

## Research Article

# EFFECT OF TYPE OF INSTRUCTIONAL RESOURCES USED AND THE QUALITY OF LEARNING OUTCOMES IN BIOLOGY THEORY IN PUBLIC SECONDARY SCHOOLS IN MWALA SUB-COUNTY, MACHAKOS COUNTY, KENYA

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### ABSTRACT

The study sought 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. 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 2 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. 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. Data was analysed qualitatively and quantitatively with the help of the Statistical Package for Social sciences version 27. Results of the study indicate that type of instructional resources used have an influence on the quality of learning outcomes in Biology theory. In addition, the study has established that in the surveyed secondary schools had challenges in acquiring instructional media due to resource constraints. Furthermore, the study established 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.

**Keywords:** Instructional resources, Learning outcomes and Learning process.

### BACKGROUND TO THE STUDY

Instructional media are the materials and physical means an instructor might use to implement instruction and facilitate student's achievement of instructional objectives (Jannah, 2020). Instructional media are classified into four groups namely print media, audio media, visual media and audio-visual media. Instructional media play an important role in teaching and learning. They can be used to support and supplement the content of a lesson, help students learn new concepts, and provide practice opportunities (Saikat, 2022). In general, the benefits of instructional media are to facilitate interaction between teachers and students so that learning activities are more effective and efficient (Emron & Dhindsa, 2010). The utilization of instructional media enables the learning process to become clearer and more interesting, more interactive, and easier to achieve instructional objectives with the maximal minimal time and effort and improves students' quality of learning outcomes.

Haryudin, Yana & Efransyah, (2020) state that instructional resources are important in the teaching and learning process in the classroom. These resources can be understood as something that can convey messages from existing sources in a planned manner so that a conducive learning process occurs where the recipient can carry out the teaching and learning process efficiently and effectively. Wahyuni and Yokhebed (2019) indicate that learning media are tools used to help convey information in teaching and learning activities. Learning media in the teaching and learning process is very important as it provides motivation and captures student interest in following the

process of teaching and learning activities, providing a pleasant experience so that student learning outcomes can be improved. Muvango, Indoshi & Okwara (2019) found out that instructional media become one of the factors that influence the success of teachers to deliver material and make it easier for students to master the material taught.

Abdelraheem and Al-Rabane (2005) found out that the proper use and integration of instructional media in teaching and learning led to an improvement in students' performance in Social Studies. Curzon & California, (1997) points out that using instructional media in social studies classrooms widens the channel of communication between teachers and their students. The instructional media allow the growth of specific learning abilities and enhance intellectual skills and motor skills. The use of charts and models enables the teacher to present and illustrate many physical phenomena and allows them to focus attention on the characteristics of objects.

In Nigeria, Nkiruka, Uchenna, Uzochukwu, Pauline, & Okwuchukwu, (2021) point out that, the effective use of instructional media in teaching and learning of Biology Theory is crucial in our educational system and requires proper training and supervision. According to Arop, Umanah, & Effiong, (2015), instructional materials are designed to develop the learner and achieve objectives in a learning situation. Instructional materials bring science to bear in the classroom. Usman and Adewumi (2006) states that the successful implementation of any curriculum is fully dependent on the quality and quantity of instructional materials available to teachers and pupils for use in schools. Instructional materials stimulate the learner's interest; help both the teacher and the learner overcome physical limitations during the presentation of the subject matter.

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In Tanzania, Muhamba, Kisandu, Komu, Kemikimba, & Manyama (2018) denote that teachers need to increase the interactive atmosphere in the teaching and learning process with the use of instructional media and technology opportunities. While there are numerous variables with which the learner can interact, instructional media and technology aspects can play a big deal in enhancing the interaction. Mzinga and Onyango (2021) concluded that the use of learning materials in Geography contributed to enhanced creativity and innovativeness in learners. Learning materials further assisted learners to comprehend difficult topics in Geography. It also made learning very interesting and this motivated learners to fully participate in the learning process. Their study recommended that the use of instructional materials should be emphasized in public secondary schools as they played a key role in enhancing productive learning of Geography.

In Kenya, Achola (2016), indicates that teaching using various instructional materials improves the performance of learners in various learning activities including the ability to write dictated words and that mandatory use of instructional media should be established to enhance mastery of language subjects. Achieng (2013) found out that the use of Instructional media aroused children's curiosity and motivated them to learn. Kasilia (2018), concluded that the performance of CRE was good due to the use of instructional media in teaching and learning.

According to Adenle, (2014), the use of instructional media is of vital importance for the teaching and learning of the basic sciences in primary and secondary schools, as it drives home the lesson point of the subject being taught and reduces stress for both teacher and student. Kamji & Agu (2022), recommended that the use of instructional materials by teachers should be made compulsory in the teaching and learning of all topics in Chemistry at our senior secondary schools, and this must be enforced through periodical monitoring by the school authority.

Kamau (2018), states that when all instructional materials required in Biology are put in place and fully utilized in schools, learner's performance will improve as many are motivated in different ways. The materials provide scientific skills and a big picture to the minds of the learners hence the ability to recall. Ong'amo, Ondigi, & Omariba (2017) found out that students who were frequently taught Biology using instructional resources had an improvement in their performance. Mukagihana, Nsanganwimana and Aurah (2022), observed that low-level use of available Biology instructional resources in teaching pre-service Biology teachers would produce less competent future Biology teachers. The provision of adequate Biology instructional resources, as well as the monitoring of their use in teaching Biology, was recommended. This study therefore focused on assessing the type of instructional resources used in teaching biology theory in secondary schools in Mwala sub-county and the effect it had on the quality of learning outcomes.

## THEORITICAL FRAMEWORK

The study was guided by Richard Mayer's Multimedia Learning theory (MMLT) which states that deeper learning can occur when information is presented in both text and graphics than graphics alone. The theory of multimedia learning hinges on the presumption that there are two channels for learning: auditory and visual. These channels are both used to process information into working memory (Moreno & Mayer, 1999). Multimedia learning theory states that there are two cognitive processing channels accessible to learners; One is for filtering auditory information and the other one visual information. They lead to development of new knowledge or learning (Mayer,

2010). The theory emphasizes that the use of both visual and audio media in teaching and learning provides an opportunity for the learner to filter the lesson content using the two channels and hence understanding better.

## REVIEW OF LITERATURE

### Utilization of Instructional Media in Learning Science

According to Adenle (2014), the use of instructional media is of vital importance for the teaching and learning of the basic sciences in primary and secondary schools, as it drives home the lesson point of the subject being taught and reduces stress for both teacher and student. The use of well-planned instructional media will enhance students' performance in science subjects; including Physics, Chemistry, Biology and Mathematics. Media is instructional and recreating and holds students' attention hence can be used as teaching aids. The utilization of instructional media in teaching and learning stimulates students learning outcomes thus improving students' interest and academic performance in class activities

Ehirim (2020) recommends that, the utilization of media resources by teachers should be made compulsory in the teaching and learning of all topics in Chemistry at our senior secondary schools, and this must be enforced through periodical monitoring by the school authority. He added that, the Government should provide funds to motivate teachers as regards improvisation and should organize seminars, workshops, and conferences for Chemistry teachers on how to improvise and make effective use of instructional materials in the teaching and learning of Chemistry. The use of instructional media will make learning interesting and help learners capture Chemistry concepts easily hence it should be encouraged in teaching and learning.

Ibrahim (2019) avers that there exists a practical and theoretical shift of emphasis towards acknowledging the fact that instructional media remains the key to effective teaching/learning of chemistry concepts which are perceived to be abstract and symbolic. The ineffective use of instructional media will reduce the effectiveness of the learning process and make Chemistry lessons boring and abstract.

According to Chukwudi *et al.*, (2022) one of the reasons why many students perform very poorly and below expectations in Physics is that the schools lack relevant instructional media. The teaching of Physics must focus on making teachers competent at using technology to promote strategies that enable the integration of technology. Adcock & Bolick (2011) state that teaching and learning Physics supported by information and communication technologies offers an alternative to the solutions used in the traditional approach. Instructional media has an emotional impact on Physics students and affects their attitude toward learning.

Nyawira (2015) states that abstract Mathematical concepts are made concrete when students see and do some activities using real objects like models hence its essential to utilize instructional materials in teaching. Biology as a science subject becomes very difficult for teachers to teach effectively without the use of appropriate educational media Thus, it is important for teachers to properly select and use instructional media to enhance students' outcomes in Biology. A study carried out by Ong'amo *et al.*, (2017) on the Extent of the use of Biology instructional resources and their effect on students' academic performance in secondary schools, found out that students frequently taught using resources performed better than those rarely taught using the resources. The present study aims to find out the influence of utilizing instructional media in teaching and learning Biology theory.

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

Instructional resources refer to the human and non-human materials and facilities that can be used to ease, encourage, improve and promote teaching and learning activities. They are used to facilitate effective delivery of instruction. They are human and non-human material that a teacher uses to pass information to the learner. There are various types of instructional resources used in teaching; print media resources, audio resources, visual resources and audiovisual resources. Instructional resources are very important in teaching and learning as they; Gain and hold the attention of the learner, provide visual aspects to a process or techniques, focus attention on highlight of key points, facilitates the understanding of abstract explanations, provide a common experience to a large number of learners and stimulates reality among learners. (Muraina, 2015).

Berkeley (2011) states 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. According to Reed et al., (2022), when educators are creating instructional materials, they should make sure they ask their students a wide range of questions. Some students will respond positively to certain types of questions while others will respond negatively. Instructors should ensure that the resources they create are usable by students with special needs and if they are not, they should modify them. Teachers should make multiple resources to teach the one subject. Students learn in different ways; Some students learn visually, others learn auditory while others learn through physical contact. Educators should ensure that all types instructional resources are available to cater for the needs of different of students.

Clark & Mayer (2023) aver that there are various factors to consider when selecting instructional resources: Relevance of the resource to the lesson objectives, the resource should be useful to student's age and learning abilities, the material should be up to date, original or revised, the resource should enhance learner participation, the resources should be appealing to the students and should be easy to use or operate. According to Gravelle (2022), Instructional materials provide the basis for what learners will experience and learn. They hold the power to either motivate or demotivate students.

According to Arop, Umanah, & Effiong, (2015), instructional materials are designed to develop the learner and achieve objectives in a learning situation. Instructional materials bring science to bear in the classroom. Instructional materials stimulate the learner's interest; help both the teacher and the learner overcome physical limitations during the presentation of the subject matter. Ugorji, King-Agboto, & Okpara, (2012) found out that the more the teachers make use of instructional materials, the better the performance of the students in Mathematics was enhanced. They recommended that Mathematics teachers should endeavor to utilize the available instructional materials where necessary.

Usman and Adewumi (2006) states that the successful implementation of any curriculum is fully dependent on the quality and quantity of instructional materials available to teachers and pupils for use in schools. Kamji & Agu (2022), recommended that the use of instructional materials by teachers should be made compulsory in the teaching and learning of all topics in Chemistry at senior secondary schools, and this must be enforced through periodical monitoring by the school authority.

Kamau (2018), states that when all instructional materials required in Biology are put in place and fully utilized in schools, learner's performance will improve as many are motivated in different ways.

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## RESEARCH FINDINGS

### 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 1 presents data of the Biology theory test.

Table 1: Student's Performance in Biology

School	School Category	Mean	Standard Dev	Min Mark	Max 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 shows an overall mean score of 23.15. This implies 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 media used, students' attitude towards the subject and poor quality of teaching. Those in county schools perform better than those in sub-county schools (See Table1). By design, the extra-county schools are more resourced in terms of manpower. 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.

### Type of Instructional Resources 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 2 displays summary statistics.

**Table 4.1: 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

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

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 use the charts. The study has also established that while 50% of the Biology teachers rarely use real objects in teaching Biology theory, another half of them, never use these objects 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 nor never uses them (33.3%).

Concerning computers, the study has established that half of the teachers do not use the computers in teaching Biology while only 33.3% of them argued that they sometimes use them. The study

further establishes that only 16.7% of the Biology teachers always 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 argued that the type of instructional materials 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.

Also one of the interviewed heads of department had this to say

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

Another one argued:

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

Yet 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)*

The findings are aligned with previous studies which have shown that instructional media can be used to ease, encourage, improve and promote teaching and learning activities (Muraina, 2015). In addition, Manurung (2017) agrees that the type of instructional materials used in teaching determine to a greater extent the learning outcomes. The findings are also supported by Gravelle, 2022 who averred that instructional material provide the basis for what learners will experience and learn, and therefore, they hold the power to either motivate or demotivate students.

**RECOMMENDATIONS**

1. The Ministry of Education should induce programmes on the use of instructional media. There is need for the national government through the Ministry of Education to increase funding for the public secondary schools. Part of this funding could go towards purchase of instructional media to enhance learning experience for the students.
2. There is need for policy makers and implementers to address inequalities among public schools by reducing categorization like national, extra-county, county and sub-county. This disadvantages some learners and hence, perpetuating education injustices in the country.
3. The ICT director in the Ministry of Education should produce relevant media to be used in teaching and learning such as the audio-visual media.

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