematics when they have a positive outlook. Many learners don't try to improve their performance since they have been

conditioned to think of mathematics as a challenging subject. This ultimately results in subpar academic achievement in mathematics.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The study's methodology is presented in this chapter. The research design, variables, study location, target population, sampling strategies and sample size, research instruments, validity and reliability, piloting, data collection methods, data processing and presentation and logistical and ethical issues are all outlined in this chapter.

3.2 Research Design

This is a mixed method research that utilized a descriptive research design. Through this, the researcher is able to triangulate and investigate more about data given quantitatively using qualitative technics. Numbers can only tell so much if followed up with interviews, can have respondents expound on their quantitative responses. Descriptive research design on the other hand helps the researcher to get comprehensive and rigorous data (Tobi & Kampen, 2018). Descriptive survey research design is helpful for gathering data about people's beliefs, behaviors, attitudes and any number of other social or educational concerns (Creswell & Creswell, 2017). The design was chosen due to its ability to accurately convey the sentiments, perspectives and opinions of the respondents regarding the factors influencing arithmetic performance in elementary school learners with hearing loss in Meru and Tharaka-Nithi Counties, Kenya.

3.3 Variables

Mugenda and Mugenda (2013) define a variable as any attribute that has many measurable or quantifiable dimensions or values. The variables in the study may be categorized as independent or dependent. Intervening variables are sometimes used in research.

3.3.1 Dependent Variable

The dependent variable of the research is performance in mathematics for learners with hearing loss. Dependent variable was measured using termly exams and KCPE results.

3.3.2 Independent Variables

Teaching and learning methods, the extent of hearing loss, teaching and learning materials, and learners' attitudes are the research's independent variables.

3.3.3 Intervening Variables

These include government policies, culture, the language of instruction, and the learners' innate abilities.

3.4 Location of the Study

The research was conducted in two schools, one in Meru and the other one in Tharaka-Nithi counties. The socioeconomic, cultural, and educational environments of Meru and Tharaka-Nithi Counties differ, which affects the experiences and results of learners with hearing loss. Researchers learnt more about how regional variables affect the education and well-being of these hearing-impaired learners by examining schools in both counties. There were regional differences in the resources, support services, and specialized educational facilities available to learners with hearing loss. The researcher evaluated the degree of suitability of teaching and learning materials for learners with hearing loss in various circumstances by looking at schools in both counties. By selecting schools from different counties, the researcher potentially improved the generalizability of her findings. If she observes similar results in schools from two different counties, it suggests that the findings are more robust and applicable to a broader population. Also, the two schools have varying access to resources like technology, libraries, extracurricular facilities and experienced teachers. Assessing schools from different areas helps in creating a comprehensive

needs assessment for learners with hearing loss, allowing for the development of targeted interventions and support programs.

3.5 Target Population

The research targeted 215 learners with hearing loss from both schools. The research also targeted the head teachers of the two schools, grades four, five, six learners and teachers teaching mathematics. Grades four to six are crucial for the development of numeracy skills. These skills form the foundation for advanced learning in subsequent grades. Studying how children acquire and apply these skills informs more effective teaching methods. Mathematics is a crucial subject in various fields, including science, technology, engineering and economics. Lack of foundational skills in mathematics can limit learners' future academic and career choices, as they may avoid pursuing fields that require a strong mathematical background. This, in turn, could lead to a sense of missed opportunities and contribute to a negative attitude towards education in general. The target population is presented in Table 3.1.

Table 3.1 Target population

Participants' Category	**School A**	**School B**	**Total population Targeted**
Head teachers	1	1	2
Teachers	3	3	6
Learners	123	92	215
Total	**127**	**96**	**223**

3.6 Sampling Techniques and Sample Size

3.6.1 Sampling Techniques

Three sample methods were utilized in this research: random, stratified, and purposive sampling. Meru and Tharaka-Nithi counties were specifically chosen since of prior data about the mathematical performance of learners with hearing loss (Uwezo, 2017). Additionally, the researcher deliberately chose two schools: Tharaka-Nithi County's School B and Meru County's School A. This raised the possibility of getting pertinent and instructive data and guaranteed that the study's sample was representative of the population's salient characteristics. Kothari (2017) asserts that purposeful sampling allows researchers to select participants who possess specific characteristics or experiences that are essential to accomplishing the objectives of the study.

Random sampling was utilized to choose the learners with hearing loss. Therefore, a proportional sample size was drawn from the two schools using stratified random sampling. Stratified sampling guarantees that every strata or subgroup of the population is represented in the sample (Creswell & Clark, 2017). This helps to reduce bias and improve the accuracy of estimates by ensuring that all important characteristics or variations in the population are adequately captured. The grade four, five, six were tangled in the research since both School A and School B have single stream. The researcher folded the papers presenting the classes and picked them randomly. Teachers teaching mathematics in the selected grades were automatically drawn from part of the sampled population.

3.6.2 Sample Size

A sample of 10% to 30% of a large population is sufficient for the study to be conducted, claim Mugenda and Mugenda (2003). As a result, 30% of the target population was included in this

study as a sample of learners with hearing loss. Thus, a sample of 65 learners with hearing loss was taken.

Table 3.2 Sample Size Distribution

Respondents Category	Total population Targeted	Sample size	Percentage (%)
Head teachers	2	2	100
Teachers	6	6	100
Learners	215	65	30
Total	**223**	**73**	

The research sample size involved 2 head teachers, 6 teachers and 65 learners with hearing loss making a total sample size of 73 participants.

3.7 Research Instruments

To gather data, the researcher used questionnaires, an interview schedule, and an observation plan. The surveys were completed by the math teachers and their fourth, fifth and sixth grade learners. While the observation schedule was utilized in the classroom during the math sessions, the interview schedule was used for the institution's head instructors.

3.7.1 Questionnaires

A self-made questionnaire was utilized in this research. A sample of teachers and learners with hearing loss were given the questionnaire. As shown in Appendices II and III, distinct questionnaires were given to teachers and learners. The questionnaire gathered data on demographic details, adapted teaching and learning strategies, teaching and learning resources, degree of hearing loss and learners' attitude towards mathematics. According to Wa-Mbaleka

(2019) questionnaires can quickly reach a significant number of respondents. The tool is impartial, provides a sense of secrecy and allows respondents the time to complete the items. The gathered questionnaires gathered both qualitative and quantitative data. The questionnaire had five sections: A, B, C, D, and E. Section A gathered data on the demographic information (bio-data) of teachers and learners; Section B gathered data on adapted teaching and learning strategies; Section C gathered data on teaching and learning resources; Section D gathered data on the degree of hearing loss; and Section E gathered data on learners' attitude towards mathematics.

3.7.2 Interview Schedule

Information on adaptive teaching and learning tactics, teaching and learning materials, the extent of hearing loss, and learners' attitudes towards mathematics were gathered from the head teachers using the interview schedule. The tool served as an addition to a survey that was distributed to teachers and learners on the performance of mathematics as a predictor of academic success among learners with hearing loss in elementary school.

3.7.3 Observation Checklist

An observation checklist, according to Creswell & Creswell (2017), is a tool that offers details regarding real behavior. According to Kothari (2017), using an observation schedule in research allows the researcher to see challenges and events firsthand without having to rely on other individuals. In order to gather data on the resources that are accessible for teaching and learning as well as the tactics employed by teachers, the researcher also attended mathematics lessons that were scheduled. For this study, an observation schedule was essential since it allowed for the collection of data that the questionnaires would not have been able to. The field note book and the observation schedule both contained information gathered from observations. The utilization of

the observation checklist was to enhance the data triangulation gathered using the questionnaire, thus resulting in in-depth study findings.

3.8 Piloting Study

Piloting was done at Njia Special School for learners with hearing loss in Meru County. The selected school was not part of the study. Piloting helped in pre-testing the study tools to enhance validity and reliability. A total of 10% of the research's sample size, according to Williams-McBean (2019), is sufficient for the pilot study. Thus, nine respondents in all were flown from the pilot study school. Six learners with hearing loss were among them, along with two instructors and a head teacher. The pilot study aided in making adjustments to the research equipment before the main study. Piloting also helped in pretesting of the research instruments to ensure clarity of instructions as well as the appropriateness of the duration to respond to the inquiries.

3.9 Validity and Reliability of the Instruments

3.9.1 Validity

For an instrument to be deemed valid, it is essential that it accurately measures concepts and yields results with a high level of precision (Kothari, 2012). By administering instruments during the pilot research, content validity was verified. Adjusting the research instruments is greatly aided by the input of certain respondents who were left out of the final study. My supervisors provided crucial advice in determining the instrument's face validity. In addition, consulting with my supervisors improved the content validity establishment. This made it possible for the researcher to determine which items to be replaced or adjusted in addition to those that needed to be included. As a result, sufficient and precise data about the variables, procedures and goals of this study were gathered.

3.9.2 Reliability

Using the test-retest approach, the reliability of research questionnaires was determined. For a test-retest, the same respondents were given the questionnaires again in a fortnight. To ascertain the internal evenness of the items in the tools, a correlation was computed between the two sets of data using Cronbach Alpha. According to Andrade (2018), an appropriate alpha (r) value falls between 0.70 and 0.90. The following is the Cronbach's Alpha Formula:

$$\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N-1) \cdot \bar{c}}$$

N = Total number of items –respondents

C= Average inter-item covariance

V = Average variance

A coefficient of more than 0.7 was accepted and the tools considered reliable.

3.10 Data Collection Procedures

After obtaining a research authorization, the researcher scheduled appointments to conduct research and get to know the respondents before the actual data collection day. She also visited the chosen schools to seek approval. Three phases of data collection were carried out. The questionnaires were distributed to teachers and learners. After giving teachers and learners 20 minutes to complete every question, the researcher gathered the completed questionnaires. According to Bizimana and Orodho (2014), by limiting the questionnaire duration to 20 minutes, researchers increase their chances of obtaining more thoughtful and accurate responses. The head teachers were also interviewed by the researcher in their own offices. Each head teacher received 20 minutes on average from the researcher. With the participants' consent, the researcher briefly recorded the interviews. Also, the researcher observed lessons scheduled for mathematics so as to

obtain information on teaching and learning strategies and the teaching and learning resources available. The researcher recorded the information on an observation checklist.

3.11 Data Analysis and Presentations

To make analysis easier, the data were coded, compiled and organized. Data that was quantitative as well as qualitative was gathered. A descriptive analysis of quantitative data was conducted using the Statistical Packages for Social Sciences (SPSS v. 26). Frequency tables, percentages, mean, standard deviation and charts were used to display the examined data. Data from the questionnaire were supported by information gleaned from the interview. Following a summary and thematic organization of the data, the research questions set to direct the study were addressed.

3.12 Logistical and Ethical Considerations

3.12.1 Logistical Considerations

To manage logistical considerations, the researcher acquired a letter of authorization and approval of the proposal from the Graduate School at Kenyatta University. Later, the researcher sought a research permit from the National Commission for Science, Technology, and Innovation (NACOSTI). The researcher obtained permission from Meru and Tharaka-Nithi MoE County Directors of Education before going to the schools. Moreover, the researcher proceeded to the selected schools to get permission from the school administration to conduct the research. After this, the researcher booked an appointment with the head teachers for data gathering.

3.12.2 Ethical Considerations

The Kenyatta University Ethics Review Committee provided the researcher with an informed consent form. Before accepting an invitation to join, the researcher made sure that every participant was fully informed about the goals, methods, possible dangers and rewards of the study. Informed

and voluntary consent is essential for any study involving human participants. By securely storing the data collected from respondents away from those not involved in the study, confidentiality was maintained throughout the data collection process. In order to maintain their anonymity, respondents were asked not to include their names on the study instruments that were given to them. Additionally, the researcher made sure that the schools' activities were not interfered with.

CHAPTER FOUR

PRESENTATION OF RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

The research's results, interpretations and discussions are presented in this chapter. This study aimed to explore mathematics performance as a determinant of academic achievement among primary school learners with hearing loss in Meru and Tharaka-Nithi Counties, Kenya. The results were presented according to the stated study objectives; influence of adapted teaching and learning strategies, adapted teaching and learning resources, degree of hearing loss and learners' attitude towards teaching and learning mathematics in Meru and Tharaka-Nithi Counties, Kenya.

4.2 Response rate

A total of six surveys were given to teacher and sixty-five to learners with hearing loss by the researcher herself. The six educators took part in the research. This indicates a 100% return rate. However, 60 learners filled and returned the surveys, giving a 92.3% return rate. Additionally, the two head teachers took part in the scheduled interviews. This supports Bailey's assertion that a response rate of at least 70% is sufficient. Consequently, the information gathered enabled the researcher to make a legitimate conclusion on the study. Table 4.1 displays the response rate.

Table 4.1 Response Rate

Category	Questionnaire issued	Questionnaire returned	Response rate
Teachers	6	6	100.0%
Learners	65	60	92.3%
Total	**71**	**66**	**93.0%**

Source: Field Data (2023)

4.3 Bio Data of Participants

This part presents the findings regarding general demographic data related to gender, age, professional credentials, teaching experience and years of service.

4.3.1 Participants' Gender

In the questionnaire, each responder was asked to specify their gender. Table 4.2 below displays the participants' gender distribution.

Table 4.2 Participants' gender

Gender	**Teachers**		**Learners**	
	f	**%**	**f**	**%**
Male	2	33.3%	34	56.7%
Female	4	66.7%	26	43.3%
Total	**6**	**100%**	**60**	**100%**

Source: Field Data (2023)

As per the research results, 66.7% teachers were female. This was an indication that teachers teaching learners with hearing loss were female-dominated, but it was clear evidence that both genders were involved in the study. It was helpful to represent the ways in which respondents offered ideas to the study by including gender statistics. Their responses varied significantly depending on whether they were male or female, which made it easier for the researcher to evaluate the data with objectivity. Moreover, 56.7% learners were male, while 43.3% were female.

4.2.2 Professional Qualification for Teachers

Determining the professional qualifications for teachers was the goal of the study. Table 4.3 is a tabulation of the results.

Table 4.3 Professional Qualification for Teachers

Qualification level	f	%
Certificate in P1	-	-
Diploma SNE	3	50.0%
Bachelor's Degree	2	33.3%
Master's Degree	1	16.7%
Total	**6**	**100**

Source: Field Data (2023)

The outcomes displayed in Table 4.3 show that the majority of mathematics teachers had attained the diploma level of education, as presented by 50%. However, those with bachelor's degrees were 16.7%. All of the teachers were formerly P1 teachers before their professional advancement while serving as teachers. The findings of the study reveal a high interest in special needs education, of which most of them are female and mothers. They have a passion for teaching learners with hearing loss, which pushes them to pursue specific areas of their choice. Teachers' academic backgrounds have an impact on their ability to teach since they determine how effectively they can prepare, choose the best teaching resources and use effective teaching techniques. Olabode (2012), who found that learners performed better when taught by teachers with advanced academic backgrounds than when taught by teachers with lower qualifications, supports this conclusion. Furthermore, this is a consequence of the teachers' aptitude for selecting the best teaching aids and educational exercises associated with the subject or idea.

4.3.3 Distribution of Teachers by Teaching Experience

A question on the participants' degree of teaching experience was posed. Table 4.4 presents the findings.

Table 4.4 Teaching Experience of Teachers

No. of years	f	%
Less than 5 years	1	16.7
5 – 10 years	3	50.0
Above 10 years	2	33.3
Total	**6**	**100%**

Source: Field Data (2023)

The results in Table 4.4 reveal that 50% teachers had worked in teaching positions in a period between 5 and 10 years. Also, 33.3% teachers had worked in teaching positions for more than 10 years. This demonstrated that educators possess the knowledge and expertise needed to instruct learners with hearing loss. To guarantee that learners with hearing loss have equal access to school, teaching them calls for specific knowledge, techniques, and a nurturing classroom setting. Teachers should have a basic understanding of hearing loss and its various causes, degrees, and types, such as conductive, sensori-neural or mixed hearing loss.

4.3 Adapted Teaching and Learning Strategies

Objective one of the research sought to find out the extent to which adapted teaching and learning strategies were utilized by teachers of mathematics in grades four, five and six. Teachers had to specify how frequently they employed each of the modified tactics when teaching mathematics to learners with hearing loss in order to meet this objective. An interview was also conducted to help teachers explain in details their responses in the table below. The data was analysed as follows starting with the quantitative data:

4.3.1 Adapted teaching and learning strategies in grade four

The table shows how often adapted teaching and learning strategies were used in grade four. The outcomes were tabulated in Table 4.5

Table 4.5 Adapted Teaching and Learning Strategies in grade four

Strategies	f	%
Lecture-Based Teaching	2	100%
Demonstration and Modeling	1	50%
Problem-Solving Approach	2	100%
Interactive teaching	1	50.0%

Source: Field Data (2023)

The results displayed in Table 4.5 show that 2 (100%) teachers used lecture-based teaching and problem-solving approaches in teaching mathematics to grade four learners. Moreover,50% teachers used demonstration, modelling, and interactive teaching. Adapted teaching and learning strategies are essential for creating inclusive, effective and supportive learning environments. To guarantee that every learner has the chance to succeed, educators must be adaptable, sympathetic, and sensitive to their needs. The results were consistent with a study by Abiatal and Howard (2019), which discovered that by customising lesson plans to fit the unique needs of their learners, teachers can enhance the learning outcomes of learners with hearing loss. The dismal performance in mathematics by learners with hearing loss mostly depends on the instructional strategies deployed by the teachers.

4.3.2 Adapted teaching and learning strategies in grade five

The table shows how often adapted teaching and learning strategies were utilized in grade five. The findings were exhibited in Table 4.6.

Table 4.6 Adapted Teaching and Learning Strategies in grade five

Strategies	f	%
Lecture-Based Teaching	1	50%
Demonstration and Modeling	2	100%
Problem-Solving Approach	2	100%
Interactive teaching	1	50.0%

Source: Field Data (2023)

The findings displayed in Table 4.6 revealed that 2 (100%) teachers used demonstration and modelling and a problem-solving approach, while 1 (50%) teachers used lecture-based teaching and interactive teaching. Effectively teaching mathematics to learners with hearing loss necessitates the creation of an inclusive and supportive environment that addresses their varied learning requirements. The findings align with those of Erbas (2017), which revealed that teachers actively supported the inclusion of deaf and hard of hearing (DHH) learners through a range of strategies. These included the implementation of workstations, diverse representations of information, and the integration of technological and visual aids into their teaching methods. Additionally, considerations such as seating arrangements, the provision of assistive listening devices for learners with hearing loss, and the use of personal microphones to enhance these devices in three classrooms were emphasized. Furthermore, successful implementation relies on collaboration among educators, learners, and support staff.

Grade five teachers were asked to comment on their practice and competency in modifying instructions for learners with hearing loss. The following were the responses

Teacher 1

I strongly believe in modifying instructions for learners with hearing loss. Unfortunately, I do not get enough support from the administration. Some of the modifications require money which is not readily available. I cannot however blame the head teacher because sure he cannot use his personal money.

Asked about collaboration and parental participation, the following was the response.

Some of the parents have no idea what it entails to Educate learners with hearing loss. Also, some are poor and others semi-illiterate or even illiterate. Sadly, some have no attachment towards their kids and they believe that it is the school's sole responsibility to take care of the children. Some do respond to phone calls but the collaboration is minimal. Others unfortunately live in denial

Asked to comment on Mathematics performance implication of the above, she had the following to say

There is no doubt that due to poor collaboration and lack of modification of our teaching strategies, our learners have been performing pathetically poor in Mathematics. It is such a challenge.

Teacher 2 and 3

I have to be honest with you. I do not differentiate instructions while teaching mathematics. To start with I personally do not like teaching mathematics. I am not competent but I am forced by the head teacher to do so due to staff shortage. On the same note since I left college, we have not received any in-service training on how to best teach learners with hearing loss. Technology and research findings call for enhancement training. The current situation has led to continued poor performance of our learners in Mathematics.

Asked whether there is collaboration and team work in differentiating work among teachers, the following was the response

Sadly, the collaboration is minimal. There is too much work hence very little time for meetings. We cannot have collaboration without meetings so that we have discussions on how to go about it. On the same note the head teacher is always in meetings outside the institution and when around, he is too busy doing administrative duties.

The teacher was probed further on implication of lack of differentiated teaching on academic performance in Mathematics. This was the response.

Honestly this is not something I am proud of. Performance of Mathematics has not been very appealing compared to other subjects. Something must be done

The two head teachers were also interviewed on what they perceived to be the state of differentiating instructions to fit the needs of learners with hearing loss.

Head teacher 1

It is true we appreciate differentiated and personalized instructions for all our learners. While this is the case, we meet quite a number of challenges. We do not have enough teachers at the moment. We are however following up with Teachers' Service Commission for deployment of teachers. The number of learners is overwhelming to our teachers. On the same note, it has been long since we took our teachers for in-service training. Finally, technology is an issue. We do not have reliable internet and computers.

Asked to comment on how the above affected Mathematic performance he added,

Generally, the end result of all the above deficits is poor achievement in Mathematics and related subjects like science. We have not been doing well enough. Hopefully, things will Change in the future. This however will need all stake holders to join hands

Head teacher 2

We try our best to teach learners based on what their I.E.Ps recommends. While this is the case, some of our learners have incomplete I.E.Ps and as well some come from other institutions without any. On the same note, some of the strategies recommended require use of technology which is not very reliably available here. At times we do not have electricity and our generator is unreliable. This among other challenges has made performance of Mathematics poor in consecutive years.

He was further probed to comment on the implication of the above on performance of Mathematics. Here is his response,

Without I.E.P that is well updated, we hardly know the strengths and weaknesses of the child. We also find it hard to come up with appropriate teaching strategies. The end result of this is poor performance in Mathematics and related subjects like science.

4.3.3 Adapted teaching and learning strategies in grade six

In this section, the research aimed to explore how often adapted teaching and learning strategies were utilized in grade six. The findings were exhibited in Table 4.7.

Table 4.7 Adapted Teaching and Learning Strategies in grade six

Strategies	f	%
Lecture-Based Teaching	2	100%
Demonstration and Modeling	2	100%
Problem-Solving Approach	1	50%
Interactive teaching	2	100%

Source: Field Data (2023)

The results exhibited in Table 4.7 show that 2 (100%) teachers used lecture-based teaching, demonstration and modelling, and interactive teaching strategies in teaching mathematics to learners with hearing loss, while 1 (50%) used only a problem-solving approach. The use of visual aids such as charts, graphs, and diagrams to illustrate mathematical concepts enhances understanding. These results are congruent with those of a research done by Kuku and Adeniyi (2020), which indicated that mathematics performances increase when learners with hearing loss are exposed to gamification and experiential methods of education. The study also found that both

male and female learners with hearing loss benefited from the two treatments. It was recommended that gamification and experiential learning techniques be used in Mathematics classes for learners with hearing loss. While the above was observed, responses to interviews showed a big gap on what happens in the school and what should ideally happen.

INTERVIEW RESPONSES

Teachers in grade six were asked to give their opinion on use of technology or visual aids as a modification for learners with hearing loss. The following were the responses.

Teacher 1

We do not use any modern technology like many other schools around here. We do not have projectors and the one we used to have has not been repaired for quite some time. On the same note, we have a small computer room but the computers are few with some computers being old and non-functional. They were donated when already old. On the same note, we do not have any computer expert to guide us through or guide the learners

Teacher 2

In the modern world, technology plays a great role in education of both typically developing and those with hearing loss like ours. In this school, we have an issue with electricity. It is not reliable and our generator is equally inefficient. We do not have free WIFI to use for teaching and learning enhancement. The teacher- learner ratio is also very discouraging. We are overwhelmed by the numbers. Remember this is the only school of this kind in this region. Our catchment area is large.

The head teachers from both schools were also interviewed on the same. The following were the responses.

Head teacher 1

Yes, we use visual illustration and technology. During my training this was quite emphasized as an intervention and teaching enhancement strategy. The only concern is that Teachers' Service Commission has not deployed enough teachers to the school and as well the numbers of learners has been increasing at an alarming rate. Our catchment area is quite wide.

Head teacher 2

To be honest we try our best. Unfortunately, we do not have a reliable source of electricity. Of late, we have electricity black out regularly. On the same note, our generator has done some good work in the past but it is old and keeps breaking down. Finally, we do not have free WIFI and hence use of internet is not reliable. This for sure frustrates our efforts and is responsible for poor performance in Mathematics and closely related subjects by our learners.

4.3.3 Observed adapted teaching and learning strategies in grades four, five and six

In the observed adapted teaching and learning strategies for grades four, five, and six, various approaches have been employed. Visual aids and manipulatives (blocks, shapes, counters, clock dials, and pieces of paper) have proven to be particularly effective, offering learners a tangible and comprehensible representation of abstract mathematical concepts. The integration of sign language and all other Total Communication modes (TC) has created an inclusive classroom

environment that caters for the diverse communication preferences, fostering a sense of belonging. There was minimal use of technology since there was no reliable WIFI.

Teachers improvised by allowing learners to use their laptops and phone gadgets and the few computers available but this was not sufficient. The number of learners is overwhelming. Collaborative learning opportunities have been embraced, encouraging peer interaction and teamwork as learners employ various communication modes to explain mathematical concepts to each other. Unfortunately, the number of learners was overwhelming and the teachers had difficulties conducting cooperative learning. There was minimal use of visual aids and learners were not given choice of what activities to do.

There was effort to use real-world relevance of mathematical concepts but this was not very adequate. The I.E.P were kept but rarely referred to while choosing teaching strategies and were not updated. Some learners did not have any I.E.P files. Teaching Pace was not adjusted based on learning needs of learners and teachers seemed to be more interested in moving with the pace of bright learners. The classrooms were fairly well lit but during electricity black out or when the generator was on use, there were learners who were struggling to see the board. There was fairly kept paper work but progress records had significant gaps. Performance in mathematics was notably poor.

A questionnaire was utilized to gather information on the adapted teaching and learning strategies employed when instructing learners with hearing loss. The information was categorized, and frequency counts, percentages, and the mean were used for analysis. The study utilized a scale of very large extent =4, large extent = 3, less extent = 2, and least extent = 1. The results were exhibited in Table 4.8.

Table 4.8 Learners opinions on adapted teaching and learning strategies

Parameters	1 F (%)	2 F (%)	3 F (%)	4 F (%)	Mean
Teachers use lecture-based teaching method while teaching mathematics	13(21.7%	12(20%)	15(25%)	20(33.3%)	3.64
Teachers use demonstration and modeling in teaching mathematics	13(21.7%)	14(23.3%)	17(28.3%)	16(26.7%)	3.57
Teachers use Kenya sign language in teaching mathematics	14(23.3%)	13(21.7%)	16(26.7%)	18(30%)	3.48
Teachers prefer using problem-solving approach while teaching mathematics	11(18.3%)	15(25%)	19(31.7%)	17(28.3%)	3.67

Source: Field Data (2023)

The findings displayed in Table 4.8 show that according to learners 20 (33.3%) teachers used the lecture-based teaching method to a very large extent while teaching mathematics. Similarly, educators employed visual aids like charts, graphs, and diagrams to improve learners' comprehension of mathematical ideas. In order to successfully communicate information in a manner that accommodates a variety of learning styles, these visual aids are essential for making sure that learners with hearing loss can access and comprehend the content. The findings were supported by Owino's (2011) research, which discovered that teachers may enhance the learning results of their learners with hearing loss by customising their lesson plans to suit their requirements. Teachers' use of instructional tactics is mostly to blame for the poor mathematics performance of learners with hearing loss.

Further, the findings revealed that 17 (28.3%) learners agreed to a very large extent that teachers used demonstration and modelling in teaching mathematics to learners with hearing loss. Inclusive mathematics instruction for learners with hearing loss often involves a combination of demonstration and modelling. Teachers may use visual aids, such as charts, graphs, and diagrams, to illustrate mathematical relationships and concepts. The findings were supported by Abiatal and

Howard (2019), who established that teachers may utilize modelling through interactive simulations or digital platforms, providing a more dynamic and engaging learning experience.

The findings displayed in Table 4.8 show that according to learners, 18 (30%) teachers very strongly agreed that they use Kenyan Sign Language in teaching mathematics to learners with hearing loss. Teachers who are adapt use of Kenyan Sign Language (KSL) play a crucial role in ensuring that learners with hearing loss have access to quality mathematics education. Using KSL in the mathematics classroom involves a unique set of strategies aimed at facilitating effective communication and enhancing comprehension.

The results presented in Table 4.8 show that 19 (31.7%) learners largely agreed that teachers use a problem-solving approach while teaching mathematics to learners with hearing loss. The problem-solving approach in mathematics instruction for learners with hearing loss proves to be a valuable strategy. By incorporating visual aids, manipulatives, collaborative learning, and technology, teachers create a learning environment that encourages active engagement and deepens learners' understanding of mathematical concepts. The current study supported the use of educational technologies, as did Clymer and Berent (2020). The techniques make sure learners participate actively in the teaching and learning process, which results in outstanding achievement.

Additionally, the study aimed to assess the level of agreement among teachers regarding statements related to the adapted teaching and learning strategies employed in mathematics instruction. The response options were categorized as follows: SA - Strongly Agree, A - Agree, U - Undecided, D - Disagree, and SD - Strongly Disagree. The results are illustrated in Table 4.9.

Table 4.9 Teachers opinions on adapted teaching and learning strategies

Statements	SA		A		U		D		SD		Mean
	F	%	F	%	F	%	F	%	F	%	
The use of visual aids (e.g., videos, images, diagrams) in the classroom helps the learners understand the subject matter better.	4	66.7	2	33.3	-	-	-	-	-	-	3.98
Use of Kenyan Sign Language or other communication modes improves the comprehension of the lesson.	3	50.0	3	50.0	-	-	-	-	-	-	3.83
The availability of assistive listening devices (ALDs) or hearing aids in the classroom positively impacts participation and engagement of learners.	2	33.3	4	66.7	-	-	-	-	-	-	3.51
Captioned videos and transcripts are provided for audio content learning.	3	50.0	2	33.3	1	16.7	-	-	-	-	3.86
Providing written summaries of lectures or key points helps the learners review and retain the material more effectively.	2	33.3	3	50.0	1	16.7	-	-	-	-	3.69
The provision of extra time for assignments and exams considers the unique challenges faced by learners with hearing loss.	2	33.3	3	50.0	1	16.7	-	-	-	-	3.62
Encouraging group discussions and peer interactions allows learners with hearing loss learn from different perspectives and experiences.	3	50.0	2	33.3	1	16.7	-	-	-	-	3.79

Source: Field Data (2023)

The results in Table 4.9 indicate that most teachers agreed that the use of visual aids (e.g., videos, images, and diagrams) in the classroom helps the learners understand the subject matter better, as presented by 4 (66.7%) strongly agreeing and 2 (33.3%) agreeing. The respondents also show that

50% of the teachers strongly agreed that using Kenyan Sign Language or other communication modes improves the comprehension of the lesson.

Further, teachers agreed that the availability of assistive listening devices (ALDs) or hearing aids in the classroom positively impacts the participation and engagement of learners, as indicated by 2 (33.3%) strongly agreeing and 4 (66.7%) agreeing. ALDs or hearing aids amplify sound, making it clearer and louder for learners with hearing loss (Abiatal & Howard, 2019). This ensures that they hear the teacher's instructions as well as those of their peers during classroom discussion

The findings revealed that captioned videos and transcripts are provided for audio content learning, as presented by 3 (50%) strongly agreed and 2 (33.3%) agreed. The use of a variety of strategies to aid learning by learners with HL resulted in highly successful material delivery. The results revealed that 3 (50.0%) teachers agreed that providing written summaries of lectures or key points helps the learners review and retain the material more effectively. This finding supports that of Mwangi (2014), who found that active and working discussion groups are one of the strategies for educational enhancement in teaching for improved performance of a learner or learners.

Teachers agreed that the provision of extra time for assignments and exams considers the unique challenges faced by learners with hearing loss, as indicated by 3 (50.0%). Moreover, 3 (50.0%) strongly agreed that teachers encouraging group discussions and peer interactions allows learners with hearing loss to learn from different perspectives and experiences. The results align with the research conducted by Kuku and Adeniyi (2020), who found that mathematics achievement increases when learners with hearing loss are exposed to gamification and experiential learning techniques. It is important to note that despite the above results on teachers' perceptions, the actual use of the same in the field is different. This was evident form the interview responses below.

INTERVIEW RESPONSE

Teachers were asked to comment on their use of KSL to instruct learners with hearing loss.

Teacher 1

While KSL is a good language to use to teach mathematics, majority of the teachers have different variations which cause confusion to the learners with hearing loss. Most of these learners are used to nonconventional language normally used in their homes before joining this school. We also have diverse cultural nuances.

Teachers 2

I strongly believe in use of KSL but some of us were not trained to use it. In my teachers training institution, I was taught to use American sign language. While the two are somehow related, I find it a challenge. As well, some learners have not been exposed to either of the two sign languages but use nonconventional sign language. We also have learners who have transferred from institutions that use American Sign Language.

As noted from the above responses, there are challenges in use of KSL. Research indicates that among the challenges affecting use of sign language is lack of teachers who are proficient in the language, cultural biases or nuances, regional variation in sign language and difficult adapting some concepts in sign language (Bintoro et al., 2023). The catchment area of the two schools of research is quite wide leading to interaction of cultures. On the same some mathematic concepts are difficult to conceptualize in sign language. This remain a challenge in the institutions of research.

Teacher 3 Was asked to comment on use of technology. Below is his response

We have been having a challenge with use of technology to modify instructions for our learners with hearing impairment. Most of the computers we have here were donated to us when they were already too old. On the same note, we do not have free adequately reliable WIFI and as well Electricity is a challenge. This has been a great impediment to teaching. This has been attributed to poor performance in mathematics.

Probed further and asked about use of assistive technology devices, she had the following to add

Sure, enough we have learners with Cochlear implant and others who use computerised assistive devices in class. This has been of great importance, that is okay but we also have those learners who need those devices but they are from poor background. It is emotionally draining for us to observe the desperate situations while teaching. Some learners are therefore disadvantaged compared to others. Some of our learners are sponsored by donors while others are not. Those who are sponsored have everything they need and this is great. Unfortunately, majority have no sponsor.

Research indicates that one key strategy in teaching learners with hearing loss involves the use of Technology including assistive technology such as hearing aids and cochlear implants, to enhance the auditory experience for learners with hearing loss. Looking at the above responses there is concern that technology is not adequately available in the institutions of research. Use of technology enhances learner communication and socialisation especially those with hearing loss. With incorporation of technology in class, the role of the teacher has significantly changed especially while teaching learners with hearing loss. Among the role played by technology include

assistive technology, use of visual aids and language development (Rehman et al., 2024). Internet can be used to provide animated explanations, captioned videos, sign language interpretation and text-based explanations. This significantly enhancers learners interaction with education and learning materials (Patrick, et al., 2015).

Teacher 4

While we have some few desktop computers and some tablets, many of them require to be repaired. This has not happened and when it happens it takes too long. Some are equally out dated. Some learners as well are destructive when annoyed and hence some gadgets are already vandalized. I believe in technology but it is not equally availed to me to help enhance learning. Donors should be encouraged to give what is modern as far as technology is concerned.

Probed further on her differentiated teaching skills, she had the following to add

I have been in the field for more than ten years. This is great experience. However, this means I trained long time ago. Technology keeps changing and Research on strategy has been ongoing. We probably have many new research-based teaching strategies for learners with hearing loss. I have not received any in-service training for a long time to help me differentiate instructions better or be acquainted to new strategies and technology. I feel obsolete. This has possibly led to our learners continued poor performance in Mathematics.

Teachers were also asked to comment about their use of cooperative learning and multi-disciplinary teaching approach. The following were their response

Teachers 1

I strongly believe in the two but logistics have made it difficult. Cooperative teaching has been hard to apply here because learners vary in their communication competence. On the same note, the numbers are too many. Our teacher learner ratio is quite overwhelming. Further, we do not have interpreters for some of our learners who are not conversant with American sign language. On the multidisciplinary teaching approach, we do not have enough cooperation from both parents and related professionals. Multi-disciplinary team approach entails a number of partners.

Teacher 2, had the following to say

I have a number of challenges in this. Multidisciplinary team approach requires several meetings that is time consuming. Too getting a common time for all stake holders is a difficult task. With the introduction of competence-based curriculum, there is not much time for meetings. The curriculum is too overwhelming. On the same, note our school population is too high. Teachers Service Commission has not deployed enough teachers despite enrolment being too high.

Probed Further about use of Individualized Educational Program, this was the response

Many of our learners come here with incomplete records. Their I.E.P files are incomplete. We have a lot of gaps. Some have been poorly assessed for comorbidity. Apart from having hearing loss they seem to have additional conditions like AD/HD, learning disabilities and Autism. We try our best but some of the key areas such as competence levels and teaching and learning strategies are incomplete. This is quite frustrating when half of the class are in that category. I am concerned that this has led to our learner unsatisfactory performance in Mathematics.

The above response by teachers clearly indicates that there is no multidisciplinary team approach in both institutions. A multidisciplinary team is a collaborative approach where different professionals including educationist, psychologists etc., work together to address a common goal. This gives an approach to dealing with a challenge in special education a holistic approach. The interactive experience depends with one's mastery of the knowledge and professional experience and the ability to consume and respond to knowledge brought by other professional in the meeting (Bagadood & Saigh 2022). It means that knowledge from several disciplines are employed in solving a particular problem and they are supplementary to one another to a point of getting clear cut solution to the problem (Ogwuegbu, 2018). A good example as mentioned by one of the respondents above is when reviewing or writing an I.E.P. This is a document that outlines an education program and services that a particular learner needs to have in order to have her education needs addressed. Depending with the assessment done, several stakeholders and professionals may be involved (Roy, 2023). It is there a very concerning situations that the teacher above states that some learners with comorbidity do not have Individualized Educational Program.

4.4 Teaching and Learning Resources

The objective two of the research was to explore how teaching and learning resources affect the performance of learners with hearing loss. To achieve this objective, teachers were asked to express their level of agreement regarding these resources, using the following scale: SA - Strongly Agree, A - Agree, U - Undecided, D - Disagree, and SD - Strongly Disagree. The findings are summarized in Table 4.10.

Table 4.10 Teacher's opinions on teaching and learning resources

Statements	SA		A		U		D		SD		Mean
	F	%	F	%	F	%	F	%	F	%	
The availability of customized teaching and learning resources developed for learners with hearing loss is adequate.	2	33.3	4	66.7							4.11
Current teaching and learning resources cater for the specific needs of learners with hearing loss.	2	33.3	3	50.0	1						3.48
Visual aids, captioned videos and use of Kenyan Sign Language dictionary, are integrated into the learning materials.	2	33.3	2	33.3	2	33.3					3.56
Teaching and learning resources for learners with hearing loss are accessible in terms of format and usability.	1	16.7	3	50.0	2	33.3					3.17
Teachers incorporate assistive devices, like hearing aids into the teaching process.	3	50.0	2	33.3	1	16.7					3.48
School fosters an inclusive environment that promotes collaborative learning among learners with hearing loss.	2	33.3	3	50.0	1	16.7					3.44

Source: Field Data (2023)

The results in Table 4.10 established that 4 (66.7%) teachers agreed that the availability of customized teaching and learning resources developed for learners with hearing loss is adequate. Educational institutions and technology developers have recognized the importance of catering for the diverse needs of learners, including those with hearing loss. The findings were supported by Githua (2011), who revealed that inadequate resources and equipment for teaching mathematics, as well as teachers' lack of expertise, are to blame for the learners' dismal performance in mathematics.

Also, 3 (50%) teachers agreed that current teaching and learning resources cater for the specific needs of learners with hearing loss. The continuous development of assistive technology has played a crucial role in catering for the needs of learners with hearing loss. This includes cochlear implants, improved hearing aids, and assistive listening devices designed to enhance auditory experiences in educational settings. The results are supported by Livumbaze and Achoka (2017), who established that the availability of resources and the equipment to assist underperforming schools have been connected to the success of teaching and learning.

Moreover, the results show that teachers agreed that visual aids, captioned videos and use of Kenyan Sign Language, are integrated into the learning materials, as indicated by strongly agreeing with 2 (33.3%) and agreeing with 2 (33.3%). The results agree with those of Visser, Andrea, and Feza (2015), who revealed that the utilization of digital technology in the classroom enhances learners' engagement and improves teaching and learning activities. Also, inadequate resources and equipment for teaching mathematics, as well as teachers' lack of expertise, result in learners' dismal performance in mathematics.

The findings further revealed that two (50%) teachers agreed that teaching and learning resources for learners with hearing loss are accessible in terms of format and usability. Continuous efforts and collaboration between educators, technology developers, and accessibility experts are essential to ensuring that teaching and learning resources remain accessible in terms of both format and usability for learners with hearing loss. The findings were corroborated by Lyons' (2012) study, which found that the learners' achievements were significantly impacted by the material resources. This was because the tangible resources helped the learners grasp the principles and concepts that surrounded them, discouraging rote learning.

A total of 3 (50%) teachers strongly agreed that teachers incorporate assistive devices, like hearing aids, into the teaching process. Teachers play a pivotal role in understanding the unique needs of every learner by actively engaging in open communication with both learners and their families. By gathering information on the type and degree of hearing loss, preferred communication modes, and the use of assistive devices, educators tailor their instructional approach to accommodate individual needs. The findings were supported by Yusta, Karugu, Muthee, and Tekle (2016), who established that visual aids, audio-visual aids and regalia were commonly used by teachers when teaching mathematics to learners with hearing loss.

Further, 3 (50%) of teachers agreed that school fosters an inclusive environment that promotes collaborative learning among learners with hearing loss. The findings align with those of Njoroge (2019), who established a link between learners' academic achievement and the availability of teaching materials across schools. The study indicated that these resources significantly influenced learners' success by reducing rote memorization and fostering a deeper understanding of essential concepts. Moreover, resources play a crucial role in enhancing the quality of teaching and learning. Therefore, educational authorities should invest in these materials to support underperforming schools, ultimately improving learners' skills and readiness for national examinations (UNESCO, 2015).

Data regarding the availability and use of teaching and learning resources in mathematics education were gathered through a questionnaire. The responses were coded and analysed employing frequency counts, percentages, and means. The study utilized a rating scale where a very large extent was assigned a value of 4, a large extent a value of 3, a lesser extent a value of 2, and the least extent a value of 1. The results are presented in Table 4.11.

Table 4.11 Learners opinions on teaching and learning resources

Parameters	1 F(%)	2 F(%)	3 F(%)	4 F(%)	Mean
To what extent do learners use hearing aids in class.	14(23.3%	13(21.7%)	17(28.3%)	16(26.7%)	3.72
To what extent are there enough mathematics text books.	13(21.7%)	12(20.0%)	19(31.7%)	15(25%)	3.59
To what extent is Kenyan Sign Language used during mathematics classes for learners with hearing loss.	8(18.3%)	11(18.3%)	18(30%)	20(33.3%)	3.67

Source: Field Data (2023)

The findings presented in Table 4.11 show that 16 (26.7%) learners agreed to a very large extent that they use hearing aids in class. Learners with hearing loss often utilize hearing aids as essential assistive devices in the classroom. These small electronic devices are designed to amplify sound, allowing learners to better perceive spoken information. The findings are supported by a report by UNESCO (2015), which revealed that the use of hearing aids enables these learners to actively engage in classroom discussions, understand instructional content, and participate in various educational activities.

Further, 19 (31.7%) learners largely agreed that there are enough mathematics text books. It is however a big concern that a large population disagreed. Lashley (2017), who established that the availability and utilization of teaching and learning resources in the context of mathematics education significantly impact the quality of instruction and learner learning outcomes. Access to quality mathematics text books and curriculum materials is fundamental. These resources provide a structured approach to teaching mathematics. Teachers need training to effectively utilize these resources. The government of Kenya promised at some point to provide text books for all learners including those with hearing loss. These text books should be adapted to match the needs of learners with hearing loss.

Regarding the Kenyan Sign Language use during mathematics classes for learners with hearing loss, 20 (33.3%) agreed to a very large extent with the statement. The use of Kenyan Sign Language underscores a commitment to creating an inclusive educational environment where every learner, regardless of their hearing abilities, thrives and succeeds in mastering mathematical concepts and skills. The findings are supported by findings from a study by Njoroge (2019), who established that use, of Kenyan Sign language contribute to a more inclusive classroom environment. It empowers learners to participate fully in discussions, ask questions and collaborate with their peers, fostering a sense of belonging and community within the mathematics classrooms.

During the observation, the researcher aimed to observe the availability of teaching and learning resources in the school. A tick mark (√) indicates the availability of resources used, while an X shows that the resources were not available.

Table 4.12 Availability of teaching and Learning Resources

Resources	Availability
Resource room	√
Computers	×
Kenyan Sign Language use	√
Projectors	x
Trained staff in handling learners with hearing loss	×
Trained counselor in special needs education	×
Teacher aides	x
Teacher using lesson plan	√
Use of IEP by the teacher	x
Having modified adequate text books	x

Source: Field Data (2023)

Resources are categorized into physical and human resources. For physical resources to be adequately used, we must have enough human resources. From the observation above, it was noted that we, do not have enough projectors in the institutions. The researcher also observed that the

institutions do not have enough computers and neither do we have enough supplementary teaching notes. Text books were not modified to meet the needs of learners with hearing loss and comorbidity.

Through an in-depth face to face interview, Teachers were asked about their opinion on availability and utilization of resources in the schools for learners with hearing loss. The following were their responses.

Teacher 1

In my opinion, we do not have enough resource materials to teach. Learners with hearing loss require concrete hands-on activity. This is not always the case. With the current CBC curriculum, a lot of hands-on work is required. We do not readily have enough access to such materials owing to the complex government procurement process. Some parents are also poor or unconcerned. On the same note, we need technology for online activities but this is not freely available. Some learning experience require video clips and watching activities online through YOU TUBE. We are disadvantaged owing to lack of free Wifi. If this would improve our learners would not continue performing poorly in Mathematics and related subjects.

Teacher 2

While I believe in multiple intelligence theory and use of visual aids for learners with hearing impairment, I find myself struggling in terms of resources. Visual aids need to be prepared every other lesson. They also need to be differentiated as per learners' needs. This is overwhelming owing to the diverse needs of the learners. I can simply say the resources we have are somehow wanting. Something needs to be done

As noted from the above two respondents, resources are not adequate in the two institutions. One of the respondents is very clear on his faith in Haward Gardner's multiple intelligence theory but resources frustrate him. Teaching using Haward Gardners multiple intelligence theory has been noted to improve career efficacy of learners with hearing loss. Career efficacy is considered as one of the most critical issues in education of learners with special needs. This applies more in learners with hearing loss who start their social life mostly when they graduate from school (Saeed et al., 2019). According to research, Common challenges in using the multiple intelligence theory include inadequate books, crowded classes and inadequate teaching materials.

Teacher 3

As far as resources are concerned, I can say all is not well. We rely on donors and well-wishers. Most of our resources are dilapidated or too old by the time they get here. On the same note, we do not have enough human resource. We need more support on technology. Our computers are rarely reliable and internet access is limited. We also lack sign language interpreters

Teacher 4

As far as resources are concerned, the Teachers Service Commission has not deployed enough teachers here. We are overwhelmed. We teach some subjects that we are not comfortable in. Our computer room is not well equipped and we do not have any computer expert to guide us. Some of us are not computer literate. We have not received adequate CBC training as well.

Looking at the responses above, it is clear that both human resources and physical resources are inadequate. In this era, incorporation of technology in teaching is expected in any modern day class. Technology is quite critical when teaching learners with hearing loss. It provides visual aids, provides real time captions, and also assistive communication devices. It allows learners to access information effectively and participate actively in the learning process. Research indicates that teachers for learners with hearing loss have embraced ICT mainly because computer technology

is deaf friendly. It enhances learners' creativity in graphical and visual drawing (Nordin et al., 2013).

4.5 Degree of Hearing Loss

Determining the impact of hearing loss severity on the performance of students with hearing loss was the third goal of the study. The intellectual, social, and emotional development are all impacted by the severity of their hearing loss. Using a Likert scale with SA standing for "Strongly Agree," this study aimed to ascertain the degree of agreement on a number of statements pertaining to the impact of hearing loss on mathematical ability. SA- Strongly Agree, A-Agree, D-Disagree, SD-Strongly Disagree and U-Undecided. Table 4.13 displayed the results.

Table 4.13 Teachers opinions on influence of degree of hearing loss on performance

Statements	**SA**		**A**		**U**		**D**		**SD**		**Mean**
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	
The learners with mild hearing loss perform better than those with severe and profound hearing loss.	2	33.3	3	50	1	16.7					3.73
The hearing loss impacted the learners´ level of confidence in participating in mathematics-related discussions in the classroom.	4	66.7	1	16.7	1	16.7					3.58
Learners with hearing loss experience difficulties in understanding concepts presented to them during lessons.	3	50.0	2	33.3	1	16.7					3.62
Assessment seemed to be too overloaded for learners with hearing loss.	2	33.3	3	50	1	16.7					3.43
Learners with hearing loss can learn and socialize in the same way like hearing learners	1	16.7	3	50	2	33.3					3.55

Source: Field Data (2023)

The results in Table 4.13 revealed that 3 (50%) teachers agreed that learners with mild hearing loss perform better than those with severe and profound hearing loss. Accessing spoken language and auditory clues is more difficult for learners with profound and severe hearing loss. Mwololo (2017), who found that learners with minor hearing loss may exhibit relatively superior academic achievements, supports the findings. Greater access to spoken language and auditory information is made possible by reduced hearing loss, which facilitates a smoother transition into conventional educational environments.

Further, the findings show that 4 (66.7%) teachers strongly agreed that hearing loss impacted the learner's level of confidence in participating in mathematics-related discussions in the classroom. The degree of hearing loss significantly impacts the performance of learners with hearing loss across various domains of their development, including communication skills, educational progress, social and emotional well-being and self-esteem. The findings agreed with those of Charema and Charema (2013), who demonstrated that learners with mild hearing loss outperform those with substantial hearing loss. Due to their restricted vocabulary, poor comprehension and ignorance of mathematical concepts, children with hearing loss seem to be more affected by verbal language in their mathematical performance.

The results uncovered that 3 (50%) teachers strongly agreed that learners with hearing loss experience difficulties in understanding concepts presented to them during lessons. Teachers and support personnel are essential in identifying and resolving these issues, collaborating to provide a welcoming classroom that meets the various requirements of learners with hearing loss. This is consistent with research by Charema and Charema (2013), who found that learners with hearing

loss frequently struggle to understand topics taught to them in class, indicating the effect of their auditory loss on the learning process.

Also, 3 (50%) of teachers agreed that assessment seemed to be too overloaded for learners with hearing loss. To help them develop and communicate effectively in the classroom, language instruction for learners with hearing loss should begin as early as age three. The findings of a research by Mwololo (2017), which showed that the severity of hearing loss also affects how learners interact with their surroundings, corroborated the findings. Those with mild or moderate hearing loss benefit from a quieter and more acoustically favourable classroom, while those with severe to profound hearing loss may require assistive devices and specialized educational settings to access sound effectively.

Learners with hearing loss can learn and socialize in the same way as hearing learners, as indicated by three (50%) teachers who strongly agreed. Particularly in busy settings, learners with minor hearing loss may have trouble hearing distant or soft speech. To hear even loud speech, learners with severe hearing loss can need a lot of amplification or assistive technology. They may have trouble with pronunciation and articulation, and their language development is usually more delayed. The results corroborated the findings of Su *et al.* (2020), who discovered that learners with hearing loss struggle to communicate and can benefit from having their hearing aids fitted properly to assist them comprehend what the instructor is teaching.

Using a scale of extremely large extent = 5, very large extent = 4, large extent = 3, less extent = 2, and least extent = 1, the research collected data on the mathematical performance of learners with HL according to their level of hearing loss using a questionnaire, coded the data, and analyzed the data using frequency counts, percentages, and the mean (Table 4.14).

Table 4.14 Learners opinions on how degree of hearing loss impacted the performance

	1 F(%)	2 F(%)	3 F(%)	4 F(%)	5 F(%)	Mean
To what extent does your degree of hearing loss affect your engagement and focus during mathematics lesson	5(8.3%)	9(15%	14(23.3%)	20(33.3%)	12(20%)	3.49
To what extent does your degree of hearing loss impact your ability to comprehend mathematical concepts and problem-solving strategy.	6(10.0%)	10(16.7%)	14(23.3%)	17(28.3%)	13(21.7%)	3.53
To what extent do you believe that your degree of hearing loss affects your confidence in participating in mathematics classes.	4(6.7%)	9(15%)	12(20%)	17(28.3%)	18(30%)	3.44

Source: Field Data (2023)

The findings exhibited in Table 4.14 show that 12 (20%) and 20 (33.3%) learners, respectively, noted that the degree of hearing loss affects their engagement and focus during mathematics lessons. For learners with mild hearing loss, the challenges may be relatively manageable, and they might still be able to follow the auditory aspects of the lesson to a reasonable extent. However, as the degree of hearing loss increases to moderate, severe, or profound levels, engagement and focus can be more profoundly affected. The findings are supported by ASHA (2007), which established that individuals with severe or profound hearing loss may find it more challenging to fully engage in mathematics lessons that heavily rely on verbal communication.

Further, 13 (21.7%) and 17 (28.1%) learners, respectively, noted that the degree of hearing loss impacted the ability to comprehend mathematical concepts and problem-solving strategies.

Learners with a mild degree of hearing loss may experience some challenges, but they often retain the ability to perceive and comprehend spoken information to a certain extent. The findings agree with Mwololo (2017), who established that the level of difficulty increases as the degree of hearing loss becomes more profound, making it essential to implement additional support measures.

Also, the findings revealed that 17 (28.3%) and 8 (30%) learners, respectively, noted that their degree of hearing loss affects their confidence in participating in mathematics classes. The degree of hearing loss directly affects a learner's ability to perceive and understand spoken language. Profound hearing loss may result in limited or no access to auditory information, making it challenging to follow classroom discussions, lessons or conversations. The study's results supported those of Charema and Charema (2013), who found that learners with mild hearing loss perform better than those with significant hearing loss. Learners with hearing loss appear to be more impacted by verbal language in their mathematical performance because of their limited vocabulary, poor comprehension, and lack of knowledge of mathematical concepts.

4.6 Learners' Attitude Towards Teaching and Learning Mathematics

Finding out how learners felt about teaching and studying mathematics was the study's fourth objective. Using a Likert scale with SA standing for "strongly disagree," Agree for "agree," U for "undecided," D for "disagree," and SD for "strongly disagree," this study sought to ascertain the instructors' degree of agreement with statements about learners' attitudes towards teaching and studying mathematics. Table 4.15 displayed the findings.

Table 4.15 Teachers opinions on learners' attitude towards teaching and learning mathematics

Statements	SA		A		U		D		SD		Mean
	F	%	F	%	F	%	F	%	F	%	
Learners participate in class activities involving mathematics	3	50.0	3	50.0	-	-	-	-	-	-	3.82
Mathematics is an enjoyable and interesting subject.	2	33.3	3	50.0	1	16.7	-	-	-	-	3.71
Learners find mathematics boring and uninteresting.	1	16.7	2	33.3	3	50.0	-	-	-	-	3.25
Learners feel anxious when faced with complex mathematical tasks.	2	33.3	2	33.3	2	33.3	-	-	-	-	3.68
Learners enjoy collaborating with others on mathematical problem-solving.	3	50.0	2	33.3	1	16.7	-	-	-	-	3.59
I believe that a strong foundation in mathematics is crucial for future career opportunities.	2	33.3	4	66.7	-	-	-	-	-	-	3.74

Source: Field Data (2023)

The findings in Table 4.15 established that 3 (50.0%) teachers strongly agreed that learners participate in class activities involving mathematics. Teachers employ various modes, such as Kenyan Sign Language use or captioned videos, to ensure that auditory information is accessible. This is supported by Hwang and Son (2021), who established that with the support of inclusive teaching strategies such as visual aids, written instructions and technology, learners with hearing loss can navigate mathematical concepts effectively.

Further, 3 (50.0%) agreed that mathematics is an enjoyable and interesting subject. The visual and logical nature of mathematical concepts allows these learners to engage deeply with the material, emphasizing problem-solving skills and critical thinking. Teachers often incorporate hands-on activities, interactive visual aids and real-world examples, making the learning experience both

accessible and captivating. The results are supported by Akcay (2017), who found out that the structured nature of mathematical reasoning provides a sense of order and predictability, offering a comforting environment for learners with hearing loss to excel.

Also, 2 (33.3%) teachers agreed that, learners find mathematics boring and uninteresting. The results concur with those of Subia, Salangsang, and Medrano (2018), who uncovered that learners with hearing loss consider mathematics the most difficult subject. Learners' attitudes towards teaching and learning mathematics play a crucial role in their academic success and their overall perception of the subject. Positive attitudes lead to increased motivation, better performance and a lifelong appreciation for mathematics.

The findings further revealed that 2 (33.3%) teachers strongly agreed that learners feel anxious when faced with complex mathematical tasks. The challenges associated with communication and potential difficulties in accessing auditory information can contribute to feelings of stress and apprehension. The outcomes are reinforced by Mazana, Montero and Olifage (2019), who revealed that mathematical concepts often involve intricate language and nuanced explanations, which may pose additional barriers for learners with hearing loss.

A total of 3 (50%) teachers strongly agreed that learners enjoy collaborating with others on mathematical problem-solving. The joy that learners with hearing loss derive from collaborative mathematical problem-solving is rooted in the inclusive nature of the experience. The findings are supported by Pagliaro and Kritzer (2005), which found that learners with hearing loss do poorly because they primarily rely on procedural knowledge and rote learning, with little focus on higher-order thinking and actual problem solving.

Further, 4 (66.7%) teachers agreed that a strong foundation in mathematics is crucial for future career opportunities. Positive experiences in mathematics can foster a favourable attitude. If a learner has had engaging and effective mathematics teachers in the past, they are more likely to have a positive attitude towards the subject. On the other hand, bad experiences might cause a negative attitude and anxiety related to mathematics. The study's findings support those of Githaiga, Mutahi, and Mwenda (2018), who found that learners' attitudes affect their mathematical performance in public secondary schools in Kilifi sub-county.

A questionnaire was utilized to gather information on learners' views towards mathematics' instruction and learning. The information was coded, and frequency counts, percentages, and the mean were used for analysis. The study utilized a scale of very large extent =4, large extent = 3, less extent = 2, and least extent = 1. The findings were displayed in Table 4.16.

Table 4.16 Learners opinions on learners' attitude towards teaching and learning mathematics

Parameters	**1 F(%)**	**2 F(%)**	**3 F(%)**	**4 F(%)**	**Mean**
To what extent do you feel that teaching strategies accommodate your needs as a learner with hearing loss in mathematics.	11(18.3%	21(35%)	15(25%)	12(20%)	3.42
To what extent do hands-on activities contribute to your interest and understanding of mathematics as a learner with hearing loss.	12(20.0%)	15(25%)	18(30%)	15(25%)	3.36
To what extent does the use of assistive technologies or devices positively influence your participation and success in mathematics learning.	12(20.0%)	20(33.3%)	13(21.7%)	15(30%)	3.39

Source: Field Data (2023)

The results displayed in Table 4.16 revealed that the majority of the learners (35%) agreed that teaching strategies accommodated their needs as learners with hearing loss in mathematics. Teachers utilize visual aids such as charts, graphs, diagrams, and multimedia presentations to convey mathematical concepts. The findings agree with Hwang and Son (2021), who established that visual representations enhance understanding for learners with hearing loss. Building a strong partnership with support services, such as sign language use or educational assistants, is crucial to creating an inclusive learning environment. This provide additional support and clarification and facilitate effective communication between educators and learners with hearing loss.

Further, 18 (30%) learners noted that they largely agreed that hands-on activities contribute to their interest in and understanding of mathematics as learners with hearing loss. The hands-on activities are a cornerstone in creating an inclusive and engaging mathematics curriculum for learners with hearing loss. The results concur with those of Githaiga, Mutahi and Mwenda (2018), who established that through a combination of tactile materials, visual aids, real-life applications, technology, and collaborative learning, educators cater to diverse learning needs, instilling a deeper understanding and appreciation for mathematics in all learners, regardless of their hearing abilities.

Also, 20 (33.3%) learners, less than half, agreed that the use of assistive technologies or devices positively influenced their participation and success in mathematics learning. The results of this research concur with those of Subia, Salangsang, and Medrano (2018), who established that fostering positive attitudes toward mathematics is essential for promoting mathematical literacy and helping learners achieve their full potential in this critical subject. As noted by Cadencies (2012), attitudes toward learning and levels of motivation significantly influence the relationships

among academic performance, learner achievements, and learner competencies. However, interviews conducted with learners who have hearing impairments indicated that a majority of them possess a negative attitude toward Mathematics.

Interview with learners

Learners were asked to give their opinion or perception towards their Mathematics performance. The following were their responses.

Learner 1, Grade Six,

I love mathematics but unfortunately it is one of my most challenging subjects. My parents really encourage me but no matter how much I try, I always fail. I wish there is anything I could do about it.

Learner 2, Grade five

Mathematics is a good subject. I used to perform well before I was transferred to this school. I hope to improve this year but I do not have someone to guide me. My friends who we study with also have challenges in the subject.

Learner 3, Grade 4

I am honestly speaking. I like the way we are taught but unfortunately, I do not remember much when the teacher has left the class. English and social science are far much better for me.

Learner 5, grade 6

If I am given mathematics problems of adding numbers only I am comfortable. However, when I have mathematics problems that requires me to read, I get frustrated. It is as if they are testing whether I can read or not.

Learner 6, Grade 5

I like the subject but my classmates discourage me. They learn faster than me and I feel left out. At times a feel embarrassment asking them questions because they might think I am foolish. At times when I am told to go solve a problem on the chalk board I get nervous.

From the above responses which cut across grades, majority of learners reported that they have a negative attitude towards Mathematics as a subject. Learning and performance in mathematics is affected by several factors including teachers' instructional practices, school environment and learners' attitude (Mozana, 2019). Mathematics anxiety and attitude has been found to have a great influence on mathematics performance (Mutegi et al., 2021). Research indicates that in order for learners to perform well in mathematics, they need to have a positive attitude towards the subject. Research on the attitudes of learners with hearing loss towards mathematics often reveals a complex relationship. While some learners exhibit a distinctly positive attitude, others face challenges stemming from factors like language barriers. These obstacles can hinder their comprehension of mathematical concepts, ultimately resulting in a negative perception of the subject. A positive attitude on the other hand, leads to discipline in time and study habits which improves cognitive skills, study habits and academic achievement (Leton et al., 2020). Teachers have a responsibility to help learners develop a positive attitude towards mathematics, and creating

a welcoming and inclusive learning environment is crucial in influencing learners' attitudes towards the subject. When learners with hearing loss feel a sense of belonging and are encouraged to express themselves, their confidence in tackling mathematical challenges grows. Teachers fostering a positive classroom culture that values diverse perspectives contribute to creating an environment where learners with hearing loss feel empowered and motivated to excel in mathematics. Negative attitude, can act as a barrier to academic success for learners with hearing loss. As they teach, teachers have a responsibility to cultivate a good attitude towards their learners. Teachers should have a growth mindset, not a fixed mindset. A fixed mindset believe that mathematics ability is innate (Sun, 2018)

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMEDATIONS

5.1 Introduction

This section presents a summary of the results, conclusions and recommendations of the study. Also, suggestions for further studies are stated here.

5.2 Summary of the Study Findings

This research was anchored on four main objectives. It was the desire of the researcher to look at how teaching and learning strategies influence mathematics achievement in learners with hearing loss, how physical and human resources influence mathematics achievement in learners with hearing loss, how degree of hearing loss influences mathematics achievement in learners with hearing loss and finally how learners' attitude influences mathematics performance.

5.2.1 Teaching and Learning Strategies

Findings of this research show there was an effort to use teaching strategies appropriate for learners with hearing loss but it is not adequately done. There is no effective differentiation of curriculum to fit the learning needs of learners with hearing loss. The results show that teachers used various teaching strategies, such as lecture-based teaching, demonstration and modelling, problem-solving approaches and interactive teaching. These were not efficiently used or modified to fit the needs of learners with hearing loss. Technology and visual aids were not effectively used. There was unreliable electricity and WIFI to effectively meet the learning needs of learners with Hearing loss.

5.2.2 Teaching and Learning Resources

On objective two, the researcher found that while there were moderately available resources, both physical and human resources were not adequate to meet the learning needs of learners with hearing loss. Technology was not adequately available to enhance both teaching and learning of learners with hearing loss. Unreliable source of electricity and malfunction electricity as well as unreliable WIFI frustrated teaching of learners with hearing loss. Finally, both institutions lack appropriately trained human resource such as interpreters and computer experts. Teachers in both schools lack productive computer literacy and have not attended in-service training regularly to acquaint themselves with the most recent research-based teaching strategies for learners with hearing loss. Some learners are not proficient in Kenyan sign language by the time they enter the classroom, despite the fact that it has been used equitably. The textbooks that are now available have not been adjusted to accommodate learners with hearing loss.

5.2.3 Degree of Hearing Loss

The findings in this objective are that the degree of hearing loss significantly impacts the performance of learners in mathematics. Compared to those with more severe hearing loss, those with milder hearing loss did better. Those completely deaf performed worse than any of the above two categories. The degree of hearing loss also influences how learners interact with their environment. Learners with severe hearing loss may require significant amplification or assistive devices to hear even loud speech. Their language development is typically more delayed, and they may struggle with articulation and pronunciation.

5.2.4 Learners' Attitude Towards Teaching and Learning Mathematics

The researcher in this study found that attitude significantly affects mathematics achievement in learners with hearing loss. The majority of learners felt negatively about mathematics. Positive attitudes among learners result in better academic performance, just like in any other topic. Conversely, a negative attitude causes learners with hearing loss to perform poorly academically in mathematics. Positive attitude leads to increased motivation, better performance and a lifelong appreciation for mathematics. Fostering positive attitude towards mathematics is essential for promoting mathematical literacy and helping learners achieve their full potential in this critical subject.

5.3 Conclusion

The research concludes that in the two schools of research, teaching was not adequately modified to meet the needs of learners with hearing loss. A reasonable number of learners had incomplete individualized education programs while others did not have any at all. There are some who had IEPs but teachers rarely referred to them while teaching. The learners are too many compared to teachers, making differentiated instructions hard. Similarly, neither school has enough human or physical resources to address the educational needs of learners with hearing loss. The textbooks aren't adjusted to accommodate learners who have hearing impairments. The degree of hearing loss affected mathematics' achievement of learners with hearing loss. Some learners have cochlear implants while others used computerised assistive devices. Some learners need assistive devices but they cannot afford them. This significantly affects their learning and mathematics achievement. Lastly, the majority of learners with hearing loss performed poorly in mathematics because they had a bad attitude towards the topic. Learners with hearing loss performed poorly academically in mathematics and in school overall as a result of a negative attitude.

5.4 Recommendations

Based on its results, the research presents recommendations to the following bodies:

5.4.1 Recommendations for Policy Makers

I. To address teaching and learning strategies for learners with hearing loss, the Ministry of Education, through the Kenya Institute of Curriculum Development, should review the Diploma in Inclusive Education curriculum.

II. It is also crucial that the government, through the Ministry of Education, arrange regular professional development and in-service training for teachers who are currently employed.

III. It is important that the government improve their inspection and quality assurance measures and monitoring to ensure Individualized Education Programs are adequately followed and updated.

IV. It is important to ensure that learners with hearing loss receive occasional motivation, guidance and counselling to ensure they improve their attitude towards learning mathematics as a subject.

5.4.2 Recommendations for Implementers

I. It is important that teachers make their own initiative to improve their skills in information technology to help integrate ICT in their teaching for learners with hearing loss.

II. It is important that head teachers, teachers and related stakeholders embrace collaboration and team work to help improve teaching of mathematics to learners with hearing loss.

III. Teachers should take their own initiative to counsel and motivate learners with Hearing loss to help improve their attitude towards learning mathematics as a subject

IV. It is important that teachers improve their teaching strategies to better fit learners with diverse degrees of hearing loss

5.4.3 Recommendations for Further Studies

This study was conducted in only two counties which are Meru and Tharaka-Nithi and the findings are not therefore applicable to other counties in Kenya. It is recommended that similar research is conducted in the remaining counties in order to get more a Nationally Generalisable findings.

.

REFERENCES

Abiatal, L. K., & Howard, G. R. (2019). Constructivist assistive technology in a mathematics classroom for the deaf: Going digital at a rural Namibian primary school. In *Proceedings of the South African Institute of Computer Scientists and Information Technologists 2019* (pp. 1-9).

Adeniyi, S. O., & Kuku, O. (2018). Effectiveness of two instructional methods on reasoning ability of children with hearing impairment in Nigeria. *Specijalnaedukacija irehabilitacija, 17*(4), 395-417. https://doi.org/10.5937/specedreh17-18600

Adeniyi, S., & Kuku, O. (2020). Impact of gamification and experiential learning on achievement in mathematics among learners with hearing impairment in Lagos State, Nigeria. *African Journal of Educational Studies in Mathematics and Sciences, 16*(2), 51-65.

Akcay, A. O. (2017). Instructional Technologies and Pre-Service Mathematics Teachers' Selection of Technology. *Journal of Education and Practice, 8*(7), 163-173.

Akpinar, Burhan & Selim, Erdamar & Yılmaz, Emrullah. (2010). Problems encountered in the applications of multiple intelligence theory in primary schools in Turkey. Procedia - Social and Behavioral Sciences. 9. 1873-1877. 10.1016/j.sbspro.2010.12.416.

ASHA. Childhood apraxia of speech. (2007). http://www.asha.org/policy/TR2007-00278.htm.

Ashmore, B. (2017). A study of the performance of deaf/hard of hearing learners in high school mathematics on conceptual understanding, procedural fluency, and mathematical reasoning tasks. Master Thesis, The College at Brockport, State University of New York. Retrieved from 896. https://digitalcommons.brockport.edu/ehd_theses/896

Bakker, A., Cai, J., & Zenger, L. (2021). Future themes of mathematics education research: An international survey before and during the pandemic. *Educational Studies in Mathematics, 107*, 1–24.

Bintoro, T., Fahrurrozi, Kusmawati, A. P., & Dewi, R. S. (2023). The teacher strategies in teaching sign language for deaf learners in special schools Jakarta. *Cogent Education, 10*(2). https://doi.org/10.1080/2331186X.2023.2258294

Bizimana, D. B., & Orodho, J. A. (2014). Teaching and learning resource availability and teachers' effective classroom management and content delivery in secondary schools in Huye District, Rwanda. *Journal of Education and Practice, 5*(9).

Casty, Mukami & Ciriaka, Muriithi & Rugano, Peter. (2021). Mathematics anxiety, attitude and performance among secondary school learners in Kenya. Educational Research and Reviews. 16. 226-235. 10.5897/ERR2021.4119.

Charema, G., & Charema, J. (2013). The effects of the verbal language on the performance of children with hearing impairments in mathematics in Zimbabwe. *Journal of Languages and Cultures*, *4*(8), 139-149.

Charema, G., & Charema, J. (2013). The effects of the verbal language on the performance of children with hearing impairments in mathematics in Zimbabwe. *Journal of Languages and Cultures*, *4*(8), 139-149.

Creswell, J. W., & Clark, V. L. P. (2017). Designing and Conducting Mixed Methods Research. Thousand Oaks, CA: Sage Publications.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Damrongpanit, S. (2019). From modern teaching to mathematics achievement: The mediating role of mathematics attitude, achievement motivation, and self-efficacy. *European Journal of Educational Research*, *8*(3), 713-727.

Erbas, E. (2017). *Strategies that teachers use to support the inclusion of learners who are deaf and hard of hearing* (Doctoral dissertation, [Bloomington, Ind.]: Indiana University).

Githaiga, E. W., Mutahi, D., & Mwenda, M. P. (2018). Influence of Learner's Attitude in Mathematics Performance among Learners in Public Secondary Schools in Kilifi Sub-County, Kenya. *International Journal of Novel Research in Humanity and Social Sciences* Vol. 5, Issue 5, pp: (228-237).

Hwang, S., & Son, T. (2021). Learners' Attitude toward Mathematics and Its Relationship with Mathematics Achievement. *Journal of Education and e-Learning Research*, *8*(3), 272-280.

Kathare, N. M. (2020). Effect of teaching methods on academic performance in mathematics among learners with hearing impairment in Meru County, Kenya. (Unpublished Doctoral dissertation, Kenyatta University). Kenya.

Kathy Liu Sun. (2018). The Role of Mathematics Teaching in Fostering Learner Growth Mindset. *Journal for Research in Mathematics Education*, *49*(3), 330–355. https://doi.org/10.5951/jresematheduc.49.3.0330

Kothari, C. (2017). Research methodology methods and techniques by CR Kothari. *Published by New Age International (P) Ltd., Publishers*, *91*.

Kuku, O. O., & Adeniyi, S. O. (2020). Impact of learning interventions on mathematics achievement among learners with hearing impairment. *Contemporary Educational Researches Journal*, *10*(4), 131-143.

Lashley L. (2017). The effects of computer aided instruction in mathematics on the performance of grade four pupils—Guyana. *SAGE Open*. Advance online publication.

Livumbaze, A. G., & Achoka, S. J. (2017). Analysing the effect of teaching/learning resources on learners' academic achievement in public secondary schools, Hamisi Sub-County, Kenya. *European Journal of Education Studies*.

Lyons, A. (2012) Workers of tomorrow, Education in progress, Ministry of Education and Scientific Research. Port Fortis: Fiji.

Mazana, Y. M., Suero Montero, C., & Olifage, C. R. (2019). Investigating learners' attitude towards learning mathematics. *International Electronic Journal of Mathematics Education,14*(1), 207-231.

Mtuli, T. C. (2015). Assessing the challenges of teaching and learning of hearing impaired learners enrolled in regular primary and secondary schools (Doctoral dissertation, The Open University of Tanzania).

Mugenda, O. M., & Mugenda, A. G. (2003). *Research methods: Quantitative & qualitative approaches* (Vol. 2, No. 2). Nairobi: Acts press.

Mwololo, M. U. (2017). *Strategies for enhancing performance in mathematics for learners with hearing impairment in primary schools. A case of Makongo School for the deaf Makueni County, Kenya* (Doctoral dissertation, Doctoral dissertation, Kenyatta University].

Ngetich, S.K. Wambui, B.K & Kosgei, Z.K. (2014). Determining optimal size and cost efficiency of Nandi District Secondary Schools. *European Scientific Journal, 10* (16), 211-220 Retrieved from eujournal.org/index.php/esj/article/download/3522/3294.

Njoroge, S. N. (2019). Effects of Teaching and Learning Resources in Lower Primary School Children in the Eastern Zone of Nakuru Municipality, Kenya.

Noorian, M., Maleki, S. A., & Abolhassani, M. (2013). Comparing of mathematical learners of deaf and normal types. *International Research Journal of Applied and Basic Sciences, 7*(6), 367–370.

Nordin, Norazah & Zaharudin, Rozniza & Yasin, Mohd & Din, Rosseni & Embi, Mohamed & Lubis, Maimun. (2013). ICT in education for deaf learners: Teachers' perspective. Research Journal of Applied Sciences. 8. 103-111. 10.3923/rjasci.2013.103.111.

Nunes, T., & Moreno, C. (2002). An intervention program for promoting deaf pupils' achievement in mathematics. *Journal of Deaf Studies and Deaf Education, 7*(2), 120-133.

Owino, C. O. (2011). Factors Contributing to Poor Performance in Mathematics at KCPE among Standard Eight Pupils in Primary Schools for Learners with Hearing-Impairment in Nyanza Province, Kenya (Doctoral dissertation).

Parvez, K., Khan, M., Iqbal, J., Tahir, M., Alghamdi, A., Alqarni, M., Alzaidi, A. A., & Javaid, N. (2019). Measuring Effectiveness of Mobile Application in Learning Basic Mathematical Concepts Using Sign Language. *Sustainability, 11,* 1-20. https://doi.org/10.3390/su11113064

Roy, Suprajit. (2023). Individualized Education Plan, Process of IEP With Special Reference To Its Development and Implementation.

S I Letonet al., (2020) J. Phys.: Conf. Ser. 1657 012018

Shelton, B. E., & Parlin, M. A. (2016). Teaching Math to Deaf/Hard-of Hearing (DHH) Children Using Mobile Games: Outcomes with Learner and Teacher Perspectives. *International Journal of Mobile and Blended Learning*, *8*(1), 1-17. https://doi.org/10.4018/IJMBL.2016010101

Su, J. Y., Guthridge, S., He, V. Y., Howard, D., & Leach, A. J. (2020). The impact of hearing impairment on early academic achievement in Aboriginal children living in remote Australia: a data linkage study. *BMC public health*, *20*, 1-13.

Subia, G. S., Salangsang, L. G., & Medrano, H. B. (2018). Attitude and performance in mathematics I of bachelor of elementary education learners: A correlational analysis. *American Scientific Research Journal for Engineering, Technology, and Sciences (ASRJETS)*, *39*(1), 206-213.

Sylvia, M. (2015). Factors contributing to low achievement levels in mathematics among hearing impaired learners: A case of selected schools of Lusaka, Zambia. Master Dissertation, The University of Zambia, Lusaka.

Tanridiler A, Uzuner Y, Girgin U (2015). Teaching and learning mathematics with hearing impaired learners. *Anthropologist; 22*(2): 237-248. [Accessed on 16 Sep 2017]. Available from: https://doi.org/10.1080/09720073.2015.11891874 https://doi.org/10.1080/09720073.2015.118918
74

Tobi, H., & Kampen, J. K. (2018). Research design: the methodology for interdisciplinary research framework. *Quality & quantity*, *52*, 1209-1225.

Visser, M., Juan, A., & Feza, N. (2015). Home and school resources as predictors of mathematics performance in South Africa. *South African Journal of Education*, *35*(1).

Wa-Mbaleka, S. (2019, December). Ethics in qualitative research: A practical guide. In *International Forum Journal* (Vol. 22, No. 2, pp. 116-132).

Yusta, N., Karugu, G., Muthee, J., & Tekle, T. (2016). Impact of Instructional Resources on Mathematics Performance of Learners with Dyscalculia in Integrated Primary Schools, Arusha City, Tanzania. *Journal of education and practice*, *7*(3), 12-18.

APPENDICES

APPENDIX I: QUESTIONNAIRE FOR TEACHERS

The purpose of this survey was to gather information about the "**MATHEMATICS PERFORMANCE AS A DETERMINANT OF ACADEMIC ACHIEVEMENT AMONG PRIMARY SCHOOL LEARNERS WITH HEARING LOSS IN MERU AND THARAKA-NITHI COUNTIES, KENYA."** Please answer all questions by either filling in the blanks or, if necessary, checking the spaces denoted by checking the brackets [√]. The provided information was only utilized for this study's objectives. For complete confidence, **DO NOT WRITE YOUR NAME OR THAT OF YOUR SCHOOL** anywhere on the questionnaire.

SECTION A: DEMOGRAPHIC INFORMATION

1. What is your gender? Male [ ] Female [ ]
2. Indicate your academic qualification?

   Certificate in P1 [ ] Diploma SNE [ ] Degree [ ] Master's Degree [ ]

3. What is your teaching experience?

   Below 5 years [ ] 5 -10 years [ ] Above 10 years [ ]

SECTION B: ADAPTED TEACHING AND LEARNING STRATEGIES

4. Which method do you use to teach mathematics? (You can tick more than one)

   Lecture-Based Teaching [ ]

   Demonstration and Modeling [ ]

   Problem-Solving Approach [ ]

   Interactive teaching [ ]

5. These elements pertain to adaptive teaching and learning strategies. Use the key below to tick the appropriate box that corresponds to you. Where:

Strongly Agree =5, Agree =4, Undecided =3, Disagreed =2, Strongly Disagree =1.

Statements	**1**	**2**	**3**	**4**	**5**
The use of visual aids (e.g., videos, images, diagrams) in the classroom helps the learners understand the subject matter better.					
Use sign language or other communication methods improves the comprehension of the lesson.					
The availability of assistive listening devices (ALDs) or hearing loops in the classroom positively impacts participation and engagement of learners.					
Captioned videos and transcripts provided for audio content learning.					
Providing written summaries of lectures or key points helps the learners review and retain the material more effectively.					
The provision of extra time for assignments and exams considers the unique challenges faced by learners with hearing loss.					
Encouraging group discussions and peer interactions allows learners with hearing loss learn from different perspectives and experiences.					

6. In your own opinion, explain how teaching and learning strategies influenced the performance of learners with hearing loss.

_____

_____

_____

SECTION C: TEACHING AND LEARNING RESOURCES

7. How do teaching and learning resources affect teaching mathematics?

   _____

   _____

8. The following items relate to teaching and learning resources. Use the following key to tick appropriately as it applies to you.

   Strongly Agree =5, Agree =4, Undecided =3, Disagreed =2, Strongly Disagree =1.

Statements	**1**	**2**	**3**	**4**	**5**
The availability of customized teaching and learning tools developed for learners with hearing loss is adequate.					
Current teaching and learning resources cater to the specific needs of learners with hearing loss.					
Visual aids, such as captioned videos and sign language resources, are integrated into the learning materials					
Teaching and learning resources for learners with hearing loss are accessible in terms of format and usability.					
Teachers incorporate assistive devices, like hearing aids into the teaching process.					
School fosters an inclusive environment that promotes collaborative learning among learners with and without hearing loss.					

9. (a) What effects do educational resources have on learners who have hearing loss in terms of their performance? Yes [ ] No [ ]

   b. Explain your answer _____

SECTION D: DEGREE OF HEARING LOSS

10. The following items relate to degree of hearing loss. Use the following key to tick appropriately as it applies to you.

    Strongly Agree =5, Agree =4, Undecided =3, Disagreed =2, Strongly Disagree =1.

Statements	**1**	**2**	**3**	**4**	**5**
The learners with mild hearing loss perform better than those with severe and profound hearing loss.					
The hearing loss impacted the learners level of confidence in participating in mathematics-related discussions in the classroom.					
Learners with hearing loss experience difficulties in understanding concepts presented to them during lessons.					
Assessment seem to be too overloaded for learners with hearing loss.					
Learners with hearing loss can interact socially and learn in the same ways as learners without hearing loss.					

11. What strategies, in your opinion, should be implemented to support the improvement of arithmetic performance for learners who have hearing loss?

    _____

    _____

SECTION E: LEARNERS' ATTITUDES TOWARD TEACHING AND LEARNING MATHEMATICS

12. What are the general attitudes of your learners towards learning mathematics?

    Very positive [ ] Positive [ ] Negative [ ] Very negative [ ]

13. Kindly specify your level of agreement in the following statements regarding how learners' attitudes toward teaching and learning mathematics influenced performance in mathematics. Put a tick in the best option; Where: Strongly Agree =5, Agree =4, Undecided=3, Disagreed =2, Strongly Disagree =1.

Statements	**1**	**2**	**3**	**4**	**5**
Learners participate in class activities involving mathematics					
Mathematics is an enjoyable and interesting subject.					
Learners find mathematics boring and uninteresting.					
Learners feel anxious when faced with complex mathematical tasks.					
Learners enjoy collaborating with others on mathematical problem-solving.					
I believe that a strong foundation in mathematics is crucial for future career opportunities.					

14. In your own views, explain how degree of hearing loss impacted the performance in mathematics?

    _____

    _____

    _____

APPENDIX II: INTERVIEW SCHEDULE FOR HEAD TEACHER

1. Gender _____
2. Education level _____
3. Teaching experience _____
4. How long have you been head teacher in the current school? _____
5. What would you say about teaching and learning strategies used by teachers to teach mathematics?

   _____

   _____

6. What teaching and learning resources available for teaching mathematics?

   _____

   _____

7. What are teaching and learning resources do you think teachers can use in order to enhance performance in mathematics.

   _____

   _____

8. How can learners with hearing loss be motivated to perform well in mathematics assessment?

   _____

   _____

9. Which elements do educators believe are critical to the successful instruction of learners with hearing loss?

_____

_____

10. What do you think the school administration should do to improve on mathematics performance by learners with hearing loss?

_____

_____

APPENDIX III: QUESTIONNAIRES FOR LEARNERS WITH HEARING LOSS

The provided information will be handled with the strictest confidence. It's just necessary for research purposes. To maintain privacy, you are not allowed to sign your name on this document. Provide as much truthful information as you can.

1. Gender _____
2. Age _____

Teaching and Learning methods

Rate the use of the following teaching strategies. Put a tick in the best option Where: Extremely very large extent =5, Very large extent =4, Large extent=3, Less extent =2 and Least extent=1.

Indicators	5	4	3	2	1
Teachers utilize lecture-based teaching method while teaching mathematics					
Teachers use demonstration and modeling in teaching mathematics					
Teachers use Kenya sign language in teaching mathematics					
Teachers prefer using problem-solving approach while teaching mathematics					

Teaching and learning resources

Teaching/ Learning resources used for mathematics Rate the following Teaching/ Learning Resources used in teaching mathematics Where: Extremely very large extent =5 Very large extent =4 Large extent =3 Less extent =2 Least extent =1

Indicators	5	4	3	2	1
To what extent do learners use hearing aids in class.					
The extent are there enough text books for mathematics.					
To what extent are sign language interpreters available during mathematics classes for learners with hearing loss.					

How often are educational apps or software specifically designed for learners with hearing loss utilized to enhance learning in mathematics?

Never [ ]

Rarely [ ]

Sometimes [ ]

Often [ ]

Very Often [ ]

Degree of hearing loss

Perception of learners towards impact of degree of hearing loss, Where: Extremely very large extent =5, Very large extent =4, Large extent =3, Less extent =2 and Least extent =1.

Indicators	5	4	3	2	1
To what extent does your degree of hearing loss affect your engagement and focus during mathematics lectures					
To what extent does your degree of hearing loss impact your ability to comprehend mathematical concepts and problem-solving strategies.					
To what extent do you believe that your degree of hearing loss affects your confidence in participating in mathematics classes.					

Learners' attitudes toward teaching and learning mathematics

Attitude of learners with hearing loss towards teaching and learning mathematics Where: Extremely very large extent =5, Very large extent =4, Large extent =3, Less extent =2 and Least extent =1.

Indicators	5	4	3	2	1
To what extent do you feel that teaching strategies accommodate your needs as a learner with hearing loss in mathematics.					
To what extent do hands-on activities contribute to your interest and understanding of mathematics as a learner with hearing loss.					
To what extent does the use of assistive technologies or devices positively influence your participation and success in mathematics learning.					

How receptive are you to utilizing educational apps or software designed specifically for learners with hearing loss for learning mathematics?

Not Receptive at All	[ ]
Slightly Receptive	[ ]
Moderately Receptive	[ ]
Very Receptive	[ ]
Extremely Receptive	[ ]

APPENDIX IV: OBSERVATION CHECKLIST

The observation checklist was utilized to observe resources available and teaching methods utilized by teachers in teaching mathematics during lesson.

RESOURCES	**AVAILABLE**	**NOT AVAILABLE**
Resource room		
Computers		
Sign language interpreter		
Projectors		
Audio technician		
Counsellor trained in special education.		
Staff members have been trained to deal with learners who have hearing loss.		
Teacher aides		
Teacher using lesson plan		
Use of IEP by the teacher		
Having adequate lesson notes		

LESSON OBSERVATION	
Mode of content delivery to learners	
Teaching-learning strategies used	
Teaching nature	
Length of teaching	
Utilization of teaching aids	
Mode of communication used	

APPENDIX V: RESEARCH AUTHORIZATION LETTER FROM KU

KENYATTA UNIVERSITY
OFFICE OF THE EXECUTIVE DEAN GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Our Ref: E55/33040/2014

DATE: 23rd February 2024

Director General,
National Commission for Science, Technology and Innovation
P.O. Box 30623-00100
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR MS. EUNICE KAGWIRIA MURUNGI – REG.NO. E55/33040/2014

I write to introduce Ms. Eunice Kagwiria Murungi who is a Postgraduate Student of this University. She is registered for M.Ed. degree programme in the **Department of Early Childhood and Special Needs Education.**

Ms. Eunice Kagwiria Murungi intends to conduct research for an M.Ed. Thesis Proposal titled, ***"Mathematics Performance as a Determinant of Academic Achievement Among Primary School Learners with Hearing Loss in Meru and Tharaka-Nithi Counties, Kenya"***.

Any assistance given will be highly appreciated.

Yours faithfully,

PROF. ELISHIBA KIMANI
EXECUTIVE DEAN, GRADUATE SCHOOL

KENYATTA UNIVERSITY OFFICE OF EXECUTIVE DEAN 23 FEB 2024 GRADUATE SCHOOL

JG/ewm

APPENDIX VI: NACOSTI RESEARCH PERMIT

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **754384**

Date of Issue: **27/February/2024**

RESEARCH LICENSE

This is to Certify that Ms.. EUNICE KAGWIRIA MURUNGI of Kenyatta University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Meru, Tharaka-Nithi on the topic: MATHEMATICS PERFORMANCE AS A DETERMINANT OF ACADEMIC ACHIEVEMENT AMONG PRIMARY SCHOOL LEARNERS WITH HEARING LOSS IN MERU AND THARAKA-NITHI COUNTIES, KENYA for the period ending : 27/February/2025.

License No: **NACOSTI/P/24/33503**

754384

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

APPENDIX VII: RESEARCH AUTHORIZATION LETTER FROM MERU COUNTY

REPUBLIC OF KENYA
MINISTRY OF EDUCATION
State Department for Early Learning and Basic Education

Telegrams: " ELIMU " Meru
EMAIL: cdemerucounty@gmail.com
When Replying please quote

County Director Of Education
Meru County
P.O. Box 61
MERU

Ref: MRU/C/EDU/11/1/

7th March, 2024

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATION – MS EUNICE KAGWIRIA MURUNGI

Reference is made to letter Ref: NACOSTI/P/24/33503 dated 27th February, 2024.

Authority is hereby granted to **MS Eunice Kagwiria Murungi** to carry out research on ***"Mathematics Performance as a Determination of Academic Achievement Among Primary School Learners with Hearing Loss in Meru and Tharaka Nithi Counties"*** Kenya, for the period ending 27th February, 2025.

The person(s) undertaking this research is bound by all ethical rules and regulations governing surveys of this nature, and will carry it out professionally without interfering with normal school routine.

FOR: COUNTY DIRECTOR OF EDUCATION
MERU COUNTY
P. O. BOX 61- 60200,
Tel: 064-32372 MERU

P.J. Muinde
For: County Director of Education
MERU

APPENDIX VIII: RESEARCH AUTHORIZATION LETTER FROM THARAKA-NITHI COUNTY

REPUBLIC OF KENYA
MINISTRY OF EDUCATION
STATE DEPARTMENT OF EARLY LEARNING AND BASIC EDUCATION

Telegrams: "Elimu", Chuka
Telephone: Chuka 630353
FAX: 064 630166
Email: *tharakanithicountyedu@gmail.com*
When replying please quote:

COUNTY DIRECTOR OF EDUCATION
THARAKA NITHI
P.O. BOX 113-60400
CHUKA.

TNC/ED/RA/GEN/129/107

6th MARCH, 2024

Ms. Eunice Kagwiria Murungi
Kenyatta University

RE: RESEARCH AUTHORIZATION FOR MS. EUNICE KAGWIRIA MURUNGI REG. NO. E55/33040/2014

I am pleased to inform you that you have been authorized to undertake research on ***"Matmematics Performance as a Determinant of Academic Achievement Among Primary School Learners with Hearing Loss in Tharaka Nithi County, Kenya".*** The research will be undertaken for a period ending **12th February 2025.**

On completion of the research, you are expected to give a hard copy and soft copy of the research report/thesis to this office.

The research Authorization is granted according to all existing rules and regulations in force from time to time and observance of Covid-19 Guidelines and protocols as recommended by the relevant government MDAs.

Good luck!

FOR:- COUNTY DIRECTOR OF EDUCATION
07 MAR 2024
THARAKA NITHI
P. O. Box 113 CHUKA

Titus Kamande Mburu
For: County Director of Education
THARAKA NITHI