

**UTILIZATION OF INSTRUCTIONAL MEDIA AND THE QUALITY OF  
LEARNING OUTCOMES IN BIOLOGY THEORY IN PUBLIC SECONDARY  
SCHOOLS IN MWALA SUB-COUNTY, MACHAKOS COUNTY, KENYA**

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of the Requirements for the Award of Masters Degree in Educational**

**Communication and Technology**

**of Machakos University**

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## DECLARATION

This project is my original work and has not been submitted for the award of a degree in any other University.

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## Approval by Supervisors

This project has been submitted for examination with our approval as University Supervisors.

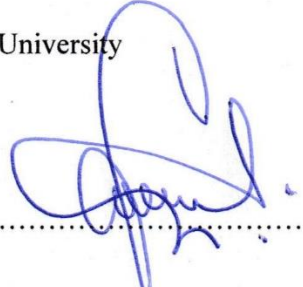
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## **DEDICATION**

I dedicate this work to my parents, Mr. and Mrs. Justus King'ola Mbatha, who taught me virtues.

## **ACKNOWLEDGEMENT**

I am deeply thankful to God for his providence which enabled me to conduct the study and write the report. I am thankful to my supervisors Prof. Henry Embeywa and Prof. Peter Koech for their support and encouragement during this work. I also thank my parents for their moral, financial, and spiritual support. I thank my lecturers with whom we interacted during my coursework for their scholarly advice and motivation.

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## **ABBREVIATIONS AND ACRONYMS**

|                 |                                                                  |
|-----------------|------------------------------------------------------------------|
| <b>CBC:</b>     | Competency Based Curriculum                                      |
| <b>CRE:</b>     | Christian Religious Education                                    |
| <b>HOD:</b>     | Head of Department                                               |
| <b>ICT:</b>     | Information and Communication Technology                         |
| <b>KCSE:</b>    | Kenya Certificate of Secondary Education                         |
| <b>KICD:</b>    | Kenya Institute of Curriculum Development                        |
| <b>KNEC:</b>    | Kenya National Examination Council                               |
| <b>MMLT:</b>    | Multimedia Learning Theory                                       |
| <b>NACOSTI:</b> | National Commission for Science, Technology and Innovation.      |
| <b>OECD:</b>    | Organization for Economic Co-operation and Development           |
| <b>SMART:</b>   | Specific, Measurable, Achievable, Realistic and Time Bound       |
| <b>SPSS:</b>    | Statistical Package for Social Sciences                          |
| <b>UNESCO:</b>  | United Nations Educational, Scientific and Cultural Organization |
| <b>USA:</b>     | United States of America                                         |

## **ABSTRACT**

There has been poor performance in Biology in the national examination at the Kenya Certificate of Secondary Education (KCSE) level. This may have been attributed to many factors, but the utilization of instructional media had not been investigated in depth, hence prompting the researcher to conduct a study on utilization of instructional media and the quality of learning outcomes in Biology theory in public secondary schools in Mwala sub county, Kenya. The objectives of the study were to establish the effect of teacher preparedness on the quality of learning outcomes in Biology theory; assess the type of instructional resources used and the quality of learning outcomes in Biology theory; determine the influence of students' attitude on the quality of learning outcomes in Biology theory; and assess the effect of students' self-concept on the quality of learning outcomes in Biology theory in public secondary schools in Mwala Sub- County. The study was based on multimedia learning theory by Richard Mayer. The study adopted mixed method methodology and descriptive survey research design. The target population of the study was all public secondary schools, all teachers of Biology, all heads of Science Department and all form two students in Mwala sub-county. Stratified Random Sampling was used to sample 6 schools; two extra county schools, two county schools, and two sub-county schools. Purposive sampling was used to select 6 Heads of Science Department from the 6 sampled schools. One form two stream was randomly sampled for schools with more than one stream to minimise bias. A total of 240 students were selected randomly to participate in the study. Questionnaires and interviews were used as data collection tools in the study. The piloting of the instruments was carried out in one of the schools in Machakos County and this was not included in the study. Data was analysed qualitatively and quantitatively with the help of the Statistical Package for Social sciences version 27. Results of the study indicate that teacher preparedness in the use of instructional media, type of instructional media used, students' attitude and self-concept have an influence on the quality of learning outcomes in Biology theory. In addition, the study has established that in the surveyed secondary schools, Biology teachers were not well prepared in teaching using instructional media, and schools had challenges in acquiring these media due to resource constraints. Furthermore, the study establishes that students in extra-county schools performed better than their counterparts in both county and sub-county schools. The study recommends that the government should increase resource allocation to the public schools, and address inequalities experienced in access to resources to equalise resource allocation.

# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1 Background to the Study**

Instructional media are resources utilized by a teacher to implement instruction and facilitate achievement of learning objectives by learners (Jannah, 2020). Instructional media are categorised into; print, audio, visual and audio-visual media. Instructional media can be used to capture the interest of the learner, diversify the delivery of information to learners, act as supplement to the content being delivered and ease the teaching process (Saikat, 2022). The advantages of instructional media are to support, stimulate and improve learning process and foster interaction between teachers and learners so that learning is improved (Emron & Dhindsa, 2010). Utilizing instructional media will encourage more learning among students as it removes boredom in learner, makes learning interactive and interesting.

In Indonesia, according to Aisyah & Haryudin (2020), learning media is a tool to facilitate the course of learning effectively and practically so that learning can be carried out smoothly and per regulations. Learning media or teaching materials are very important to be used in the world of education, especially in the teaching and learning process at school. Haryudin, Yana & Efransyah, (2020) found out that learning media is important in the process of teaching and learning in the classroom. learning media is a tool that is used to smoothen the process of learning by encouraging conveying information to learners. Wahyuni and Yokhebed (2019) states that instructional media are tools used to help convey information in during the process of teaching and learning. Learning media is the very key in the process of teaching and learning, as it provides motivation and captures learners interest in following the activities that will follow,

enabling a pleasant experience to improve learners learning outcomes. Muvango, Indoshi & Okwara (2019) established that learning media will influence the teacher's success in delivering content to students and makes students to capture what is taught easily. Research shows that use of instructional media in teaching and learning process is very important hence there is need to encourage educators to incorporate instructional resources while teaching.

Abdelraheem and Al-Rabane (2005) established that the use of learning media in teaching and learning will lead to an improved in learners' performance. Abu-Jaber & Qutami (1998) state that the importance of instructional media for both teachers and students cannot be overemphasized. In Social Studies, the use of instructional media is essential to support learning because social studies is concerned with natural and social phenomena which cannot be easily expressed without the support of graphics maps, videos and pictures. Curzon & California, (1997) points out that the use of learning media in class increases the channels of communication between the teacher and their learners. Instructional media enables the growth of learning abilities and fosters development of motor skills and intellectual skills. The utilization of models and realia during teaching and learning allows the instructor to teach and demonstrate to his students.

In Nigeria, Nkiruka, Uchenna, Uzochukwu, Pauline, & Okwuchukwu, (2021) avers that for teachers to deliver well in class they have to be properly trained on the utilization of media, the school head also should supervise the teachers. According to Arop, Umanah, & Effiong, (2015), instructional materials are designed to develop the student's cognitive ability and achieve learning objectives during a lesson or at the end of a course. Instructional media will help one bring science to the classroom as students are able to interact with the learning resources and learn. Usman and Adewumi (2006)

denote that the success of implementing any curriculum is dependent on the quality and quantity of instructional materials available to instructors and students for use in learning. Instructional media helps in stimulating the student's interest; assist the teacher in overcoming limitations as he or she presents the subject matter to the students. Ugorji, King-Agboto, & Okpara, (2012) established that the more one made good use of instructional materials, the better the performance of the learners in Mathematics was realized. Mathematics teachers should aspire to utilize the instructional materials available to them where necessary to improve the quality of learning outcomes.

Muhamba, Kisandu, Komu, Kemikimba, & Manyama (2018) indicated that it was important to encourage the interaction between teachers and learners using learning media. According to Ngussa & Chiza (2017), there is a significant relationship between the use of instructional media and pupils' mastery of reading and writing in the Kiswahili language. Mzinga and Onyango (2021) found that creativity and innovativeness of learners in geography was enhanced by the use of learning materials in teaching Geography. This made classes very interactive and captured learners' attention hence learners participated in the classroom activities. The use of instructional material should be encouraged in secondary schools as they play a major role in enhancing productive learning of Geography.

Achola (2016), states that utilizing a variety of instructional materials during teaching improved students' performance in various learning activities including the capability to put down on paper, pronounce words and that mandatory utilization of instructional media should be encouraged to enhance mastery of subject matter. Achieng (2013) found out that the utilizing Instructional media during teaching would arouse children's curiosity and motivated them to learn more easily. Kasilia (2018), established that the



performance in CRE was improved as teacher utilized instructional media in teaching and learning. Teachers should use appropriate media to enhance the process of teaching.

According to Adenle, (2014), using of instructional media in teaching basic sciences in schools was very critical, as made learning interesting ,removed boredom am learners and encouraged more learning among learners. Kamji & Agu (2022), found out that utilizing instructional materials during teaching and learning of Chemistry at schools should be made compulsory and be supervised by the school heads.

In the Kenyan secondary school curriculum, science is divided into Physics, Chemistry and Biology. Biology has two parts that's Biology theory and practical. Both the parts are tested at the end of the four-year course by KNEC. Biology is a key subject as a good grade in the subject will end one into a good career. Kamau (2018), recommends that when all instructional resources needed in Biology are made available for the teacher and students and are maximumly used in class, students' performance will be improved as many learners are motivated to learn. The materials provide scientific knowledge smoothly to students thus enhancing them to recall. Ong'amo, Ondigi, & Omariba (2017) established that teaching students while incoorpating instructional resources lead to an improvement in their performance. Mukagihana, Nsanganwimana and Aurah (2022), observed that poor utilization of available Biology instructional materials in teaching Biology teachers would produce less brilliant Biology teachers as they won't be equipped with sufficient know-how to use the materials. They recommended the provision of adequate Biology instructional materials and monitoring of their utilization in teaching Biology by the school authority. Generally, in the developed countries they use electronic media while in the developing countries they majorly use print media hence there is need for the developing countries to emprise the use of electronic media to enhance the process of teaching and learning.

Research has shown that the use of instructional media will influence learning outcomes in various subjects including; Kiswahili, Mathematics, English and CRE. Very few studies have been done in Biology as a subject, hence the present study will investigate the utilization of instructional media and the quality of learning outcomes in Biology theory.

## **1.2 Statement of the Problem**

In the Secondary School Biology curriculum for Kenya, there has been persistent poor performance in the last five years; especially in various topical areas of Biology theory (Kiilu et al.,2022). Although interventions for reducing poor performance using instructional media have been investigated in many subjects including Kiswahili, C.R.E, Mathematics and English, very few of such studies have been on the utilization of instructional media in Biology as a subject. The studies have also largely focused on the utilization of instructional media rather than the influence of utilization of such media on the quality of learning outcomes. Furthermore, no study has distinguished between the impact of instructional media on biology theory and the practical component.

It is also observed that most of the instructional media studies undertaken in the Kenyan context have focused on Biology as a whole without separating the practical and theory components, (Kamau, 2018). The general distribution of such studies has included Nairobi County, Siaya County, Nakuru County and Kakamega County but very few of the studies have been carried out in Machakos County. There was a need to explore how the challenge of poor performance in Biology can be addressed through the use of instructional media. The present study investigated the influence of utilization of

instructional media on the quality of learning outcomes in Biology theory in Mwala Sub-county of Machakos County.

### **1.3 Purpose of the Study**

The purpose of this study was to investigate the influence of the utilization of instructional media on the quality of learning outcomes in Biology theory in public secondary schools in Mwala sub-county, Kenya.

### **1.4 Objectives of the Study**

1. To establish the effect of teacher preparedness on the quality of learning outcomes in Biology theory in public secondary schools in Mwala Sub-County.
2. To assess the type of instructional resources used and the quality of learning outcomes in Biology theory in public secondary schools in Mwala Sub-County.
3. To determine the influence of students' attitude on the quality of learning outcomes in Biology theory in public secondary schools in Mwala Sub-County.
4. To assess the effect of students' self-concept on the quality of learning outcomes in Biology theory in public secondary schools in Mwala Sub-County.

### **1.5 Research Questions**

1. To what extent are Biology teachers in Mwala Sub- County prepared to enhance the quality of learning outcomes in Biology theory in public c secondary schools?

2. What are the types of instructional media used to enhance quality of learning outcomes in Biology theory in public secondary schools in Mwala Sub- County?
3. What is the influence of students' attitude on the quality of learning outcomes in Biology theory in public secondary schools in Mwala Sub- County?
4. What is the effect of students' self-concept on the quality of learning outcomes in Biology theory in public secondary schools in Mwala Sub- County?

### **1.6 Significance of the Study**

The findings from this study may be useful to a number of groups not only in Mwala sub county but also in the entire country. The findings of this study may help teachers to be aware of the importance and be prepared to utilize instructional media in teaching Biology, therefore imparting scientific knowledge and skills to students easier and faster. The findings may be beneficial to teachers as the methods of delivering content may be improved.

The findings of this study may help learners to improve their performance. When instructors use instructional media in teaching this may lead to an improved performance. The utilization of media may capture learners' attention, draw learners' interest and remove boredom thus students will be able to learn easily.

The findings may help to impact the learners' attitude towards Biology. The use of instructional media may lead to learners changing their attitude towards Biology. The learner may develop an interest in Biology thus they may be able to capture concept in Biology easily. The learners may also start enjoying Biology classes and learn fast.

The findings of the study may help in improving Biology student self-concept. The findings may impact on the students' self-image enhance the way students see

themselves and develop a positive thinking. The finding may influence students' self-esteem as they may build confidence in themselves and believe in their ability.

The findings may be helpful in planning and organizing national in-service training for teachers, in order to equip teacher trainees with necessary required skills and knowledge on the utilization of instructional media.

### **1.7 Delimitation of the Study**

The study was limited to 6 public secondary schools, 6 heads of department, 6 teachers of Biology and 240 form two students. The influence of instructional media entails many aspects; however, the study was limited to the level of teacher preparedness, type of instructional resources used, students' attitude towards Biology and students' self-concept on the quality of learning outcomes in Biology theory in public secondary schools in Mwala sub-county.

### **1.8 Assumptions of the Study**

The study assumed that, teachers of Biology in Mwala Sub-County use instructional media in teaching Biology theory; effective use of media has an effect on learning outcomes, teacher preparedness contributes to effective use of instructional media; students' attitude will have an effect on the quality of learning outcomes; students' self-concept will influence the quality of learning outcomes and that the respondents will give honest responses to the questionnaires.

## **1.9 Theoretical Framework**

The study was guided by Richard Mayer's Multimedia Learning theory (MMLT) which asserts that deeper learning can occur when information is presented in both text and graphics rather than graphics alone. According to this theory learning occurs in two channels: auditory and visual. The channels are utilized in processing information into working memory (Moreno & Mayer,1999). This theory presumes cognitive processing channels are categorised; the one for filtering auditory information and one for giving visual information. The two channels lead to development of new knowledge (Mayer, 2010). This theory denotes that for better understanding the teacher should utilize both visual and audio media in teaching and learning to enable learners to filter the lesson content using the two channels.

In the learning process, the learner will first observe and listens to instructional resources this will lead to an instant storage of that information in the working memory. When words pass through the audio processing channel, visual information is filtered by the visual channel and the essential information is separated from the irrelevant information in the immediate memory. The working memory will then process the remaining relevant content and infers connection between the verbal and the visual information and then recollects similar foreknowledge from long-term memory. Comparison between recollected schema and new information occurs and the learner gains understanding. This will lead to the creation of a new schema or the modification of the previous schema that is finally stored in long term memory.

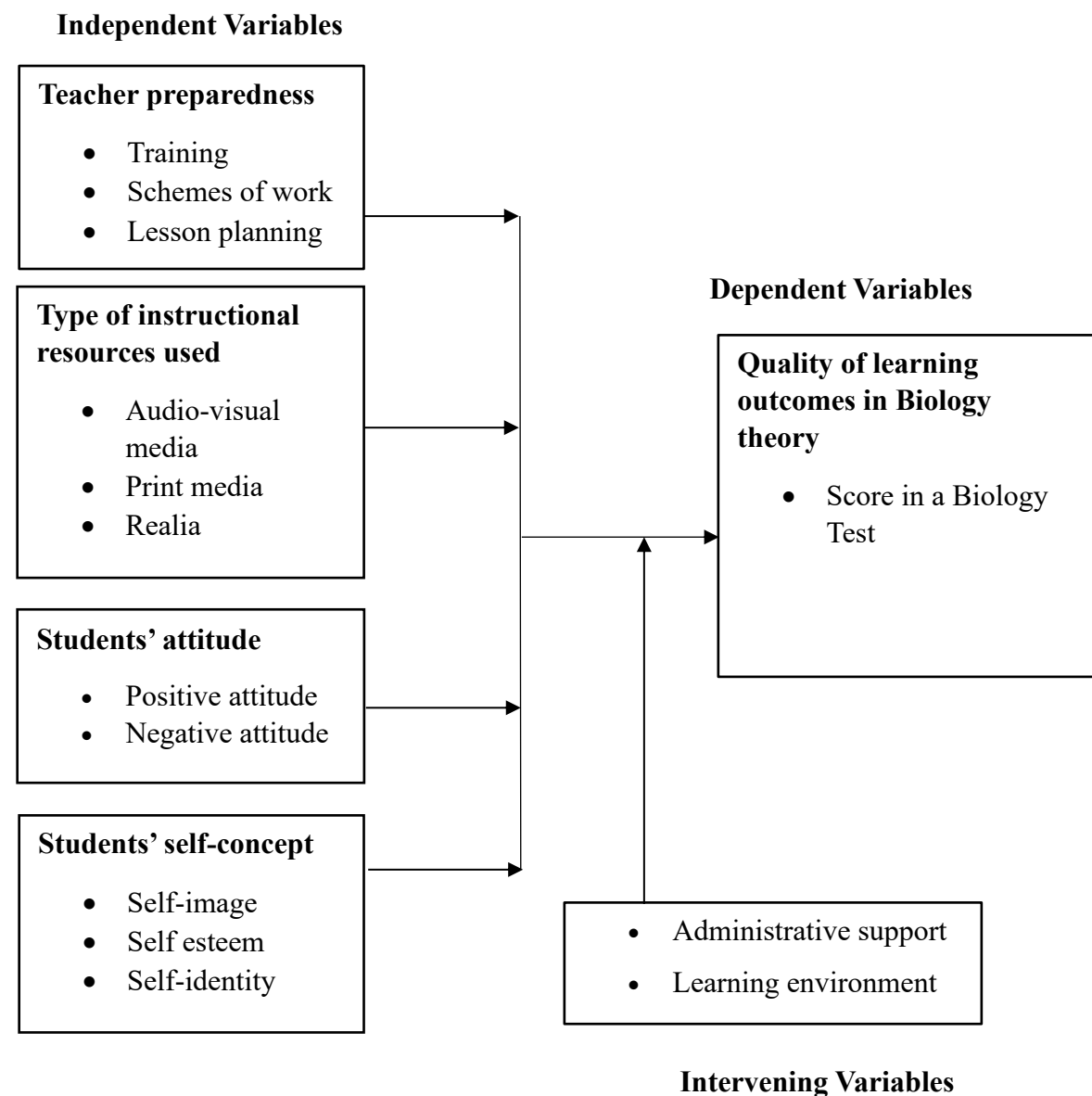
Multimedia Learning theory is established on three main principles, dual channel principle, limited capacity principle and active processing principle. Dual channel principle assumes that learners have different channels for visual and verbal

information and if both channels are used at the same time, they are more beneficial to the student than using each channel on its own. Limited capacity principle presumes that the two filtering channels in immediate memory have restricted capacity for both short-term storage and active processing. Active processing principle denotes that if learning occurs, the immediate memory as to filter, pull earlier information, create and store new altered schema into long term memory (Mayer, 2011).

Multimedia learning theory was applicable to this study as it emphasizes on the application of technology in teaching and learning Biology theory to enhance the quality of learning outcomes. Teaching using instructional media enhance learning. The application of MMLT in teaching and learning helps the instructor use technology to make learning interesting, capture learners' attention and change student's attitudes towards the subject hence achieving learning outcomes easily. Application of this theory in teaching and learning makes it possible for the teacher to utilize variety of instructional materials in presenting information to students to attain meaningful learning. The theory assumes that the instructors are well trained on the use of instructional media and that a variety of media resources are available in the learning institutions.

### 1.10 Conceptual Framework

A conceptual framework defines the relevant objectives for a research process and map out how they come together to draw coherent conclusions. Conceptual framework is the method of presentation where the researcher presents the relationship between variables in the study and explains them diagrammatically. The conceptual framework is as presented in Figure 1



**Figure 1.1 Conceptual framework**



Figure 1 shows the relationship between the independent variable, which encompasses utilization of instructional media and the dependent variable which in this study is wrapped up in the quality of learning outcomes. The utilization of instructional media may influence the process of learning. Teaching and learning using instructional media might influence student performance in examinations. This will depend on factors such as teacher preparedness, type of instructional resources used, students' attitude and students' self-concept which were the independent variables in this study.

Intervening variables such as learning environment and administrative support may determine how the independent variables influence the dependent variables. For instance, administrative support may influence teacher preparedness in terms of preparing for the delivery of content while incorporating media.

## 1.11 Operational Definition of Terms

|                                        |   |                                                                                                                                                                                              |
|----------------------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Instructional media</b>             | : | This term refers to a means of transmitting knowledge and skills to learners using electronic or non-electric devices to ease teaching and learning process.                                 |
| <b>Type of instructional Resources</b> | : | This refers to various resource and facilities that are utilized to stimulate, smoothen, improve and support teaching and learning process in schools.                                       |
| <b>Utilization of Media</b>            | : | Refers to the process of planning, acquisition and effective use of media to enhance the process of teaching and learning in learning institutions.                                          |
| <b>Biology theory</b>                  | : | This term refers to a theory part of Biology used as an explanation for phenomena pertaining to the life sciences, or study of living organisms.                                             |
| <b>Learning media</b>                  | : | This refers to the various tools, resources, and materials used by teachers and students to facilitate the teaching and learning process.                                                    |
| <b>Learning outcomes</b>               | : | Refers to a specific statement that describes what a learner is expected to know, understand, or be able to do after completing a learning experience, such as a lesson, course, or program. |
| <b>Learning process</b>                | : | Refers to the series of steps or activities that students go through in order to acquire new knowledge, skills, or behaviours.                                                               |

- Multimedia learning** : Refers to the process of learning from instructional materials that combine verbal (text) and visual (pictures or animations) information, which has been shown to enhance learning compared to the use of text alone.
- Quality of learning**
- Outcomes** : Refers to how well the outcome captures the desired level of knowledge, skills, or competencies that students are expected to achieve at the end of a course or a learning program.
- Self-concept** : This refers to the multidimensional perception of who we are, including self-esteem and self-image.
- Student's attitude** : These are the emotional and cognitive approaches a student demonstrates in an academic situation such as a class or subject.
- Teacher preparedness** : This term has been used to refer to the extent to which a teacher is equipped with the necessary knowledge, skills, and resources to effectively plan, deliver, and assess instruction.
- Working memory** : Refers to the cognitive system responsible for temporarily storing and manipulating information that is needed for tasks such as reasoning, learning, problem-solving, and decision-making.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter provides a literature review of the study in regards to utilization of instructional media in learning science, teacher preparedness in using instructional media and the quality of learning outcomes, students' attitude towards instructional media and quality of learning outcomes, students' self-concept and the quality of learning outcomes and type of Instructional resources used and the quality of learning outcomes.

#### **2.2 Utilization of Instructional Media in Learning Science**

Media in Education is a new area of interest for specialists in the field of education and communication (Lincy, Thanavathi & Thoothukudi, 2014). The use of media in teaching and learning will give information and activate sensory organs. Instructional media is a vital tool for the teaching-learning process. Utilization of instructional media in teaching and learning process will improve students' interest hence enhancing students learning outcomes leading to an improvement in academic performance (Henry, 2017). According to Adenle (2014), it is important to use instructional resources in delivering content to students in basic sciences in schools, because it makes learning interesting to the learner and stimulates understanding of the subject matter. When instructors plan and utilize appropriate instructional media in teaching this will improve students' performance in science subjects.

To help learners comprehend Chemistry concepts, researchers have suggested a number of instructional approaches, such as adapting teaching strategies based on the

conceptual change model (Wu, Krajcik, & Soloway, 2001). Poor utilization of learning material will hinder the efficiency of the teaching and learning process making Chemistry lessons boring and abstract this will lead to poor outcomes among students. According to Koko (2016), although the adequacy of instructional media is to ensure its effective use, the few available instructional materials can be used effectively to boost teaching and learning. Ehirim (2020) recommends that, using instructional resources in teaching and learning of all topics in Chemistry at our schools should be made compulsory and this must be supervised by the school administration to encourage better outcomes among learners. Furthermore, the Government should motivate teachers by providing funds to enable them teach smoothly. The government should also encourage and put in place programs on how to improvise, make and utilize instructional materials in the teaching and learning of Chemistry.

According to Chukwudi et al., (2022) learners in secondary schools registered low performance which is below expectations in Physics due to lack relevant instructional media for use by their teachers. The government should focus on providing relevant instructional resources to enhance teacher's competence in using modern teaching methods to promote better understanding of what is taught by teachers. Adcock & Bolick (2011), pointed a precarious relationship between the teaching of Physics and the utilization of instructional media. Radlović-Čubrilo, Lozanov-Crvenković, Obadović & Segedinac (2014) denotes that a teacher may gain solutions to the traditional approach by teaching Physics supported by information and communication technologies as this will make the lesson interesting and make learners attentive hence more learning. Use of Instructional resources in teaching physics will motivate Physics students to learn and have positive impact on their attitude toward learning.

Instructional media can be used in concert with teacher-directed instruction. Instructional media can help learners in practicing the visualization of a problem. Instructional media can also model positive student and teacher behaviour. Nyawira (2015) found out that when students are involved in doing activities using real objects like models, this will make abstract Mathematical concepts concrete hence its essential to use instructional media in teaching. Use of appropriate instructional media while teaching Biology as a science will ease the process hence promoting more learning (Ntukidem,2020). Hence, it is crucial for instructors to select, prepare and utilize instructional materials adequately to promote learners' achievements. A study done by Ong'amo et al., (2017) found out that students who were taught using instructional material performed better in their exams than those who were taught using the traditional approaches. This study thus aims at finding out the influence of utilizing instructional media in teaching and learning Biology theory.

### **2.3 The Utilization of Instructional Media**

This section explores literature based on the utilization of instructional media under:

#### **2.3.1 Teacher Preparedness on the Use of Instructional Media and the Quality of Learning Outcomes in Biology Theory**

Teacher preparedness is defined as the degree of confidence the instructor has in his or her ability to deliver content to learners. Teacher preparedness refers to the collection of knowledge, attitudes, and skills presented by teachers to enhance education outcomes (Ondimu ,2018). Preparation for teaching will include lesson planning, creating daily activities and the training one goes through to gain skills and competency. Preparing for teaching will enable a teacher lead to productive, engaging lessons for their students and maximize the effectiveness of their time and resources. Preparing for teaching will help one sharpen their teaching skills and philosophies and perform effectively in their

career role. Teachers need to have significant knowledge, skills and abilities to create a learning environment.

The government has put effort in ensuring quality delivery of content and enhancement of learning process through teacher training and teacher career development (Wandera, 2019). According to the Mohamed 2022, teacher training is categorised into two: Pre-service teacher training for acquisition of skills and knowhow for better delivery in class and in-service teacher training to improve teachers' classroom delivery and enhance understanding of the subject matter. For one to be trained as teacher they attend a college or a university. Wamalwa (2019) avers that during training teacher trainees are introduced to teaching using teaching aids in university or colleges in their microteaching and teaching practice. Teacher training sections should include the use of instructional media in order to enhance the teaching and learning process.

Instructors should take their time and prepare media before they utilize them in class as this will lead to reduction of errors that may occur. Research carried out by Zuryanti et al., (2017) revealed that mindset transformation, curriculum concepts comprehension, ability to analyse subject matter, and teaching design were some of the factors influencing elementary school teachers' preparedness in implementing the curriculum. Teachers need to emphasize the importance of collaboration between teachers and students. Teachers' mindset is associated with a few changes such as a strong desire and acceptance or openness to accept the change, strategy implementation, management, and leadership learning. Studies show that teacher are not adequately prepared thus there is need to for teacher Inservice training and workshops and also encourage teacher to be adequately prepared before going to class.

According to Asdin & Erlina, (2022), teacher's sufficient capacity to develop lesson plans which were oriented to the inquiry process, peer support, and teachers' working groups affected the readiness of the teacher to assess inquiry-based science in elementary schools. Chege (2014) found out that, personal characteristics, prior computer training, and ICT infrastructure have to some extent some influence on teachers' preparedness to use ICT in teaching. Teacher preparedness can be referred as collective knowledge, attitudes and skills that enhance the designed curriculum in a way that leads to improving the quality of education as evinced by improved academic performance (Ondimu, 2018). Kimosop (2019), states that poor teachers' preparedness tends to lead to poor students' academic performance. According to Abraham et al., (2021) the majority of teachers in the USA devised what might now be labelled as alternative ways where teachers were prepared in school district-based programs. Teacher preparedness indicates a significant impact related to the promotion of teacher capacity as well as the quality of education (Kee, 2012). Studies done show that teacher preparedness is key in enhancing students' performance hence teachers should be encouraged to prepare and informed on the importance of being prepared before teaching in order to enhance student's learning outcomes.

Cochran & Maria (2015) state that a low standard of teacher preparedness affects negatively the performance of students in school activities mostly in rural areas. Duncan (2009), found out that teacher preparedness in Europe is allied with getting what can make them to increase the teaching experience for all beginner teachers. Woods (2015) added that the preparation and ongoing support of teachers should have regular mentors. A study by Isaboke et al., (2021) recommended that the Ministry of education should equip teachers with the requisite skills, knowledge, and teaching and learning resources to adequately prepare them for implementation of the curriculum. Generally, research



has shown that teacher unpreparedness has a negative impact on learning outcomes hence there is need for teacher to be prepared by creating awareness on the importance of teacher preparedness before delivering content to students.

Teacher preparedness implies a complex process of a teacher processing professional values and attitudes and also being able to put into practice such values established (Tatto 2021). Sayed & Ahmed (2015), recommended that the school heads make regular checking of teachers' documents to enhance the level of teachers' readiness. The Ministry of Education is responsible for improving the teaching profession and is required to enhance the quality and quantity of professional training given to teachers. Hence the Government and Non-governmental organizations should collaborate with the school administration to improve the level of teachers' preparedness and students' academic performance. Digital Literacy Program (DLP) is said to target the use of digital technology and communications in teaching and learning in primary schools in Kenya. The purpose of the programme is to integrate ICT with the education curriculum so as to enhance effective delivery of learning materials to learners. In the programme, ICT is used as a teaching and learning tool (Nyaga,2018). Lai et al., (2020) recommend that more training and professional development programs should be provided by the school for their teachers to prepare and equip them for the ICT integration in education and further unfold their ICT integration practices in teaching. Critics of the infrastructure in ICT integration in education argue that, in spite the Government effort to acquire ICT tools such as computer hardware and software they have lagged behind on where the teachers have the know and are prepared on the use of ICT tools in teaching students. Thus, there is need to increase teachers know how on the use of modern technology in teaching.

According to Momanyi & Rop (2020), teachers are inadequately prepared. Their knowledge of CBC is vague and this has hampered their delivery and evaluation. It is also recommended that KICD and the Ministry of Education plan for more training sessions to bridge capacity gaps highlighted in pedagogy, Assessment and preparation of teaching documents. Teacher-preparedness plays a crucial role in improving students' grade scores, school completion and active participation of students in the classroom (Kim et al.,2012). Waweru (2018) carried out a review analysing the impact of teacher preparedness towards execution of the Competency-Based program in primary schools. Wandera (2019), states that for teachers to enhance their preparedness and be able to improve students' grades, attendance and school completion, they need to identify the students' knowledge gaps that they should address as teachers before adapting the standard ways of fulfilling and improving the learner performance. Research shows that teachers are not well prepared hence there is need to expose teachers to many Inservice training workshops to sensitize them on the use of instructional media.

### **2.3.2 Types of Instructional Resources Used and the Quality of Learning Outcomes in Biology Theory**

Instructional resource can be defined as the human and non-human resources that are used to ease, encourage, improved and stimulate teaching and learning process (Muraina, 2015). They are utilized in order to enhance effective delivery of instruction. They include both human and non-human material that an instructor utilizes to convey content to the students. Instructional resources can be divided into; print media, audio, visual and audiovisual resources. The resources are vital in teaching and learning as they; gain the attention of the learner, give visual aspects to the student, stimulate the

understanding of abstract explanations and enable learners with different needs to acquire knowledge easily.

According to Manurung (2017), instructional materials are used to create clear idea of something. Berkeley (2011) denotes that it is important for every teacher to be able to select instructional materials to use during delivery of content to students. Teachers should possess the ability to select and utilize methods and materials for use during delivery of content. According to Reed et al., (2022), when teachers are making and planning instructional resources, they should consider their learners as students will have different needs. In a class there are different learners and it's important for the teacher to cater for different needs of the students. One should be considerate when coming up with instructional resources, he should ensure that the resources can be utilized by students with special needs if there are any in his class. Teachers should make multiple media to teach one subject. Students learn in different ways; Some are visual learners; others are auditory learners while others learn through physical contact. Instructors should make sure that a variety of instructional materials are available to cater for the different needs of students.

Silvi and Acep (2020) observed that insufficient learning resources led to English teachers not using instructional media in the classroom resulting to ineffectiveness in teaching English. This led to poor performance in the English language examinations offered in elementary schools. Wamalwa (2016) postulates that a planned use of instructional material enables students to acquire and remember concepts. Proper utilization of instructional resources can assist teachers in delivery of the content effectively to students. Fiorella and Kuhlmann (2020) found out that when instructional materials are used well by instructors, they support learning through visual elaboration. Instructional materials stimulate and excite learners when the teacher fully utilizes them

in the teaching and learning process. Studies have shown that the use of instructional material enhance the process of teaching and learning furthermore they will also have an influence on their learner outcomes.

Ordu and Amadi (2019) stated that the utilization of graphic materials and computer (hardware and software) relate to students' academic performance as these tools were critical to academic success of students in the class. Ahmad (2024) revealed that the use of instructional material in mathematics not only improves both critical and analytical thinking of the learner but also enhance higher secondary school students' academic achievement. He also posited that it helps the teacher to present the lesson effectively and efficiently, as students learn and retain the concepts better and for a longer period. Studies have also shown that the academic performance of students who were taught with educational materials notably performed better to that of those who were not instructed with such materials. Additionally, the utilization of instructional materials generally enhanced students' comprehension of concepts and resulted in commendable academic accomplishments (Ameen et al.2023). Researchers agree that the use of instructional materials enhances the teaching and learning process hence impacting on students' performance thus the need to avail these resources in schools.

The availability and utilization of instructional materials in teaching and learning of mathematics will not only arouse students' interest positively in learning mathematics but assist teachers in achieving the predetermined learning objectives (Ogunwuyi, 2020). Additionally, it has been reported that availability and utilization of instructional materials helps learners to retain more knowledge than those taught without instructional materials (Achimugu, 2017; Adu, 2020; Arokoyu & Ugonwa, 2012; Okoji & Olubayo, 2021; Olaniran et al., 2016; Sam-Kayode et al., 2020). Hence, it is plausible that the poor performance observed in mathematics students' performance, as

mentioned earlier, may be linked to the status of instructional materials within schools. Students have difficulties in understanding mathematics because of its abstract nature (Shukia, 2019). Therefore, it is crucial to explore methods that render mathematics more tangible for learners to facilitate their comprehension of the subject. Instructional materials serve as a valuable avenue for achieving this goal. The significance of instructional materials in the process of teaching and learning cannot be underestimated, as they have proven to be instrumental in facilitating effective and successful educational practices within schools. Instructional materials, also referred to as teaching aids, are utilized by teachers to demonstrate and elucidate procedures, concepts, and phenomena being studied (Tuimur, 2015). Teaching and learning of mathematics should be approached in manners that foster a positive attitude among learners.

Teaching science demands more practical clarifications hence there is need to come out of the old teaching methods. There is also the need to provide adequate teaching aids to serve the objective of teaching and learning of science subjects. Research has shown that the more experienced a teacher is with any form of instructional media, the more they will use it and implement it in their study of interest. According to Nwos (2018) in his view on the use of instructional media as a means of teaching and learning, discovered that most teachers do not use instructional material at the appropriate time, and that the use of instructional material must be timely. The application of instructional media in teaching and learning science is a vital tool in instructional delivery and has led to increase in the standards of education. Science subjects are challenging to comprehend and highly required in tertiary institutions for admissions and thereby the need to encourage teachers to utilize instructional media to enhance the process of teaching and learning in order to achieve better student's performance.

Kamji & Agu (2022), established that media use should be made compulsory in teaching Chemistry at our senior secondary schools, and be monitored by the administration. Kamau (2018), denotes that when all instructional resources are availed and adequately utilized in teaching Biology there will be an improved performance as many are motivated to learn. Learning resources provide scientific knowledge and make the learning process easier. Instructional materials make students understand physics more easily and makes the teacher task easier and more effective (Perpetua,2019). Research shows that use of instructional resources enhances teaching and learning of science subjects hence the need to encourage teachers to utilize instructional materials while teaching.

Instructional resources may motivate or demotivate students depending on how well they are used (Gravelle, 2022). According to Clark & Mayer (2023),there are a number of elements to look at when choosing type instructional materials, they include; how relevant the material is to the lesson, age of the student and the abilities of the student, how current the resource is, whether the resource enhances learner participation, the resources should make learning interesting and should be easy to interact with or operate.

### **2.3.3 Students' Attitude Towards the Use of Instructional Media and Quality of Learning Outcomes**

Attitude refers to a set of emotions, beliefs, and behaviours toward a particular object, person, thing, or event (Kendra et al.,2014). Attitude towards learning refers to how you assess and monitor how well learners approach their learning and involves engagement, effort, collaboration, active involvement, independence, and enthusiasm which will demonstrate the aspiration to achieve their best. According to Kara, (2019) attitudes that cause individuals to always behave in the same way as people, objects,

events, and foundations are constant and unchangeable beliefs, feelings, and tendencies. Şen (2016) states that attitudes towards learning are important factors in the learners' levels of goal setting, problem-solving abilities, their beliefs towards learning, their inner and external motivations in the process of learning, and all the academic performances they perform. He adds that for most teachers, a good student is eager to learn and has a positive attitude toward learning. Attitude can be considered as a positive or negative evaluation of people, objects, events, activities, ideas, or just about anything in the environment.

According Kabir (2016), attitude can be defined as the mental position that represents an individual's degree of like or dislike for an item, a generally positive or negative view of a person, place, thing, or event. Positive attitudes serve a better comprehension of the nature of learning for the learners, it also makes the students more open to learning, increases their expectations from the learning process, and reduces their anxiety levels (Şen ,2016). He further observes that a positive attitude activates the thinking, feeling, and reacting components of an individual which helps to improve students' performance. Hamzah & Ahmad (2017) found that the role of science teachers can influence the attitudes of students towards Science Therefore, teachers must design an exciting teaching and learning process along with creating a learning environment that can arouse students' interest in respective subject. Therefore, the selection of appropriate instructional media is very important in influencing students' attitudes towards a subject.

Yaziz & Rahman, (2015) found out that most students had a positive attitude towards Mathematics and that they perceived Mathematics as doable, learnable, and important yet this did not translate to good grades. He recommended the use of varied instructional strategies by the teachers, which promote discovery and elicit learner interest. Ahmed

(2021) states that a negative attitude which is caused by limiting beliefs and negative thinking contributes to a lack of motivation in learners and hinders their academic performance. According to Judi, (2017) negative attitude makes students feel not to undertake the course. Oluwatelure, (2015) found out that negative attitude is self-defeating and will cause many problems in life. Consequently, a negative attitude toward Biology hampers students' understanding and academic performance causing them to lose interest in all the activities in the classroom and create room for distractions. (Albert et al.,2015). Akinbobola (2019), in his finding reports that many students developed negative attitudes to science learning, probably because teachers are unable to satisfy their aspirations or goals. There is need for teachers to discover ways of gaining students attention and making learning interesting while teaching.

Soibamcha and Pandey (2016) postulated that attitudes are very personal and complex in character, uniquely organized in each person and the organization itself is the product of his own reactions to his own experiences. In using multimedia, attitudes considerably influence one's behaviour, accordingly, the individuals, attitudes may be positive (favourable) or negative (unfavourable). Attitudes, once established, help to shape the experiences the individual has with an object, subject, or person. According to Odewole (2023), attitude is a precursor of the behaviour of an individual and varies from favourable to unfavourable. In this 21st century with the advent of Information and Communication Technologies (ICTs), attitudes of the students play critically roles in the utilization of these technologies. Most importantly, undergraduate student's attitudes are considered as major determinant towards the use of multimedia technologies in the educational sector. This is because the success of multimedia resources in educational sectors greatly depends on attitudes of students towards its use.



Therefore, for effective utilization of multimedia resources, students must have positive attitudes to these resources which will in turn add value to the education.

Akinbadewa & Sofowora (2020) concluded that students developed positive attitudes toward learning Biology after using the packages and that multimedia instructional packages are an interesting and creative method of teaching, learning, and enhancing positive attitudes towards learning among secondary school students. Positive attitude toward school and learning has been identified as a precursor to effective learning and academic success (Dagnew, 2017). Research shows that use of learning media makes learning process interesting hence instructor should be encouraged to use various media resources while teaching.

Al-Sobhi et al., (2018) points out that a learner's attitude is considered a key motivational component and an important non-linguistic factor that influences second-language learning. Findings indicated that the students' attitude toward the social use of English is the highest. There is a significant positive relationship between the students' attitudes toward spelling and writing. According to Yara (2019), the attitude of students toward Mathematics has been considered to be a very significant factor underlying their school experience and achievement. That is to say that the attitude students hold towards Mathematics determines how they approach the subject. Owan (2014) state that investigation into students' Mathematics attitudes and perspectives not only informs teachers, parents, and administrators about students' needs but also serves as a catalyst for reform in Mathematics education. Attitude can be considered as a positive or negative evaluation of people, objects, event, activities, ideas, or just about anything in the environment. Weidmann (2020) found out that positive attitude towards learning Mathematics will lead to better performance in Mathematics. Melad (2022) recommended that educators should give much effort to the students' attitude towards

the course as this would propel them to achieve higher in the learning process. According to Nolan (2014), improving students' attitudes through educational interventions may also increase confidence in their ability to understand statistical information and problem-solve using statistics beyond the classroom. It is evident that attitude is key in learning thus teacher should be ready to enhance students' attitude in order to foster learning.

Teachers must set up appropriate media and materials in order to make the students understand the lesson easier and increase their interest in the learning process (Sari, 2024). Hamzah (2017) says, that the main issue in teaching English in the classroom appears to be the students' lack of motivation in learning. Bigirwa (2021) established that learner who had their own computers as well as previous computer hands-on experience had more positive attitudes towards using the media than their counterparts without previous computer hands-on experience. It is evident that use of media while teaching inspires students to learn thus there is need to utilize media during delivery of content. The ministry of education should ensure a variety of media is available in school for use by instructors.

Student's attitude is a factor in determining their success in learning. Chepkemai 2019, revealed that student's attitude on the use of ICT in teaching and learning Kiswahili play was positive however, students indicated that they rarely use ICT in learning Kiswahili plays and others have never used any form of ICT during their learning of Kiswahili plays. They also felt that the use of ICT is interesting during teaching and learning of Kiswahili plays. Ngaine (2022), established that majority of the stakeholders in tertiary institutions in Kiambu county have a positive attitude towards use of e-learning and that there is no significant difference between the attitude of learners and lecturers towards the use of e-learning. Research has established that there

is a relationship between the use of media and students' attitude thus instructors should include media resources in their teaching to make learning more interesting and inspire students to learn.

Albert et al., (2015) in their research on the Relationship between Students' Attitudes towards Biology and Performance in Kenya Certificate of Secondary Education discovered that there is a positive relationship between student's attitude towards Biology and their performance in KCSE Biology. They recommended that Biology teachers should use teaching methodologies that will promote positive attitudes towards Biology among students. Because of this, the present study aims to investigate the relation between student attitude and the quality of learning outcomes in Biology theory in the Mwala sub-county.

#### **2.3.4 Student's Self-Concept and the Quality of Learning Outcomes in Biology Theory**

Self-concept is an idea we have about who we are physically, emotionally, socially, spiritually, and in terms of any other aspects that make up who we are (Eccles, 2015). Self-concept is formed and regulated as one grows up and is based on the knowledge one has about himself or herself. The relationship that one has with the environment and the society constructs their self-concept. According to Ajmal & Rafique (2018), Self-concept can be divided into two academic self-concept and non-academic self-concept. Academic self-concept involves one's perception on activities that are related to specific subjects, teacher or school. Non-academic concept involves one's perception on non-academic activities including physical self and the way one relates with others. Attributing a negative outcome to a student may harm their self-concept, while attributing positive outcome to a student may increase their self-concept.

(Omolade,2021), reports that students and individuals often form their self-concept from past experience of success or failure. He further found out that, some academic libraries have not been adequately stocked with study facilities to improve students' academic performance with the resultant effects of failure which invariably influence their self-concept academically. An individual's self- concept can be influenced by depression, internal self-critic, parental upbringing and continuous failure.

Self-concept is an internal mirror, reflecting how you see your abilities, your worth, and your place in the world. It's a multifaceted construct that includes: Self-image, Self-esteem and Self-efficacy. Positive self-concept fuels motivation, pushing one to set higher goals and persist through challenges while a negative self-concept will lead to self-doubt, reduced effort, and a fear of failure. When students believe in their capabilities, they often adopt more effective learning strategies, manage their time better, and engage more deeply with the material. Their self-concept acts as a catalyst for efficient learning behaviours. Overtime studies have found a correlation between self-concept and academic achievement. Learners with a high self-concept are more engaged, more persistent, and achieve better outcomes in their academic pursuits, on the other hand students with low self-concept are at a greater risk of underperforming, often due to a lack of confidence and a tendency to avoid challenging work (Rani et al., 2023).

Kalam ,(2023) established that self-concept is significantly related to academic achievement. He found that a positive self-concept is associated with higher academic achievement and improved learning outcomes and a negative self-concept is associated with lower academic achievement and poorer learning outcomes. furthermore, it was found that the relationship between self-concept and learning is moderated by other factors such as gender, age, peers, parents and socioeconomic status. Thus, it is

important to understand the link between self-concept and learning in order to better support adolescents as they develop and learn. It is vital to achieve students with a positive self-concept in order for them to be able to cope with educational challenges. In other words, the teacher-student relationship has a significant significance, which goes beyond the simple transmission of content and teaching-learning experiences, as the development of the internal beliefs that the student possesses will be closely linked to the skills and learning that the student possesses (Closas et al., 2020).

Chen, (2022) found out that self-concept, self-imagination, and self-efficacy have an impact on ELLO among students. The self-concept is a cognitive process that influences the students' ELLO. In a broader sense, this self-concept provides a significant base to understand self, which refers toward students' better performance in their study (Chen et al., 2021). The self-imagination concept deals with a student's perspective for performing a work activity in academia. It gives a belief or wishes to the individual to perform a task somewhere else in the future. Self-imagination provides a belief to the students that they can communicate in English with their international friends or colleagues lies in their imagination. Moreover, teachers need to design learning environments and encourage them to engage their self-imagination in learning. It is essential to understand how self-imagination improves ELLO through blended learning (Rivers et al., 2021). Most studies suggested that self-efficacy's role in learning is needed to explore further (Shin, 2018). Moreover, self-efficacy provides courage to the students that they should be skilful enough to improve in their performance (Erten and Burden, 2014). Social learning theory provides the views of how cognitive process interacts to influence individual learning, especially Bandura's self-efficacy theory (SET), which is a subset of social learning theory in the sense of the cognitive process that plays a role in dealing with learning challenges (Genc et al., 2016). Studies show

that there is a positive relationship between self-concept, self-imagination, self-efficacy hence ensuring all are catered for learners will be better place.

There is a significant relationship between academic self-concept and academic performance among learners. According to Erten and Burden (2014), positive self-concept is an extremely important goal for educational programs to promote and help to link positive outcomes including higher academic achievement and effort. The increase in utilization of instructional media during teaching and learning develops students' critical thinking and self-concept because it involves multiple activities. It will catalyse the learner to think critically which will orient them technologically and satisfy their needs and develop the learners' self-concept. Yara (2010), observed that students with good self-concept performed well in accounting in some Universities in south-west Nigeria. Teachers and parents can use positive feedback to maintain positive self-concept among students. Teachers should encourage supportive relationship among learners in order to promote positive self-concept. Parents should be mindful of the language they use to describe their children; they should look for and point out their children's strengths. A healthy self-concept will help in positive development and the over-all well-being of a child; hence parents and teachers should nurture a positive self-concept among learners as it empowers the child to feel competent, try new things, and strive for success. An increase in students' self-concept will lead a progressive increase in academic achievements.

Rodiah, (2020) found out that there is a positive and significant correlation between academic self-concept and biology learning outcomes of students. According to Jensen et al., (2015) the main factor which influences a learning process and outcome of science subject is academic self-concept. Some large-scale studies such as PISA have examined students' self-concepts in general science, while other researchers have

developed different steps in the science subdomain and the results show students with good self-concepts can distinguish their academic self-concepts in biology, physics or chemistry (Jansen, et al., 2019). According to Cokley in Khalaila (2015) self-concept covers a set of students' attitude, belief, and perception based on their intellectual or performance and skill. Students who have good academic self-concept will easily to understand their abilities and potential within themselves. Students with a good academic self-concept have a positive relationship with academics as they are motivated and this leads them to have a satisfactory achievement, hence students are able to recognize their academic abilities that will help in achieving learning outcomes. Students who have high academic self-concept will also have high motivation in completing tasks from the schools.

Self-concept is one of the factors that has most influence on students learning ability. Students who feel themselves more confident in a certain topic or in a certain course will get better results than those who feel less confident (Lubis & Fazira, 2022). According to Retelsdorf et al., (2014) the presence of a reciprocal relationship between academic self-concept and academic achievement has been a source of inspiration for scientific debates, numerous theoretical models and many experimental works. Academic self-concept is one of the most important variables that motivated students, and it is an important factor for improving achievement. A study done by Dulay (2017) on the effect of self-concept on student achievement revealed that self-concept had a medium-level positive effect on student achievement. Thus, the current study will seek to find out the effect of using instructional media in teaching and learning on Biology students' self-concept.

## **2.4 Quality of Learning Outcomes in Biology Theory**

Learning outcomes are defined as statements of knowledge, skills and abilities individual students will possess and can demonstrate upon completion of a learning experience. According to Melisandy and Lena (2020), learning outcomes are the attitudes, skills, and knowledge that students have acquired as a result of the learning process. Jaaska et al, (2022), state that, outcomes are typically measurable declarations that enable a learning instructor to assess the effectiveness and usefulness of the learning program's methodology. They show teachers the path to be followed and make the students aware of what they will be able to achieve at the end of the course (Mahajan and Singh, 2017). Learning outcomes direct the content and design of a unit of study and form the basis of assessment.

According to Bai et al., (2022), learning outcomes will inform the teaching staff on the content to teach, the teaching strategies to use, the type of learning activities to set for students, appropriate assessment tasks and course evaluation. Learning outcomes are also useful to students as they; provide a solid framework to guide their studies and assist them to prepare for their assessment. Gronlund & Brookhart (2009) state that learning outcomes should be SMART: specific, measurable, achievable, realistic and time-bound. Quality learning outcomes are concise and clearly stated, specific enough to be observable and measurable and thus capable of being assessed. Quality learning outcomes are broad enough so as not to limit flexibility in achieving them and they are realistic given time and resources are available (Kennedy, 2008).

Learning outcomes are generally written based on Bloom's Taxonomy which explains the process of learning and hence has proved to be a powerful tool to help develop learning outcomes (Mahajan & Singh ,2017). The concept of Bloom's Taxonomy



involves remember, understand, apply, analyse and create (Irvine,2017). The taxonomy attempts to divide learning into three types of domains cognitive, affective, and behavioural. To achieve meaningful learning the teacher should fully understand the material to be used in the learning, content to be taught and how to apply it in the classroom. Teachers should be able to select the appropriate learning model in order to achieve the desired learning outcomes. The teacher should be able to make lesson plans, implementing learning activities and also assessing the learning outcomes obtained by students (Indra and Lena, 2023). It is important that instructors in schools create clear outcomes that help learners understand the lesson's relevance. Teachers should ensure they make smart objective for them to achieve quality learning outcomes.

According to Wakhidah and Bandonono (2022), the quality of learning outcomes can be determined based on students' achievement of certain targets and their creative, innovative, critical thinking, problem-solving, communication and collaboration abilities. Hendrawaty et al., (2023) state that students can get easily distracted from learning if the process is not interesting hence teachers have to put a lot of effort into designing the curriculum in such a way that it enhances their learning outcomes.

## **2.5 Summary of Literature Review**

This chapter provides a summary of literature review of the study in regards to utilization of instructional media in learning science, teacher preparedness in using instructional media and the quality of learning outcomes, students' attitude towards instructional media and quality of learning outcomes, students' self-concept and the quality of learning outcomes and type of Instructional resources used and the quality of learning outcomes. Use of learning media will stimulate interaction among teachers and

students thus making learning process effective. According to Henry (2017) the application of media in teaching and learning improves students' interest and academic performance in class activities.

Teachers' preparedness on use of instructional media will enhance their utilization during teaching and learning. Kimosop (2019), states that poor teachers' preparedness tends to lead to poor students' academic performance. Attitude can be regarded as positive or negative and is related to what one likes or dislikes. Schunk and Hanson (1985) suggest that the attitude of pupils is likely to play a significant part in any satisfactory explanation of the variable level of performance shown by students in their school science subject. Positive attitudes serve a better comprehension of the nature of learning for the learners, it also makes the students more open to learning, increases their expectations from the learning process, and reduces their anxiety levels (Şen (2013).

There are a variety of instructional material utilized in teaching and learning process; Print media, audio media and visual media. According to Manurung (2017) instructional materials are used to create clear idea of something. The integration of various instructional resources will improve learning as it captures students' attention and caters for difference learners needs. Self-concept is an idea we have about who we are physically, emotionally, socially, spiritually, and in terms of any other aspects that make up who we are (Eccles, 2005). Self-concept is one of the factors that has most influence on students learning ability.

## **2.6 Research Gaps**

Studies done on the utilization of instructional media have been in different subjects; including Mathematics, English, Kiswahili and CRE, but very few have been on the utilization of instructional media concerning Biology as a subject. The studies have largely focused on the utilization of instructional media rather than the influence of the utilization of such media and the quality of learning outcomes. It is also observed that most of the instructional media studies undertaken in the Kenyan context have focused on Biology as a whole without separating the practical and theory components. The general distribution of such studies done in Kenya have been in Nairobi County, Siaya county, Nakuru county and Kakamega county but very few in Machakos county.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter gives research methodology, design, location of the study, target population, sampling procedures and sample size, the research instruments, piloting of the instruments, validity of the research instruments, reliability of the research instruments, data collection and analysis procedures and ethical consideration.

#### **3.2 Research Methodology**

The study adopted mixed method methodology in data collection. Mixed methods research combines elements of quantitative research and qualitative research gaining a more complete picture as it integrates benefits of both methods.

#### **3.3 Research Design**

The study applied descriptive survey design which can use a wide variety of research methods to investigate one or more variable. Descriptive research is an exploratory research method that aims at describing a population, situation or phenomenon. It allows one to observe and collect valid and reliable responses and analyse them. This method and design were appropriate for the study as the study seeks to put forward strategies and provide remedies that can be taken to improve the quality of learning outcomes in Biology in national examinations.

#### **3.4 Location of the Study**

The selection of a research area is essential and it influences the usefulness of information produced. The study was carried out in Mwala sub-county; Machakos

county, Kenya. Mwala subcounty has 44 public secondary schools. Mwala sub-county is 1°21'7.14"S and 37°27'0.92"E. The sub-county is in Machakos County about 102.0 km from Nairobi, the capital city of Kenya. The region is highly productive in agriculture. Subsistence agriculture is mostly practiced with maize and beans. Fruits and vegetables are also grown in this Sub-County. Large amounts of produce are traded during open air markets within the Sub-County.

The sub-county was chosen purposely because it has registered low performance in Biology subject in KCSE over years. The performance in Biology in 2018 was 2.68, 2019 was 2.913, 2020 was 2.746, 2021 was 2.885 and 2022 was 2.7121 (SCDE Mwala sub-county, 2022)

### **3.5 Target Population**

Target population refers to population that the intervention is intended to study and take conclusions from. The target population of study included all public secondary schools, all heads of science department, all teachers of Biology and all form two students in Mwala sub-county.

### **3.6 Sample and Sampling Technique**

Sampling is the process of choosing a part of a population as a representative of the whole population. A sample of 10-30% is sufficient for a study (Mugenda and Mugenda, 2003). Sampling was carried out in Mwala sub-county which has 3 extra county schools, 11 county schools and 30 sub-county schools.

The researcher used the multi-stage sampling technique: Stratified random sampling technique was utilized to sample 6 secondary schools; 2 extra county schools, 2 county schools and 2 sub-county schools. From each of the sampled schools, purposive sampling was applied to select the head of science department. One form two stream

was randomly sampled giving a total of 240 students. The form two Teachers of Biology were purposively sampled to give a total of 6 teachers.

**Table 3.1 Sample Size**

| Categories              | Total population | Sampling technique         | Sample size | Percentage of total population |
|-------------------------|------------------|----------------------------|-------------|--------------------------------|
| Public secondary school | 44               | Stratified random sampling | 6           | 13.6%                          |
| HODs science            | 44               | Purposive sampling         | 6           | 13.6%                          |
| Teachers of Biology     | 88               | Purposive sampling         | 6           | 13.6%                          |
| Form 2 students         | 960              | Simple random sampling     | 240         | 25%                            |
| <b>Total</b>            | <b>1136</b>      |                            | <b>258</b>  | <b>65.8%</b>                   |

### 3.7 Research Instruments

#### 3.7.1 Written Biology test for students

The researcher used a Biology theory test to measure the learning outcomes on the topic excretion and homeostasis. The Biology theory test was administered with the help of the Biology teacher. The researcher then marked scripts to determine the scores of the students.

### **3.7.2 Questionnaires for Students**

The researcher administered questionnaires to students on their attitude towards the use of instructional resources and their self-concept. The questionnaires were closed ended where learners were required to select the option they agree with. The Biology teacher assisted in administering the questionnaires.

### **3.7.3 Questionnaire for Biology Teachers**

The researcher administered questionnaires to Biology teachers on the utilization of instructional media and preparedness to use instructional media in teaching. The questionnaires were closed ended where the Biology teachers were required to select the options, they most agree with.

### **3.7.4. Interview Schedules for Heads of Department**

The researcher administered an interview schedule to the heads of department on the use of instructional media in the teaching of Biology in form two. The heads of department were required to give their views on teachers' preparedness to utilize instructional media and the type of instructional media used in their schools.

## **3.8 Piloting of Instruments**

The piloting of the study instruments was done in one public secondary Schools in Machakos County which was selected by the researcher. This was to establish the research instruments' validity and reliability, in order to refine the instruments. This public secondary school selected for piloting was not included in the study.

## **3.9 Validity of the Research Instruments**

Validity refers to how accurately a method measures what it is intended to measure. If research has high validity, that means it produces results that correspond to real properties, characteristics, and variations in the physical or social world. The study

utilized both content and construct validity. The content and construct validity were determined by the researcher seeking guidance and assistance from the supervisors and other lecturers from the department of Education communication and technology in Machakos University and arranging the instruments as guided by the objectives. Experts were involved, and a rator-inter-rator reliability coefficient of 0.6 was used as the threshold for acceptance.

### 3.10 Reliability of the Research Instruments

Reliability is the extent to which measurements are repeatable when different people perform the measurement on different occasion, under different condition, supposedly with alternative instruments which measure the construct or skill. It can also be defined as the degree to which the measure of a construct is consistent or dependable. To stand reliability the researcher administered the instruments two times to the respondents, with an interval of one week. Aulin et al., (2018) reliability coefficient of 0.70 or higher is considered “acceptable” in most social science research situations. The alpha coefficient above .80 means that items have high consistency. The Cronbach’s alpha coefficient was used to determine the reliability of the research instruments at reliability index of 0.72. Findings show that all the Likert scales are reliable (alpha coefficient of >0.7), hence confirming consistency and accuracy of the data.

The formula below was used determine the reliability coefficient;

$$\alpha = \frac{k}{k-1} \left( 1 - \frac{\sum_{i=1}^k \sigma_i^2}{\sigma_X^2} \right)$$

where  $k$  is the number of items,  $\sigma_i$  is variance of item  $i$ , and  $\sigma_X$  is total score variance.



### **3.11 Data Collection Procedures**

Before going to the field to collect data, the researcher obtained an approval of the project proposal from the school of post graduate studies of Machakos University. The approval letter was used to obtain a research permit from National Council of Science and Technology and Innovation (NACOSTI). This permit enabled the researcher to get permission from the sub- County Director of Education to carry out research. The researcher then visited the sampled schools to seek permission from the principals to be allowed to administer the written Biology test, the questionnaires and the interviews. The researcher booked appointments with each school to administer the Biology teacher questionnaire and the interview for the Head of science department. A separate date was arranged for the administration of the Biology theory test and questionnaires for students; to fall at a time when the topic excretion and homeostasis was being taught.

### **3.12 Data Analysis**

The data was analysed and interpreted both qualitatively and quantitatively in the light of the research objectives. Qualitative data was analysed thematically and quantitative data was analysed through descriptive statistics which included means and percentages. Data analysis was aided by the Statistical Package for Social Sciences (SPSS) Version 27.

### **3.13 Ethical Consideration**

Ethical considerations in research are a set of principles that guide research designs and practices. These principles include voluntary participation, informed consent, anonymity, confidentiality, potential for harm, and results communication. The researcher sought respondents' consent before engaging them on voluntary basis. Before data collection, the respondents were informed on the motive of the study and were assured of the information confidentiality and privacy that they provided through written and verbal communication.

## CHAPTER FOUR

### FINDINGS AND DISCUSSION

#### 4.1 Introduction

This chapter focuses on the results of the study. In particular, findings are presented logically and discussed. There are two main sub-sections in this chapter. Sub-section one details findings on background characteristics of the study participants while, the second section comprises of results based on study objectives.

#### 4.2 Response Rate

Data was collected from 240 form 2 students spread across 6 secondary schools in Mwala sub-county in Machakos County, 6 heads of science department, 1 from each school, and 6 Biology teachers drawn from the 6 schools as was anticipated. This implies that the researcher achieved 100% response rate from all the study participants (see Table 4.1).

**Table 4.1: Instruments Response Rate**

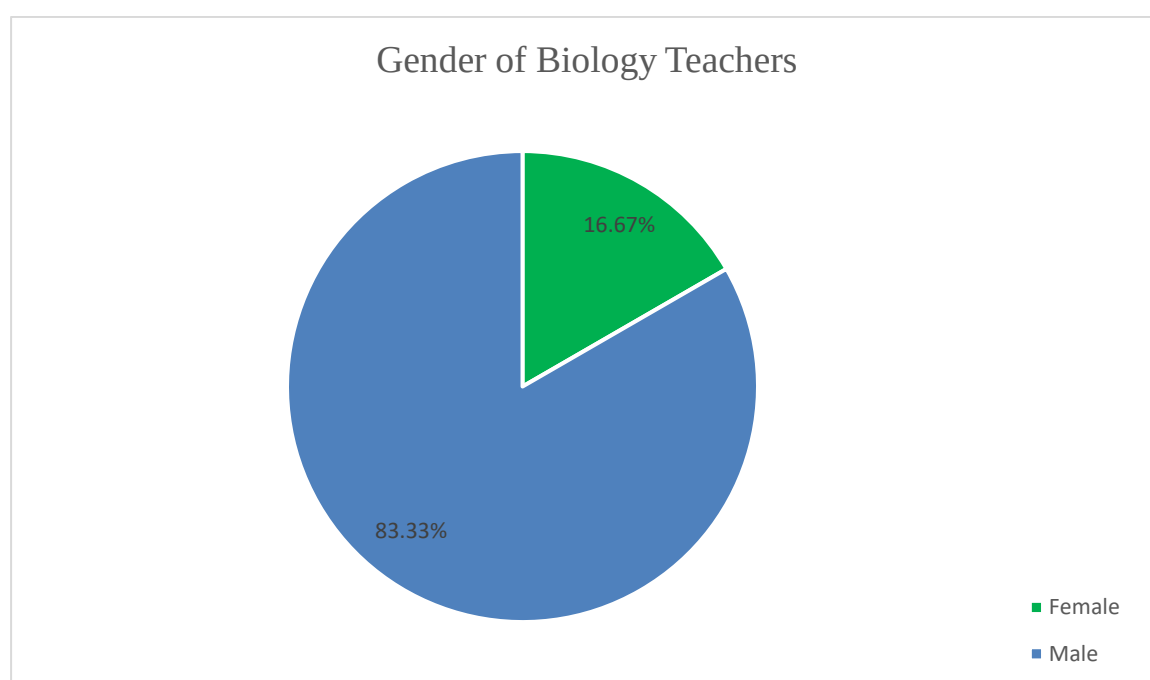
| Category of participants | Instruments administered | Instruments collected | Response rate |
|--------------------------|--------------------------|-----------------------|---------------|
| HOD Science department   | 6                        | 6                     | 100%          |
| Biology teachers         | 6                        | 6                     | 100%          |
| Form 2 students          | 240                      | 240                   | 100%          |
| <b>Total</b>             | <b>252</b>               | <b>252</b>            | <b>100%</b>   |

### 4.3 Characteristics of Participants

In this section, data on gender, age, and level of education of Biology teachers are presented and discussed. In addition, the study established gender distribution of the heads of science department in the 6 surveyed schools.

#### 4.3.1 Gender of Biology Teachers

Figure 4.1 presents data in relation to the gender of Biology teachers in the 6 surveyed schools. According to the data, only 1 teacher representing 16.67% of those interviewed was a female. This means that teaching Biology in Mwala sub-county, Machakos County is male dominated. This could be an indicator that teaching science subjects is still a male affair in the County.



**Figure 4.1: Gender of Biology teachers**

### 4.3.2 Age of Biology Teachers

Biology teachers were asked to indicate their ages. According to the data in Table 4.2, most teachers were aged 36-40 years (50%), followed by those aged 25-30 years (33.3%), while 1 out of 6 teachers was aged 31-35 years. The findings imply that majority of Biology teachers in Mwala sub-county are of youthful age.

**Table 4.2: Age of Biology teachers**

| Age Category | Frequency | Percent      |
|--------------|-----------|--------------|
| 25-30        | 2         | 33.3         |
| 31-35        | 1         | 16.7         |
| 36-40        | 3         | 50.0         |
| <b>Total</b> | <b>6</b>  | <b>100.0</b> |

### 4.3.3 Gender of Heads of Science Department

The study also established gender distribution of heads of science Departments in the surveyed public secondary schools in Mwala sub-county, Machakos County. Data (Table 4.3) show that most HODs of science departments are male, at 83.3%. This could also be an indicator that science subjects in the public secondary schools are male dominated.

**Table 4.3: Gender of Heads of Science Department**

| Gender       | Frequency | Percent      |
|--------------|-----------|--------------|
| Male         | 5         | 83.3         |
| Female       | 1         | 16.7         |
| <b>Total</b> | <b>6</b>  | <b>100.0</b> |

#### **4.4 Utilization of Instructional Media and Quality of Learning Outcomes in Biology Theory**

The study sought to establish the influence of instructional media utilization on the quality of learning outcomes in Biology among form 2 students in Mwala sub-County, Machakos County. Four specific objectives were formulated to achieve this purpose. They were: to establish the effect of teacher preparedness on the quality of learning outcomes in Biology theory; to assess the type of instructional resources used and the quality of learning outcomes in Biology theory; to determine the influence of students' attitude on the quality of learning outcomes in Biology theory and to assess the effect of students' self-concept on the quality of learning outcomes in Biology theory in public secondary schools in Mwala Sub- County. This sub-section presents findings and discussions systematically.

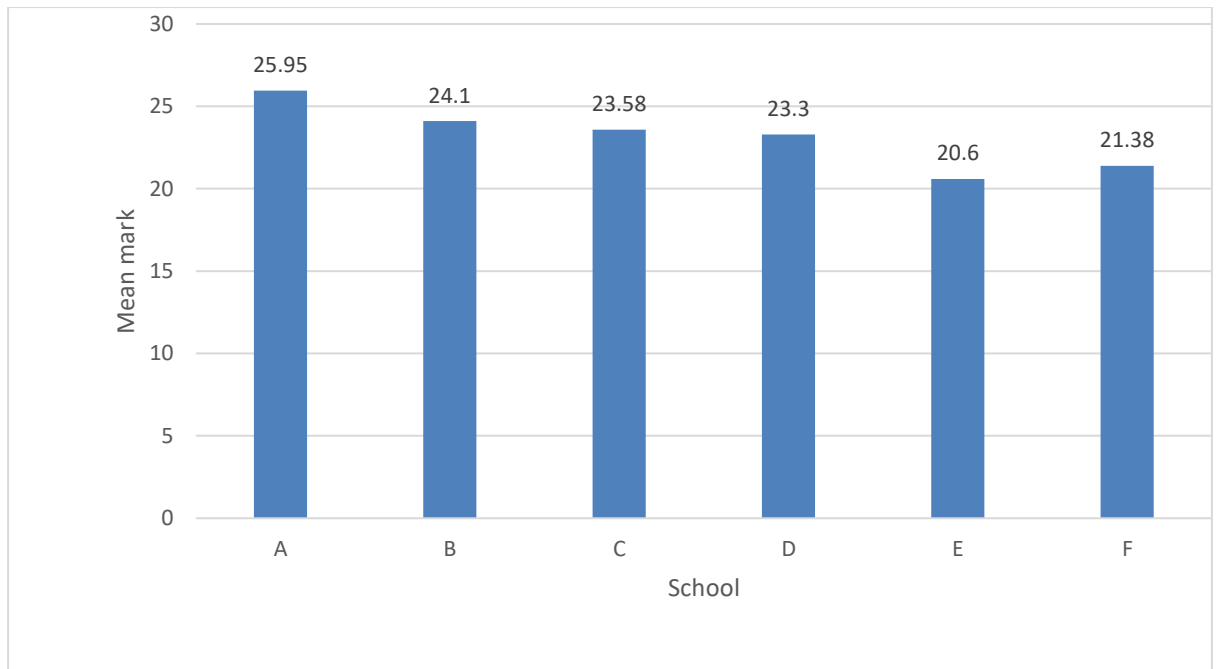
##### **4.4.1 Quality of Learning Outcomes in Biology Theory**

The quality of learning outcomes in Biology theory was determined using a Biology theory test. A total score was computed from the test which represents quality of learning outcomes in Biology. The test was marked out of 50 marks. Table 4.4 presents data of the Biology theory test.

**Table 4.4: Student's Performance in Biology**

| School              | School       | Mean         | Standard    | Min       | Max       |
|---------------------|--------------|--------------|-------------|-----------|-----------|
|                     | Category     |              | Dev         | Mark      | Mark      |
| School A            | Extra county | 25.95        | 4.55        | 18        | 35        |
| School B            | Extra county | 24.1         | 4.19        | 15        | 35        |
| School C            | County       | 23.58        | 4.70        | 15        | 34        |
| School D            | County       | 23.30        | 6.00        | 15        | 36        |
| School E            | Sub-county   | 20.60        | 5.55        | 12        | 31        |
| School F            | Sub-county   | 21.34        | 5.77        | 12        | 35        |
| <b>Overall Mean</b> |              | <b>23.15</b> | <b>5.41</b> | <b>12</b> | <b>36</b> |

The Biology theory scores show an overall mean score of 23.15. This hints that generally, the performance of students in Biology theory was below the average. This can be attributed to various factors such as poor teacher preparedness, inadequacy of the instructional resources used, learner's attitude towards the subject and poor quality of teaching. Those in county schools perform better than those in sub-county schools (See Table 4.4 & Figure 4.2). By design, the extra-county schools are more resourced in terms of human resource. In addition, extra-county schools enrol students who have higher scores in the Kenya Certificate of Primary Education (KCPE) as compared to both county and sub-county schools. Test score results based on the school category indicate that form 2 students in the extra-county schools relatively perform better than their counterparts in both county and sub-county schools.



**Figure 4.2: Form 2 Students performance in Biology Theory**

#### **4.5 Teachers' Preparedness and the Quality of Learning Outcomes in Biology Theory**

The first objective explored the effect of teacher preparedness on the quality of learning outcomes in Biology theory. To respond to this objective, teachers were asked the extent of their preparedness in the use of instructional media and its impact on the quality of learning outcomes in Biology theory. A scale of 1-5 was adopted where; **1=Always (A)**, **2=Often (O)**, **3=Sometimes (S)**, **4=Rarely (R)**, and **5=Never (N)**. Descriptive results are presented in Table 4.5.



**Table 4.5: Teachers Preparedness on the use of instructional media**

| <b>Variable</b>                                                                                                                              | <b>A</b><br><b>%</b> | <b>O</b><br><b>%</b> | <b>S</b><br><b>%</b> | <b>R</b><br><b>%</b> | <b>N</b><br><b>%</b> | <b>Mean</b> | <b>Std.</b><br><b>Deviation</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-------------|---------------------------------|
| I have attended in-service training on how to use instructional media to promote the quality of learning outcomes in Biology theory          | 16.7                 | 16.7                 | 16.7                 | 33.3                 | 16.7                 | 2.83        | 1.47                            |
| I incorporate instructional media when making lesson notes to promote the quality of learning outcomes in Biology theory.                    | 0.00                 | 0.0                  | 33.3                 | 33.3                 | 33.3                 | 2.00        | 0.89                            |
| I incorporate instructional media when preparing lesson plans to promote the quality of learning outcomes in Biology theory                  | 0.0                  | 0.0                  | 16.7                 | 33.3                 | 50.0                 | 1.67        | 0.82                            |
| I select instructional media for use in teaching Biology theory to promote the quality of learning outcomes in Biology theory                | 0.0                  | 0.0                  | 33.3                 | 50.0                 | 16.7                 | 2.17        | 0.75                            |
| I have attended teachers' workshop on how to use instructional media in teaching to enhance the quality of learning outcomes among students. | 0.0                  | 33.3                 | 33.3                 | 16.7                 | 16.7                 | 2.83        | 1.17                            |
| I prepare teaching aids to use in teaching Biology theory to enhance the quality of learning outcomes in Biology theory.                     | 0.0                  | 0.0                  | 0.0                  | 66.7                 | 33.3                 | 1.67        | .52                             |
| I incorporate instructional media when preparing schemes of work to promote the quality of learning outcomes in Biology theory.              | 0.0                  | 0.0                  | 33.3                 | 50.0                 | 16.7                 | 2.17        | 0.75                            |
| I know when to use instructional media in teaching of Biology theory to promote the quality of learning outcomes in Biology theory           | 0.0                  | 0.0                  | 0.0                  | 50.0                 | 50.0                 | 1.50        | 0.55                            |

**Mean:** Always=1.00-1.80, Often=1.81-2.60, Sometimes=2.61-3.40, Rarely=3.41-4.20, Never=4.21-5.00

The summary results show that most Biology teachers (33.3%) rarely attended in-service training on how to utilize instructional media to promote the quality of learning outcomes in Biology theory. According to findings, only 16.7% of the Biology teachers interviewed indicated that they always attend the in-service training. Concerning incorporation of instructional media, 33.3% of the teachers incorporate, 33.3% of the teachers said that they sometimes incorporate the instructional media in lesson planning. Equally important, findings show that 33.3% of Biology teachers never incorporate instructional media in lesson planning. The results further show that while 50% of the teachers interviewed rarely select instructional media to use in teaching Biology theory, 33.3% of the teachers sometimes attend workshops on how to use instructional media in teaching Biology. Results also indicate that while most Biology teachers (66.7%) interviewed rarely prepare teaching aid to use in teaching Biology, 50% of them rarely incorporate instructional media in preparing schemes of work. The findings also show that 50% of the Biology teachers do not know when to use instructional media in teaching.

Generally, these data show that Biology teachers were not well prepared on the utilization of instructional media resources. Less than average performance observed could be attributed to insufficient teacher preparedness. Preparation before teaching will enable a teacher conduct a productive and engaging lesson. Poor teacher preparedness may have resulted from resource constraints.

The findings are consistent with Ondimu (2018) who observed that preparing for teaching will enable a teacher lead to productive, engaging lessons for their students and maximize the effectiveness of their time and resources. The findings concur with those of Kimosop (2019) who underscores that poor teachers' preparedness leads to poor students' academic performance.

#### **4.5.1 Thematic Analysis on Teachers' Preparedness and The Quality of Learning Outcomes in Biology Theory**

Heads of department were also interviewed to give an in depth understanding of whether teachers in their schools were adequately trained in the use of instructional media. Qualitative interviews with heads of science departments revealed that in most of the schools surveyed, Biology teachers are not well trained on the use of instructional media due to resource constraints. When asked about the following question:

Are all teachers of Biology in your school adequately trained to use instructional media in teaching? One of the HOD respondent:

*".....some of our teachers are not sufficiently trained....the biggest challenge we have is resources.....some of the instructional media are out of date...we don't have internet...."* (HOD1, Mwala sub-county)

Findings further show that teacher preparedness is very important when it comes to classroom delivery. In addition, the HODs were probed on the influence of teacher preparedness.

How does teacher preparedness affect students' results? One HOD had this to say:

*"....when you go to class, unprepared.....the results are obvious....you can't teach well"* (HOD2, Mwala sub-county).

The study also sought to establish whether teachers incorporated instructional media in preparing schemes of work:

Do teachers of Biology incorporate instructional media when preparing schemes of work and lesson plan? The following were remarks from a HOD:

*"....Yes. To a larger extent, our teachers here incorporate instructional media in lesson planning. Teacher preparation in terms of lesson planning and teaching is very critical. Well organized teachers will always deliver in class."* (HOD05, Mwala sub-county)

Consistent with these findings is Kimosop (2019), who argues that poor teachers' preparedness leads to poor students' academic performance. The findings are also supported by Cochran & Maria (2015) who observes that a low standard of teacher preparedness affects negatively the performance of students in school activities mostly in rural areas. Similarly, Duncan (2009), agrees that teacher preparedness in Europe is affiliated with getting what can make them to increase the teaching experience for all beginner teachers.

#### **4.6 Type of Instructional Resource Used and The Quality of Learning Outcomes in Biology Theory**

The second objective sought to assess the type of instructional resources used and the quality of learning outcomes in Biology theory. Teachers were asked to give their opinion on various constructs related to the type of instructional media use and quality of learning outcomes in Biology. A scale of 1-5 was adopted where; **1=Always (A), 2=Often (O), 3=Sometimes (S), 4=Rarely (R), and 5=Never (N)**. Table 4.6 displays summary statistics.

**Table 4.6: Types of Instructional Media in Biology Theory**

| Variable                                                                                                       | A    | O    | S    | R    | N    | Mean | Std.      |
|----------------------------------------------------------------------------------------------------------------|------|------|------|------|------|------|-----------|
|                                                                                                                | %    | %    | %    | %    | %    |      | Deviation |
| I use audio cassettes in teaching of Biology theory to promote academic performance in Biology theory          | 16.7 | 50.0 | 16.7 | 16.7 | 16.7 | 3.17 | 1.33      |
| I use videos in teaching of Biology theory to enhance the quality of learning outcomes in Biology theory       | 0.0  | 0.0  | 0.0  | 50.0 | 50.0 | 4.00 | 1.09      |
| I use charts in teaching of Biology theory to enhance academic achievement in Biology theory                   | 0.0  | 0.0  | 0.0  | 66.7 | 33.3 | 4.33 | .52       |
| I use real objects in teaching of Biology theory to promote the quality of learning outcomes in Biology theory | 0.0  | 0.0  | 0.0  | 50.0 | 50.0 | 4.50 | .55       |
| I use photographs in teaching of Biology theory to enhance the quality of learning outcomes in Biology theory  | 0.0  | 0.0  | 33.3 | 33.3 | 33.3 | 4.00 | .89       |
| I use computers in teaching of Biology theory to improve academic achievement in Biology theory                | 0.0  | 0.0  | 33.3 | 16.7 | 50.0 | 3.16 | .98       |
| I use a projector in teaching of Biology theory to promote academic performance in Biology                     | 16.7 | 16.7 | 16.7 | 33.3 | 16.7 | 3.16 | 1.47      |
| I use text books in teaching of Biology theory to promote the quality of learning outcomes in Biology theory   | 0.0  | 0.0  | 16.7 | 16.7 | 66.7 | 4.16 | 1.60      |
| <b>Mean:</b> Always=1.00-1.80, Often=1.81-2.60, Sometimes=2.61-3.40, Rarely=3.41-4.20, Never=4.21, 5.00        |      |      |      |      |      |      |           |

Statistics demonstrate that most Biology teachers (50%) use audio cassettes in teaching of Biology. When it comes to the use of videos in teaching, half of the teacher rarely use them and most of the teachers surveyed (66.7%) use charts on a rare basis, while 33.3% never utilize charts. The study has also found out that while 50% of the Biology

teachers hardly use real objects in teaching Biology theory, another half of them, never utilize these resources in teaching Biology. The study further indicates that 33.3% of the teachers sometimes use photographs in teaching Biology, the rest either rarely uses (33.3%) the photographs or never utilizes them (33.3%).

Concerning computers, the study has found out that half of the teachers don't use the computers in teaching Biology while only 33.3% of them indicated that they sometimes utilize them. The study further establishes that only 16.7% of the Biology teachers use a projector in teaching Biology, while 66.7% of the teachers often use text books in teaching Biology theory to enhance the quality of learning outcomes in Biology.

Generally, these findings point to low utilization of instructional media in teaching Biology in the surveyed schools. Apart from the use of audio cassettes at 50%, utilization of other instructional media was below average. This could be attributed to lack of technical know-how among teachers, unavailability of these media, resource constraints and poor teacher supervision. The low scores in Biology theory can be attributed to these challenges.

These findings are supported by Manurung (2017) who found out that the type of instructional media used in teaching determine to a greater extent the learning outcomes. Similarly, Berkeley (2011) agrees that rational selection of instructional materials in teaching is a necessary step for effective teaching. He further adds that the ability to select and utilize methods and materials are important qualities of a professional teacher.

#### **4.6.1 Thematic Findings on Types of Instructional Resource Use and the Quality of Learning Outcomes in Biology Theory**

The researcher also interviewed the heads of science department to determine the types of instructional resources used and quality of learning outcomes in Biology theory.

Qualitative interviews with HOD for science department have revealed various types of instructional resources available to the teachers of Biology while also demonstrating various reasons which could be attributed to low use of instructional media in teaching. These includes fear of technology use among some teachers, lack of resources and insufficient training.

For example, a question was posed to the HODs:

What types of instructional resources are available for use by teachers of Biology theory in this institution? One HOD indicated that:

*In this school..... mostly we use locally made materials such as charts and photographs to certain extent.” (HOD1, Mwala sub-county).*

Another HOD revealed:

*“In this school we use radios...but the challenge is interruption in electricity supply.”*

On the question of challenges encountered, HODs were asked:

What challenges do u face in the use of instructional resources in the teaching of Biology theory in this school? HODs indicated:

*“....Besides lack of some of these media.....some of our teachers have no technical knowhow...” (HOD3, Mwala sub-county).*

In other interviews, HODs argued that instructional resource use improves that learning outcomes by making learning more practical and opposed to theoretical. For instance, a HOD claimed that:

*“...students love when you demonstrate to them using instructional media resources.” (HOD6, Mwala sub-county).*

In another interview, the HOD revealed:

*“....instructional resources determine to some extent the performance of students....especially with science subjects, these media are very critical in teaching.” (HOD05)*

These results in line with previous studies which have indicated that instructional media can be utilized to enhance teaching and learning process(Muraina, 2015). Furthermore, Manurung (2017) agrees that the type of instructional materials used in teaching determine to a greater extent the learning outcomes. Gravelle (2022) is in support of these finding as he averrers that instructional materials hold the power to either motivate or demotivate students as they ease and promote the teaching process.

#### **4.7 Students' Attitude and the Quality of Learning Outcomes in Biology Theory**

The third objective was to investigate the influence of students' attitude on the quality of learning outcomes in Biology theory. To achieve this objective, form 2 students were asked to rate their level of agreement on various statements related to students' attitude and their performance in Biology. The responses were assessed on a scale of 1-5, where; **1=Strongly Disagree (SD), 2=Disagree (D), 3=Not Sure (NS), 4=Agree (A), 5=Strongly Agree (SA)**. Summary findings are presented in Table 4.7.



**Table 4.7: Students' Attitude towards Instructional Media Use**

| Variable                                                                                               | SD   | D    | NS   | A    | SA   | Mean   | Std.      |
|--------------------------------------------------------------------------------------------------------|------|------|------|------|------|--------|-----------|
|                                                                                                        | %    | %    | %    | %    | %    |        | Deviation |
| I really like when I am taught Biology theory using instructional media.                               | 0.0  | 7.5  | 41.3 | 38.8 | 12.5 | 4.06   | .985      |
| Biology theory is enjoyable when taught using instructional media subject.                             | 2.5  | 10.0 | 6.3  | 43.8 | 37.5 | 4.04   | 1.037     |
| I have a good feeling towards Biology theory                                                           | 2.5  | 10.0 | 16.3 | 30.0 | 41.3 | 3.98   | 1.102     |
| I enjoy Biology theory classes more when the teacher incorporates instructional media during teaching. | 7.5  | 13.8 | 8.8  | 40.0 | 30.0 | 3.71   | 1.245     |
| Use of instructional media will make me a better Biologist in future.                                  | 1.3  | 12.5 | 15.0 | 40.0 | 31.3 | 3.88   | 1.036     |
| I look forward to being taught Biology theory using instructional media.                               | 43.8 | 21.3 | 12.5 | 8.8  | 13.8 | 2.2785 | 1.45828   |
| <b>Mean:</b> SD=1.00-1.80, D=1.81-2.60, NS=2.61-3.40, A=3.41-4.20, SA=4.21-5.00                        |      |      |      |      |      |        |           |

The data indicate that most form 2 students (41.3%) were not sure whether they like when they are taught Biology theory using instructional media. However, 38.8% of the students agreed to this argument. Most students agreed with the view that Biology theory is enjoyable when taught using instructional media (43.8%), and 37.5% strongly agreed with the same argument. Similarly, the study has established that most students agreed to the assertion that they enjoy Biology classes more when instructional media are incorporated in teaching (40%), and use of instructional media will make them better Biologist in future (40%). However, most students strongly disagreed with the argument that they look forward to being taught Biology theory using instructional media. These findings imply that the use of instructional media inspires Biology

students and generates positive feelings among them. This is likely to enhance their attitude towards the subject and improve their scores.

The findings agree with those of Şen (2013) who indicated that attitudes towards learning are important factors in the learners' levels of goal setting, problem-solving abilities, and their beliefs towards learning, their inner and external motivations in the process of learning, and all the academic performances they perform. Similarly, Ahmed (2021) observed that positive attitude leads to good learning outcomes among students.

#### **4.7.1 Thematic Findings on Students Attitude and the Quality of Learning Outcomes in Biology Theory**

The researcher also interviewed the heads of science department to on the attitude of the students and quality of learning outcomes in Biology theory. Interviews with HOD in charge of science department reveals that use of instructional media influences learners' attitude towards Biology. HODs were asked the question:

Do you think students' attitude towards instructional media affects the quality of learning outcomes in Biology theory? The following were responses from the HODs:

*“.....Instructional media impacts students positively which makes it easy to understand Biology”* (HOD4, Mwala sub-county).

In another interview, the HODs were asked:

Does the use of instructional media in teaching impact on students' attitude?

The following responses were given:

*“...instructional media makes learners to visualize concepts and make Biology easier.”* (HOD6, Mwala sub-county).

Yet, another HOD revealed:

*“...attitude towards instructions is very crucial for learners regardless of the type of media used.”* (HOD1, Mwala sub-county).

The findings concur with those of Şen (2013) who established that a positive attitude activates the thinking, feeling, and reacting components of an individual which helps to improve students' performance. In addition, Yaziz & Rahman, (2015) observed that most students had a positive attitude towards Mathematics and that they perceived Mathematics as doable, learnable, and important yet this did not translate to good grades. The findings are also in line with Judi, (2011) who revealed that negative attitude makes students feel not to undertake the course.

#### **4.8 Students' Self-concept and the Quality of Learning Outcomes in Biology theory**

The fourth objective of the study explored the effect of students' self-concept on the quality of learning outcomes in Biology theory in public secondary schools in Mwala Sub- County.

Students were asked to rate their level of agreement on various statements related self-concept and performance in Biology using a scale of 1-5, where; **1=Strongly Disagree (SD), 2=Disagree (D), 3=Not Sure (NS), 4=Agree (A), 5=Strongly Agree (SA).** Findings are presented in Table 4.8.

**Table 4.8: Students' Self-Concept**

| Variable                                                                                  | SD   | D    | NS   | A    | SA   | Mean   | Std.      |
|-------------------------------------------------------------------------------------------|------|------|------|------|------|--------|-----------|
|                                                                                           | %    | %    | %    | %    | %    |        | Deviation |
| The use of instructional media enhances the way I see myself.                             | 7.5  | 11.3 | 11.3 | 36.3 | 33.8 | 3.78   | 1.242     |
| The use of instructional resources provides a good learning environment for me.           | 3.8  | 2.5  | 8.8  | 41.3 | 43.8 | 4.19   | .969      |
| I perform well in Biology theory because i believe in my ability.                         | 5.0  | 6.3  | 10.0 | 22.5 | 56.3 | 4.19   | 1.159     |
| The use of instructional media stimulates me to come up with new ideas in Biology theory. | 5.0  | 6.3  | 13.8 | 41.3 | 33.8 | 3.93   | 1.088     |
| I Learn Biology when I am actively involved in finding out new concepts.                  | 5.0  | 12.5 | 18.8 | 36.3 | 27.5 | 3.6875 | 1.15390   |
| Use of instructional media in class builds my confidence.                                 | 6.3  | 15.0 | 15.0 | 25.0 | 38.8 | 3.75   | 1.288     |
| Teachers` responses in class affect my participation.                                     | 23.8 | 22.5 | 12.5 | 20.0 | 21.3 | 2.93   | 1.499     |

**Mean:** SD=1.00-1.80, D=1.81-2.60, NS=2.61-3.40, A=3.41-4.20, SA=4.21-5.00

According to the data, most students agreed (36.3%) and strongly agreed (33.8%) respectively that use of instructional media enhances the way they see themselves, while simple majority of the students (43.8%) strongly agreed that instructional media provided a good learning environment. Most students surveyed agreed that the use of instructional media stimulate them to come up with new ideas in Biology theory (41.3%), others agreed that they learn Biology when they are actively involved in finding out new concepts (36.3%). Furthermore, most students strongly agreed with the argument that the use of instructional media builds their confidence (38.8%) but,

strongly disagreed that teachers' responses in class affect their participation. Generally, these findings show that students self-concept is critical towards the learning outcomes. Students with positive attitude towards Biology do well in Biology while those with negative have low self-esteem which leads to failure.

These findings are consistent with previous literature. For example, Green et al., (2006) agrees that positive self-concept is an extremely important goal for educational programs to promote positive outcomes in learning. The increase in utilization of instructional media during teaching and learning develops students' critical thinking and self-concept because it involves multiple activities. In addition, these findings are supported by Eccles (2005) who established that self-concept which is formed and regulated as one grows up is very crucial for the achievement of one's mission in all facets of life.

#### **4.8.1 Thematic Findings on Students Self-Concept and the Quality of Learning Outcomes in Biology Theory**

The researcher also interviewed heads of science department to assess students' self-concept and the quality of learning outcomes. Qualitative interview showed that students' self-concept determines to a great extent the performance of learners in academic institutions. Most HODs interviewed argued that having positive self-concept leads to positive results. The following question was posed to the HODs:

In your opinion, do you think students' self-esteem influences the quality of learning outcomes in Biology theory?

The responses were:

*“...self-concept means believing in oneself....which is a positive thing to have as student.”* (HOD3, Mwala sub-county).

In addition, the study has shown that student's self-concept during their academic life leads to higher learning outcomes.

*".....students with self-belief tend to perform better.....you know, positive will always attract what is positive." (HOD5, Mwala sub-county).*

In your opinion, does the use of instructional materials impact on student's self-identity?

*"...having a positive self-image improves ones physical, social, emotional and spiritual well-being, an important aspect in the achievement of whatever nature." (HOD4, Mwala sub-county).*

Previous evidence indicates that self-concept is one of the factors that has most influence on students learning ability. This is in line with OECD (2003) who found out that students who feel themselves more confident in a certain topic or in a certain course will get better results than those who feel less confident. In addition, the findings are supported by Dulay (2017) who established that academic self-concept is one of the most important variables that motivated students, and it is an important factor for improving achievement. This study revealed that self-concept had a medium-level positive effect on student achievement. These findings agree with Omolade (2021) who averred that students and people in general often form their self-concept from past experience of success or failure which determine their future.

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSION AND RECOMMENDATIONS**

#### **5.1 Introduction**

This chapter presents summary of the study findings as explained in the previous chapter. Conclusions are also documented as well as key policy recommendations. The chapter also highlights areas for further study.

#### **5.2 Summary**

This study sought to investigate the influence of the utilization of instructional media and the quality of learning outcomes in Biology theory in public secondary schools in Mwala sub-county, Kenya. Mixed method approach was employed in this study with the aid of descriptive survey design. The study targeted 6 public secondary schools from Mwala sub-county comprising of extra-county (2), county (2) and sub-county schools(2).

Data was collected from 240 form 2 students, 6 teachers of Biology, and 6 heads of science departments, one from each school. The study achieved 100% response rate from all the participants. Quantitative data was analysed descriptively using percentages, means and standard deviations while, qualitative data was analysed thematically and presented in narrative form.

Background characteristics of the participants indicate that only 1 teacher of Biology out of 6 interviewed was a female. Similar findings were observed with respect to heads of science departments in the surveyed schools. This imply that most Biology teachers in public secondary schools in Mwala sub-county are male. Concerning their age, most teachers were aged 36-40 years (50%), followed by those aged 25-30 years (33.3%),

while 1 out of 6 teachers was aged 31-35 years. These means that most Biology teachers in Mwala sub-county are of youthful ages. The study established that all Biology teachers had a university degree, implying, they all have pre-requisite qualifications of a secondary school teacher.

With reference to the students' scores in Biology theory, the study established an overall mean score of 23.15 which is below the average. Various factors were attributed to this performance. They included poor teacher preparedness, inadequacy of the instructional media used, students' attitude towards the subject and poor quality of teaching. Students from extra-county schools tend to perform better than their counterparts in county and sub-county schools.

#### **5.2.1 Teachers' Preparedness and Quality of Learning Outcomes in Biology Theory**

Objective one of the studies determined the effect of teacher preparedness on the quality of learning outcomes in Biology theory. Findings show that Biology teachers were not well prepared on the use of instructional media resources. This could be the reason for poor scores reported in the Biology test. Poor teacher preparation may have resulted from resource constraints. Complementing these results are qualitative interviews which revealed that teachers were not well trained on the use of instructional media due to resource constraints. Other studies too established that poor teacher preparedness could lead to poor academic performance (Kimosop, 2019; Cochran & Maria, 2015).

#### **5.2.2 Types of Instructional Media Used and Quality of Learning Outcomes in Biology Theory**

The second objective sought to assess the type of instructional resources used and the quality of learning outcomes in Biology theory. The study demonstrates that 50% of the teachers use videos cassettes in teaching, half of the teachers hardly utilized them and



most of the teachers surveyed (66.7%) use charts rarely, while 33.3% never use the charts. The study determined that while 50% of the Biology teachers hardly use real objects in teaching Biology theory, another half of them, never use these materials in teaching Biology. The study further shows that 33.3% of the teachers sometimes use photographs in teaching Biology, the rest either hardly utilize (33.3%) the photographs or never use them (33.3%). The findings imply low utilization of instructional media in the teaching of Biology Theory. This has been attributed to insufficient technical know-how among teachers, unavailability of these resources, and resource constraints. This might have led to poor performance in the students' scores in Biology. This is in line with other studies for instance; Manurung (2017) agrees that the learning outcomes can be influenced to a greater extent by the type of instructional materials used in teaching. Similarly, Berkeley (2011) agrees that it is necessary to rationally select instructional materials for effective teaching and learning.

### **5.2.3 Learner's Attitude and Quality of Learning Outcomes in Biology Theory**

On the third objective on determining the influence of students' attitude on the quality of learning outcomes in Biology theory. Summary results indicate that the use of instructional media in teaching Biology inspires students who later develops positive attitude towards the subject, resulting into better performance. For example, most students who were surveyed agreed with the view that Biology theory is enjoyable when taught using instructional media. Use of instructional media could enhance students' attitude towards the subject and improve their scores. These findings are supported by previous studies. For example, Şen (2013) agrees that a positive attitude activates the thinking, feeling, and reacting components of an individual which helps to improve students' performance, Judi, (2011) argues that negative attitude makes students not to undertake the course.

#### **5.2.4 Students' Self-concept and Quality of Learning Outcomes in Biology**

##### **Theory**

The fourth objective of the study explored the effect of students' self-concept on the quality of learning outcomes in Biology theory. Results indicate that utilization of instructional media boosts students' self-esteem which translate to positive learning attitude. Most form 2 students who were surveyed strongly agreed that instructional media provided a good learning environment for students. In addition, most students agreed that the use of instructional media stimulate them to come up with new ideas, others agreed that they learn Biology well when they are actively involved in finding out new concepts. These results imply that student's self-concept is critical towards the learning outcomes. This is in line with Green et al., (2006) who argues that positive self-concept is an extremely important goal for educational programs to promote positive outcomes in learning. The increase in use of instructional media during teaching and learning develops learners' critical thinking and self-concept because it involves multiple activities.

#### **5.3 Conclusions**

Following the summary discussions of the findings, various conclusions are drawn. First, the study concludes that teaching Biology is a male dominated field among public secondary schools in Mwala sub-county, Machakos County. Secondly, the study concludes that students in extra-county schools perform better than their counterparts in county and sub-county schools.

Thirdly, the study concludes that teachers of Biology in Mwala sub-county public secondary schools are not well prepared to use instructional media in teaching Biology theory. Nevertheless, findings have demonstrated that teacher preparedness leads to better learning outcomes.

Fourthly, the study has illustrated that public secondary schools in Mwala sub-county have insufficient instructional media despite having a positive influence on students' performance. The study also concludes that both students' attitude and self-concept motivate students to learn, and this has a positive influence on learning outcomes.

#### **5.4 Recommendations**

The following recommendations are made:

1. The teachers should be exposed to many Inservice training workshops to sensitize them on the use of instructional media.
2. School principals should emphasize and supervise the availability and use of instructional media in the teaching of biology in their schools.
3. The Ministry of Education should enhance programmes on the use of instructional media with improved funding in public secondary schools.
4. There is need for KICD to run programmes on the use of instructional media and incorporate use of ICT in the curriculum during its development.

#### **5.5 Suggestion for Further Study**

Further studies are recommended in the following areas:

1. The utilization of instructional media in other topic areas of Biology.
2. The utilization of instructional media in other science subjects.
3. The utilization of instructional media in other sub-counties.

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## APPENDICES

### Appendix I: Letter Of Introduction

CHRISTOPHER MBATHA KING'OLA,

P.O BOX 17922 00500,

NAIROBI.

Dear Respondent,

#### **RE: PERMISSION TO CARRY OUT RESEARCH**

I am a post-graduate student at the Machakos University, pursuing Masters of Education in the Department of Educational Communication and Technology & ECE. I am undertaking research on the **Utilization of Instructional Media and quality of learning outcomes in Biology theory in public secondary schools in Mwala Sub-County**. To achieve this, your school has been sampled for the study and you have been selected to participate in this study as a respondent. I am seeking for permission to collect data from you, by responding to the questionnaires and interview schedules. Any information you give will be confidential and will be utilized for academic purpose only. Please respond to the questions as truthfully as possible.

Thank you in advance,

Yours faithfully,

CHRISTOPHER MBATHA KING'OLA

Tel. 0708048643



## **Appendix II: Questionnaire For Teachers Of Biology**

Data collected will be purely for academic purposes. The study seeks to investigate the utilization of instructional media and the quality of learning outcomes in public secondary schools in Biology theory in Mwala sub-county. Please participate by providing any valuable information. Do not write your name on the questionnaire. Answer all questions as indicated by either filling the blank or ticking the option that applies.

### **SECTION A: General Information of Respondent. Please Indicate.**

1) Your gender (please tick)

Male ( )

Female ( )

2) Age

i. 24 years and below ( )

ii. 25-30 years ( )

iii. 31-35 years ( )

iv. 36-40 years ( )

v. Over 40 years ( )

3) Highest level of education and training attained

Diploma ( )

Degree ( )

Masters ( )

4) If any other, please specify

.....

.....

.....

### **SECTION B: Teachers Preparedness and the Use of Instructional Media**

The purpose of this part of the questionnaire is to find out how prepared you are on the use of instructional media in teaching Biology theory. Give your honest responses to these questions as confidentiality will be up held.

Please put a tick (✓) once in the Likert scale below.

**Key: (A) - Always, (O) - Often, (S) - Sometimes, (R) - Rarely, (N) - Never**

| S/N | Questionnaire items                                                                                             | A | O | S | R | N |
|-----|-----------------------------------------------------------------------------------------------------------------|---|---|---|---|---|
| 1   | I have the knowhow on the use instructional media to enhance the quality of learning outcomes in Biology theory |   |   |   |   |   |
| 2   | I make lesson note by incorporate instructional media to stimulate learning among Biology theory students.      |   |   |   |   |   |
| 3   | I prepare lesson plans using instructional media to enhance the quality of learning outcomes in Biology theory  |   |   |   |   |   |
| 4   | I select instructional media for use in teaching Biology theory to stimulate learning amongst students.         |   |   |   |   |   |

|   |                                                                                                                            |  |  |  |  |  |
|---|----------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| 5 | I have attended teachers' workshop on the utilization of media in teaching to enhance academic achievements among learners |  |  |  |  |  |
| 6 | I prepare aids to use in teaching Biology theory to promote students' performance in exams.                                |  |  |  |  |  |
| 7 | I incorporate instructional media when preparing schemes of work to enhance better performance in Biology theory           |  |  |  |  |  |

### SECTION C: Types of Instructional Resources in Biology Theory

This section of the questionnaire aims at establishing the types of instructional resources that you use in teaching Biology theory. Respond by ticking (✓) in the box provided against the statement.

**Key: (A) - Always, (O) - Often, (S) - Sometimes, (R) - Rarely, (N) – Never**

| S/N | Questionnaire items                                                                                              | A | O | S | R | N |
|-----|------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|
| 1   | I use audio cassettes in delivering content on Biology theory to facilitate                                      |   |   |   |   |   |
| 2   | I utilize videos in teaching of Biology theory to encourage more learning among learners                         |   |   |   |   |   |
| 3   | I make use of charts in teaching of Biology theory to improve students' performance                              |   |   |   |   |   |
| 4   | I utilize realia in teaching of Biology theory to enhance learning in class.                                     |   |   |   |   |   |
| 5   | I use photographs in presenting information on Biology theory to enhance the quality of learning among students  |   |   |   |   |   |
| 6   | I use computers when instructing biology students to improve academic achievement in Biology                     |   |   |   |   |   |
| 7   | I use a projector while teaching to promote learning in Biology theory.                                          |   |   |   |   |   |
| 8   | I utilize text books in teaching of Biology theory to enhance the ease of interaction between me and my students |   |   |   |   |   |

### Appendix III: Questionnaire For Students

#### SECTION A: Students` Attitude Towards Instructional Media Use

Indicate on the statement that you most agree with about your attitude towards the use of instructional media in teaching and learning Biology theory. Indicate in the spaces provided.

**Key: (SA)-Strongly Agree, (A)- Agree, (NS)- Not sure, (D)- Disagree, (SD)- Strongly Disagree**

| S/N | Questionnaire items                                                                                    | SA | A | NS | D | SD |
|-----|--------------------------------------------------------------------------------------------------------|----|---|----|---|----|
| 1   | I really like when I am taught Biology theory using instructional media.                               |    |   |    |   |    |
| 2   | Biology theory is enjoyable when taught using instructional media subject.                             |    |   |    |   |    |
| 3   | I have a good feeling towards Biology theory                                                           |    |   |    |   |    |
| 4   | I enjoy Biology theory classes more when the teacher incorporates instructional media during teaching. |    |   |    |   |    |
| 5   | Use of instructional media will make me a better Biologist in future.                                  |    |   |    |   |    |
| 6   | I look forward to being taught Biology theory using instructional media.                               |    |   |    |   |    |

## SECTION B: Students' Self-Concept

This is not a test and there are no correct or wrong answers. The purpose of the questionnaire is to get your opinion on your self-concept. It is important that you give your honest view. Read the items carefully in order to understand before your choice.

Tick (✓) one response for each item.

**Key: (SA)-Strongly Agree, (A)- Agree, (NS)- Not sure, (D)- Disagree, (SD)- Strongly Disagree**

| S/N | Questionnaire items                                                                       | SA | A | NS | D | SD |
|-----|-------------------------------------------------------------------------------------------|----|---|----|---|----|
|     | <b>Self- image</b>                                                                        |    |   |    |   |    |
| 1   | The use of instructional media enhances the way I see myself.                             |    |   |    |   |    |
| 2   | The use of instructional resources provides a good learning environment for me.           |    |   |    |   |    |
|     | <b>Self- Identity</b>                                                                     |    |   |    |   |    |
| 3   | I perform well in Biology theory because I believe in my ability.                         |    |   |    |   |    |
| 4   | The use of instructional media stimulates me to come up with new ideas in Biology theory. |    |   |    |   |    |
| 5   | I Learn Biology when I am actively involved in finding out new concepts.                  |    |   |    |   |    |
|     | <b>Self Esteem</b>                                                                        |    |   |    |   |    |

|   |                                                                                                  |  |  |  |  |  |
|---|--------------------------------------------------------------------------------------------------|--|--|--|--|--|
| 6 | I enjoy Biology lessons most when instructional media are incorporated in teaching and learning. |  |  |  |  |  |
| 7 | Use of instructional media in class builds my confidence.                                        |  |  |  |  |  |
| 8 | Teachers' responses in class affect my participation.                                            |  |  |  |  |  |

**THANKS FOR YOUR RESPONSES.**

## **Appendix IV: Interview Schedule For The Head Of Science Department**

The aim of this interview schedule is to collect information on the utilization of instructional media and is meant for academic purpose. Give your responses honestly. The researcher will ensure the information is handled Confidentially.

### **SECTION A: Demographic Information.**

1. Gender?

Male [ ]      Female [ ]

2. School

category.....

### **SECTIONB: Teachers' Preparedness in the Use of Instructional Media and Quality of Learning Outcomes in Biology Theory**

1. Do you have trained teachers on the utilization of instructional media in teaching in this institution?

.....

.....

.....

.....

.....



2. When preparing schemes of work and lesson plan do teachers of Biology incorporate instructional media?

.....

.....

**SECTION C: Types of Instructional Resources Used and Quality of Learning Outcomes in Biology Theory**

1. Which instructional resources are available to teachers of Biology theory in your institution?

.....

.....

2. What challenges do you encounter while using instructional resources in the teaching of Biology theory in this school?

.....

3. Give some if there is

.....

.....

.....

#### **SECTION D: Students' Attitude and the Quality of Learning Outcomes**

1. In your opinion, do you think students' attitude towards instructional media affects the quality of learning outcomes in Biology theory?

.....  
.....

explain

.....

2. Does the use of instructional media in class has an impact on students' attitude?

.....

#### **SECTION E: Students' Self-Concept and the Quality of learning Outcomes**

1. According to you, do you think students' self-esteem influences the quality of learning outcomes in Biology theory?

.....

Explain

.....

2. Does the use in of instructional materials in class impact on student's self-identity?

.....

**THANKS FOR YOUR RESPONSES.**

## Appendix V: Biology Theory Test For Students

Name of candidate: \_\_\_\_\_

School category: (Tick where necessary) Extra-county ( ) county ( ) sub-county ( )

Gender Male ( )

Female ( )

Duration (40 minutes)

### Answer all questions.

1. Define the terms (2mks)
  - a. Excretion
  - b. Homeostasis
2. Give reasons why plants lack complex excretory organs? (4mks)
3. Explain the processes of excretion in plants? (6mks)
4. State the Economic importance of plant excretory products. (5mks)
5. State the two main methods of excretion in unicellular organisms(2mks)
6. Define the term positive feedback and negative feedback. (4mks)
7. Explain the processes involved in homeostasis. (8mks)
8. Explain the osmoregulatory changes that would take place in marine amoeba if it was transferred to a fresh water environment. (2mks)
9. Explain how marine fish regulates its osmotic pressure. (5mks)
10. Describe the adaptations of the skin to its functions. (6mks)
11. Why is the nephron long and coiled? (2mks)

## **Appendix VI: Marking Scheme**

### **BIOLOGY THEORY TEST (50MKS)**

1. a. is the process by which living organisms separate and remove/eliminate metabolic waste products from the body cells.

b. Homeostasis is the maintenance of internal conditions constant despite changes in the external environment.

2 Plant metabolic activities are few and produce/ release metabolic wastes slowly.

Plants produce fewer toxic wastes because they mainly break down carbohydrates to produce carbon (IV) oxide and water.

Some excretory products are reutilized within the plant body e.g., carbon (IV) oxide and water are used for photosynthesis and some oxygen used for respiration

Most products are converted into non-toxic/ harmless form/ products.

Plants wastes are stored in temporary structures in less toxic form which then fall off e.g. leaves, flowers, fruits and the bark.

3. Transpiration excreted in form of water vapour through the stomata/lenticels.

Diffusion- carbon (IV) oxide (from respiration) and oxygen (from photosynthesis) are eliminated through diffusion through lenticels, cuticle and stomata.

Deposition/storage in non-toxic form- some wastes (e.g. calcium oxalate, caffeine, nicotine and quinine) are stored in tissues (e.g. leaves, fruits, flowers, bark) in non-toxic form.

Tissue/organ fall- plants store some of their wastes in flowers, fruits, seeds, old leaves and the bark and when these organs fall off from the plants, the wastes are eliminated.

Exudation- some wastes (e.g. latex, salts, gum, calcium pectate, resins) are excreted in semi-solid form. Guttation- excess water is excreted in form of droplets through hydathodes.

4. Caffeine- it is stored in coffee berries and tea leaves. } It is used as a mild stimulant mental activity and reduces fatigue).

Quinine- it is stored in the bark of cinchona tree and aloe leaves. } It is used for treatment of malaria.

Cocaine- it is obtained from the leaves of coca plant. } It is used as a local anaesthesia/ pain killer.

Cannabis- it is stored in fruits, flowers and leaves of bhang (*Cannabis sativa*) } Used to treat cancer. It is a pain killer.

Nicotine- it is found in leaves of tobacco plants. It is used to manufacture insecticides and 7) narcotic drugs.

Rubber- it is made from latex of rubber plant. } It is used in shoe industry. } It is used to manufacture chewing gums

5. Mechanism of excretion through diffusion.

Carbon (IV) oxide and ammonia gases are in higher concentration in the cytoplasm than surrounding water hence they diffuse out across the cell membrane into the surrounding water where their concentration is low.

Use of contractile vacuole. } It is used to excrete excess water and dissolved chemicals (used for osmoregulation). } Excess water and dissolved chemicals accumulate in the contractile vacuole. After reaching the maximum size, a

contractile vacuole moves to cell surface and bursts releasing the wastes to the surrounding. } Soon afterwards, other contractile vacuoles form in the cytoplasm, accumulate more wastes and the process continues.

#### 6. Negative feedback

Corrective measure /action taken to restore the condition back to normal. Such action is either: An increase in the level (e.g. temperature) back to normal if it was dropping.

A decrease in the level (e.g. temperature) back to normal if it was rising.

Positive feedback- a change below or above the normal is not corrected leading to further rise or drop in the condition from the normal.

#### 7. Osmoregulation/salt and water balance.

This is the process by which the osmotic pressure of blood, protoplasm and tissue fluids is kept constant. } Osmoregulation helps to maintain optimum osmotic pressure in the body tissues and fluids for proper functioning of the cells. } For example, if the osmotic pressure of tissue fluid falls below that of cells, the cells will take in water by osmosis, swell and may burst (haemolyse). If the osmotic pressure of tissue fluid is higher than that of cells, the cells will lose water through osmosis and shrink.

Thermoregulation. It refers to regulation of body temperature/ maintenance of body temperature constant. Body enzymes work best under a narrow range of temperature. Very high temperature/ above optimum denature/destroy enzymes, while very low/below optimum inactivates the enzyme.

Regulation of ionic content- it involves regulation of body ions (e.g. sodium ions, chloride ions, calcium ions, phosphate ions) within their optimum concentration

Blood sugar/glucose regulation. {Low blood glucose level leads to low rate of respiration as glucose is the main substrate in respiration hence less energy available to the body. } High blood glucose level results in an increase in the osmotic pressure of tissue fluid. This causes the cells to lose water through osmosis leading to crenation.

8. More water will enter the amoeba through osmosis and more contractile vacuoles are formed to excrete more/ excess water.
9. It swallows plenty/ a lot of water to increase the amount of water in the body. It has chloride secretory cells in the gills to remove excess salts. It eliminates nitrogenous wastes in form of Trimethylamine oxide which requires less water for excretion/ elimination. It has small and few glomeruli thus slowing down filtration rate in the kidneys.
10. The cornified layer is made of dead cells; which protects the body against physical/mechanical injury/ damage; prevents entry of pathogens and poisonous chemicals;  
  
The sebaceous gland produces an oily secretion /sebum; that protects the skin against invasion by micro-organisms (acts as antiseptic).  
  
Malpighian layer contains melanin; which protects the body against harmful ultra-violet rays.
11. To occupy less space in the kidney, to increase surface area for selective reabsorption and allow more time for selective reabsorption.

## Appendix VII: Work Plan

| Time<br>Activity                                                    | May-<br>June,<br>2023 | June-<br>August<br>, 2023 | Septemb<br>er, 2023 | January<br>,2023 | Februar<br>y, 2024 | March -<br>April,<br>2024. | May,<br>2024. |
|---------------------------------------------------------------------|-----------------------|---------------------------|---------------------|------------------|--------------------|----------------------------|---------------|
| Problem<br>identification<br>and review of<br>related<br>literature |                       |                           |                     |                  |                    |                            |               |
| Proposal write<br>up                                                |                       |                           |                     |                  |                    |                            |               |
| Submission of<br>proposal to the<br>department for<br>defense       |                       |                           |                     |                  |                    |                            |               |
| Data<br>Collection                                                  |                       |                           |                     |                  |                    |                            |               |
| Data analysis<br>and Project<br>draft                               |                       |                           |                     |                  |                    |                            |               |
| Examination of<br>the Project                                       |                       |                           |                     |                  |                    |                            |               |
| Graduation                                                          |                       |                           |                     |                  |                    |                            |               |



## Appendix VIII: Research Authorization By Machakos University



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

Telephone: 254-(0)735247939, (0)723805929  
Email: [graduateschool@mksu.ac.ke](mailto:graduateschool@mksu.ac.ke)  
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P.O Box 136-90100  
Machakos  
**KENYA**

REF. MksU/ASA/GS/3/3

15<sup>th</sup> December, 2023

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

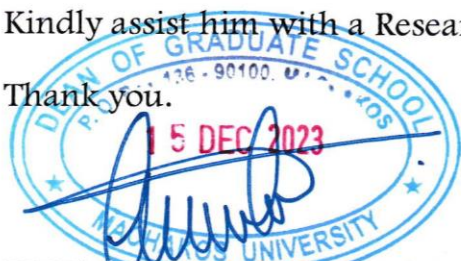
Dear Sir

**RE: CHRISTOPHER MBATHA KING'OLA (E55/12143/2021)**

The above named is a masters student in the second year of study and has cleared course work. The University has cleared him to conduct a research entitled: **"Utilization of Instructional Media and the Quality of Learning Outcomes in Biology Theory in Public Secondary Schools in Mwala Sub-County, Machakos County."**

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

Thank you.



**PROF. KIMTTI RICHARD PETER, PhD**  
**DEAN GRADUATE SCHOOL**

KRP/em

## Appendix IX: Research Authorization, NACOSTI

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br><b>REPUBLIC OF KENYA</b>                                                                                                                                                                                                                                                                                                                                                                | <br><b>NATIONAL COMMISSION FOR<br/>SCIENCE, TECHNOLOGY &amp; INNOVATION</b> |
| Ref No: <b>552446</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Date of Issue: <b>05/January/2024</b>                                                                                                                          |
| <b>RESEARCH LICENSE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                |
| <p><b>This is to Certify that Mr.. CHRISTOPHER MBATHA KING'OLA of Machakos University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Machakos on the topic:</b><br/><b>UTILIZATION OF INSTRUCTIONAL MEDIA AND THE QUALITY OF LEARNING OUTCOMES IN BIOLOGY THEORY IN PUBLIC SECONDARY SCHOOLS IN MWALA SUB-COUNTY, MACHAKOS COUNTY for the period ending :</b><br/><b>05/January/2025.</b></p> |                                                                                                                                                                |
| License No: <b>NACOSTI/P/24/32282</b>                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                |
| 552446                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                           |
| Applicant Identification Number                                                                                                                                                                                                                                                                                                                                                                                                                                              | Director General<br><b>NATIONAL COMMISSION FOR<br/>SCIENCE, TECHNOLOGY &amp;<br/>INNOVATION</b>                                                                |
| Verification QR Code                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                |
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| <b>See overleaf for conditions</b>                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                |



## Appendix X: Research Authorization by Moe

### MINISTRY OF EDUCATION



Telegrams: "Elimu",  
Telephone:  
deomwaladistrict@gmail.com  
When replying please quote:  
Ref: MW/ED/G/077/VOL.1/111

REPUBLIC OF KENYA

DISTRICT EDUCATION OFFICE  
MWALA DISTRICT  
PO BOX 413  
MASII  
Date: 9<sup>TH</sup> JANUARY 2023

Dear sir/ Madam,

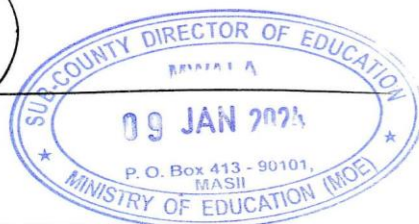
**RE: CHRISTOPHER MBATHA KINGOLA (E55/12143/2021)**

In reference to the letters from the Machakos University Ref: MksU/ASA/GS/3/3 The above named is a masters student in the second year of study and has cleared course work. The University has cleared him to conduct a research entitled: **"Utilization of Instructional Media and the Quslity of Learning Outcomes in Biology Theory in Public Secondary Schools in Mwala Sub-County, Machakos County"**.

Kindly allow him to undertake the research in your institution.

Thank you

  
STEPHEN M KITUNGU



SUB-COUNTY DIRECTOR OF EDUCATION

MWALA

## Appendix XI: Area Of Study

## MWALA SUB-COUNTY

