

Use of Information and Communication Technology Resources in Teaching of Biology; an Assessment of Secondary Schools in Imenti North Sub-County

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Abstract— Virtually all over the world teaching and learning has been stopped due to scare and danger brought by Covid-19 pandemic. Consequently, online teaching and learning has taken the centre stage as a way of circumventing the challenge. For a number of years Imenti north sub-county has been posting poor results in Kenya Certificate of Secondary Examination (KCSE) in biology. Governments all over the world are modernizing their teaching methods to improve the quality of education such as integration of ICT in education, therefore this study sought to establish whether Information and Communication Technology (ICT) resources are used in teaching and learning of biology in secondary schools in Imenti North Sub-County (INSC). Application of ICT resources in school goes beyond the training and equipping of schools with ICT resources, it ought to be a deliberate effort geared into ensuring everything is in place for successful uptake in class. Besides developing ICT skills, it is important it be integrated in teaching of biology in both offline classes and online classes. With the changing dynamics in classes and rapid evolution of ICT, the need for teachers to acquaint themselves with ICT both in class has become imperative. The study was driven by the idea that all the countries are in cutthroat competition to be ahead of each other in developing and use of ICT resources in all spheres of life. The study sampled 34 schools that is five private, three extra county and 26 Sub-County schools selected through stratified random sampling. The study sample composed of, 1305 students, selected through random sampling, 42 teachers selected through random sampling, and 34 head teachers selected through purposeful sampling. Data was collected through use of interview schedules and questionnaires. Data was then analyzed using descriptive statistics, where qualitative data was discussed under suitable themes derived from the objectives of the study while quantitative data was analyzed using frequencies and percentages. The study established that schools are rarely using ICT resources in teaching of biology. The study recommends that ministry of education and school management take a more proactive role to ensure ICT resources are used in the teaching of biology in Imenti North Sub-County.

Index Terms— Biology, ICT Resources, Secondary Schools, Teaching.

I. INTRODUCTION

With digital revolution taking over almost all aspect of our life including education, ICT has become inseparable from learning processes in class. The great advancement in ICT in

recent years has had major impact in the teaching of Biology since the advancement in biology is crossly intertwined with technology development (Yildirim, 2007).

At present there are allays of specialized tools of electronic educational media resources a teacher use in instruction of Biology. Mwaka (2008) argues that, educational technology increases interest, comprehension and retention, hence the need for resources based learning. This implies that use of ICT resources in teaching of Biology is vital. Wims & Lawler (2007) refers to the media as powerful tools that influence the minds of those who use them. Wanjiku (2016) defines media as a way that brings new ideas and information meant to educate, mould and shape individuals especially young people in the society. In today's world personalities are shaped by media more than the Mother or Father, hence it is imperative to integrate such a powerful tool in instruction in Biology. Cornu (as cited in Mwaka, 2008), argues that future teachers need not to teach the way they were taught and produce the way they are told, there is need to embrace the use of ICT resources if the graduate teachers leaving the universities are expected to use technology in future for positive development of the country now that the world economy is ICT driven.

ICT resources include radio, television, computer, internet, mobile phones, satellite, videos, compact disks, and L.C.D. projectors. Studies on teacher education and use of instructional materials have been carried out and reported by several investigators including those of Wanjara, Khaemba and Mukwa (2011) and Wong and Woo (2007), they pointed out the need for development of skills by teachers undergoing their training so that they could be able to use a wide variety of instructional materials sufficiently well. Various researchers have out found that teachers, who are trained and untrained, use some form of materials to teach their lessons (Unesco, 2013), though it is safe to argue that students taught biology through use of ICT resources in teaching benefits greatly (Stuart, Mills and Remus 2009). However, the relevance of the choice of ICT instructional material types and the quality of the instructional material types that teachers use has not been investigated.

II. METHODOLOGY

The study was based on pragmatism so that the study could benefits from the strengths of both positivists and interpretivists, hence avoiding being forced to fit in a straight jacket with no room for triangulation (Ayiro, 2012) making it

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a very restrictive approach. Therefore, great latitude to navigate enabled the authors to look at all possible issues pertaining to the use of ICT resources in teaching and learning of biology. Consequently both qualitative and quantitative strands were encapsulated within an overall research design that guided the study as a whole as advanced by Creswell (2012).

The study adopted a descriptive a survey design. Data was collected on multiple cases from schools at diverse time. Descriptive design was found appropriate because according to Kothari (2004), it is concerned with describing, recording, and reporting conditions, as they exist. This study was conducted in secondary schools in Imenti North Sub-County in Meru County, which borders Buuri Sub-County on the west, Imenti Central Sub-County on the south and Tigania west Sub-County on the Eastern side

The Sub-County was chosen because it is among the sub-county's posting poor results in Biology in K.C.S.E for a number of years (Gok, 2014), despite it being well endowed with economic resources and favorable climate conducive for learning (Mubichi, 2009). The Sub-County has significant number of schools in Extra-County, County, Sub-County and private categories. This will provide a fair crosscutting population for sampling from the four categories. Imenti north Sub-County has 68 secondary schools of which 52 are day schools, 10 private and 6 Boarding schools.

Table 1.0 Study Population and Sample

Category of schools	Number of schools in the sub-county	Number of Selected Schools	Number of students Selected	Number of teachers Selected	Number of Head teachers Selected
Public boarding	6	3	36	3	3
Public day	52	26	312	26	26
Private	10	5	60	5	5
Total	68	34	408	34	34

The study used questionnaires for teachers and students as well as interview schedules for principals. The questionnaires were fill-in type constructed by the researcher. The questionnaires had have both open and closed items, by using the questionnaire the researcher was able to obtain personal ideas and opinion from the respondents Kennedy (as cited in Maiyo,2009).In addition it is preferred because it has the ability to reach a large population and economical in terms of time (Tearle(2004)).

They helped to keep the researcher on track and avoid digressing and even forgetting the questions all together. Interview schedule was used to interview Heads of schools by the interviewer. Interview schedules are more reliable because they are systematic, objective and consistent (Randy, 2008). The researcher constructed the interview schedules. It was used to obtain data required to meet specific objectives such providing accuracy on the responses obtained from teachers particularly on the use of the ICT resources in class, moreover researcher was able establish rapport with the respondents and provides the option of elaborating or clarifying items which were not clear to the respondents

Study Population and Sample

Stratified random sample procedure was used to categorize schools into public day, private and public Boarding secondary schools, this was in order to achieve the desired representation of respondents in the various categories of schools in the sub-county (Ayiro,2012)). It is worth noting that all private schools are boarding schools. From each sampled school twelve students were selected at random as the respondents totaling to four hundred and eight students this in line with Creswell (2012) contention that in large population a sample of at least 10% and above is recommended. Students were included to act as filter of some the information given by the teachers

All head teachers were selected and in each selected school one Biology teacher was selected randomly as the respondents constituting about 50% of the population this is because if there is no estimate available of the proportion in the target population to have the characteristics of interest, 50% of the respondents should be representative enough to yield acceptable result Creswell (2012)). Table 1.0 shows the summary of the population and sample.

(Plowright,2011).Quantitative data collected using questionnaires was by first coding and keying coded responses into computer for analysis. Open-ended questions and data collected from interviews were copied,characterized, and analyzed thematically.The edited data was then coded and analyzed using statistical package for social sciences (SPSS) and Ms Excel. Descriptive statistics (Frequency distribution, percentages, averages, and variability) were used to describe the data.

III. RESULTS AND DISCUSSIONS

Effective teaching is an intricate process. It goes further than planning, choice of approaches, methods, and preparation of teaching materials.It also involves the teacher mastery of content and skills (Gakau, 2008). The teacher, according to Pedro and Francesc (2012) should be able to decide upon apt instructional procedures and suitable media, which would help produce the planned learning outcomes efficiently and economically. Therefore, the use of ICT resources need not to be viewed just as a teaching aids but an integral part of the whole learning process. Using ICT

resources, the teacher is making a conscious decision with full knowledge that, there is value in using the resources. To be able to gather more information on the study, the researcher carried out investigation under the following sub-themes

The study sought to establish from teachers whether the available ICT resources are used in teaching

Biology and as the source of information for instruction in class. The responses are as captured in table 2.0

Use of ICT Resources in Teaching of Biology

Table 2.0 Use of ICT Resources: Teachers Responses

Variable	As a source of Information: responses (%)				In Teaching	Responses
	V.F	F.	S	N		
ICT resource						%
Radio	0	0	47.1	52.9	Used	11.8
					Not used	88.2
Videos / Compact Disks	0	0	11.8	88.2	Used	26.47
					Not used	73.53
Television	0	0	14.7	85.3	Used	11.8
					Not used	88.2
Internet	0	14.7	29.4	55.9	Used	5.9
					Not used	94.1
PowerPoint	-	-	-	-	Used	2.9
					Not used	97.1
Computer	-	-	-	-	Used	11.8
					Not used	88.2

N=34, Key VF=Very frequently, F=Frequently, S=Sometime, N=Never

The data collected shows that majority of teachers (88.2%) do not use radio, television and computer to teach biology. Moreover, majority of teachers (73.53%) also do not use compact disks and videos for teaching of biology. The largest number of teachers (94.1%) do not use internet for teaching as table 4.4 shows. From the study, majority of teachers (52.9%) said that they never use radio as source of biological information to teach Biology. 47.1% of teachers reported using radio to get biological information for teaching at times. On television, over 85.3% of teachers do not use it to get biological information for teaching Biology.

With proliferations of radio and television stations in Kenya and their desire to win the market, the stations have come up with variety of programmes, documentaries, features, and topical discussions very rich in current and contemporary issues in Biology. Looking at the low percentage of teachers using radio and television for instructional information it is a surprise discovery that teachers are yet to exploit this advantage. When it comes to internet, there was slight improvement but still majority of teachers (55.9%) do not use internet as a source of their biological information. About 44% of teachers reported using internet as source of biological information frequently or sometimes for teaching.

Teachers need to understand that using instructional materials such as ICT is not a choice or an option, teaching aids should not only be used as an aid to teaching but also as

an integral part of teaching. Philosophical justification of using educational technology can be grasped by examination of ancient and medieval education systems as well as African traditional education, which reveals that education materials were embraced and extensively used. This is due to the following philosophical beliefs as propagated by Owino (2016) together with Omwenga(2003) Using education media learning becomes more meaningful and wholesome, concepts are clarified, it is accelerated, saves time, it is more interactive and there is introduction of autonomy or freedom in education. Therefore, teachers should endeavor at all times to use educational media while teaching. It is an inescapable fact that ICT add value to teaching and learning it improves students' performance. Since most schools do not have the required ICT resources, the consequence is that these materials are not being used; hence, students in Imenti north sub-county are being disadvantaged, and no wonder the results in the sub-county have not been impressive.

1. The Rate of ICT Use by Teachers in Teaching of Biology

To find more information, the study sought to find out from head teachers the rate of ICT use by teachers and the responses were as illustrated in table 3.0

Table 3.0 Rate of Inspection on the Use of ICT by Head teachers

Head teachers Responses Percentage	Very Often 0	Often 8.82	Rarely 11.8	Never 79.40
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N=34

From the study majority of Head teachers (79.40%) do not check whether their teachers use ICT resources. All schools should put in place proper and effective inspection systems on the use of ICT in teaching, there are no excusable reasons why teachers should not use ICT in class, the number of teaching ICT items have become so numerous that, today a teacher of any subject need not resort to any of the archaic methods of teaching, for instance with only less than eight

Kenyan shilling a teacher can buy a blank compact disks for storage of biological information. Uses of teaching aids are limited only by the imagination of teachers and students.

When the study sought to find out whether the teachers use ICT resources in teaching from students, the responses were as captured in the table below 4.0

Table 4.0 Use of ICT Resources: Students responses

School category	Responses in Percentage By students	
	Used	No used
Public Boarding	73.33	26.67
Private	86	14
Public day	90	10

N=408

Sub-county schools were found to be lagging behind in the use of ICT in teaching. 90% of students reported that teachers are not using ICT in teaching. Comparatively Boarding schools were slightly doing better but over 73% of students reported that their teachers do not use ICT resources during Biology lessons. In one Boarding school visited during the study, the school had all the necessary ICT resources but the materials were never used in class. From the responses given by Head teachers, teachers and students, the study found out that majority of schools do not use the available ICT resource for teaching. Computers, television, and radio are used for either administration or entertainment purposes. Teachers use ICTs as instruments of curiosity rather than instructional instrument use laptops. There is general perception that ICT resources do not have any significance as far as producing good results are concern,

within their classrooms. Therefore, teachers need to realize that ICT have a great potency and capability to fundamentally change students view about a subject. ICT has created a virtual classroom, informally teaching the students way ahead of teachers. Hence, as instructors, teachers need to tap the advantages presented by ICT to restructure the informal teaching of media into formal teaching. There is need for Head teachers to take a proactive role to ensure that teachers are embracing use of ICT resources in their classrooms. However, it should be noted that when using these resources they must be able to teach in such a way that all students will achieve the same level of understanding. Teachers should use a variety of ICT to enliven a class, encourage students' participation, and help students grasp difficult concepts.

2. The Challenges Faced in the Use of ICT Resources in teaching

The study sought to find out the challenges teachers face in using ICT resources and the responses are as indicated in table 5.0

Table 5.0 Challenges of Using ICT Resources

Variable	Responses by, Frequency/mean				Mean
ICT resource	Strongly agree(4)	Agree(3)	Disagree(2)	Strongly Disagree(1)	
Facilities and Resources	120	12	0	0	3.88
Lack of Skills	8	51	30	0	2.62
Lack of power	56	27	18	1	3.00
Lack of Time	0	45	36	1	2.41
Work Load	112	18	0	0	3.82

N=34

Majority of Head teachers strongly agree facilities and resources together with workload are the main challenges

their teachers face in using ICT resources, moreover they agree that lack of skills and electricity to be also a challenge in the use of ICT resources in teaching, but they disagreed

that lack of time to be the challenge in the use of ICT resources in teaching of biology to secondary school students. If teachers really understand the importance of instructional media resources they should be more prepared to face the challenges which confront them in using of these resources in teaching. This is because there is a direct relationship between teaching using ICT and performance. From literature reveal it has been shown that, the schools where teaching aids have been provided adequately usually perform better than those that lack these facilities and where the mode of teaching is theoretical the results reflect poor performance (Owino, 2016).

It is imperative that the Head teachers, teachers, parents and all education stakeholders put their minds together and address the challenges teachers are facing in availing and using ICT resources because there is no way of running from the issue if they have the desire for students to do well in K.C.S.E; The government allocates only, 3600 Kenya (GoK, 2016) shillings per student in a year for tuition materials

which is very little, hence in prioritization ICT resources mostly are left out because that money is not enough for all the tuition materials in school. School managements must be more enterprising and innovative to ensure there is adequate teaching aids in school without over reliance on Government. Furthermore, there is need for a teacher to employ the best management practices in provision and utilization of ICT resource to achieve the desired outcome from learners at minimal cost. In addition given the scarce resources allocated to the education sector, there is a great need for education institution to be both internal and externally efficient, proper management of learning resources is critical, including the necessary contingency skills such as identifying, selecting, developing, and utilizing in instructional programmes.

3. Frequency of Using ICT Resources in Teaching

The study sought to investigate the frequency of using ICT resources in teaching biology in secondary schools from teachers and their responses were as captured in table 6.0

Table 6.0 Frequency of Using ICT Resources: Teachers' responses

Variable	Teachers' responses (%)			
	Always	Occasion-ally	Sometimes	Never
ICT resource				
Radio	0	0	47.7	52.3
Television	0	0	14.7	85.3
Internet		0	11.7	88.3
Videos / CDs	0	14.7	29.4	55.9
Computer	0	11.77	26.4	61.76
LCD/PowerPoint	0	0	5.9	94.1

N=34

From the findings, it shows that a majority of teachers (52.3%) do not use radio at all in teaching. Only 47.7%, of teachers use radio for teaching at times. The situation was not any better with television; about 85.3% of teachers do not use television for teaching. Paltry 14.7% teachers said they use television at times to teach. About 88.3% of teachers do not use internet for teaching. Only about 11.8% of teachers were using internet for teaching at times and 11.77% of teachers uses internet frequently during teaching of Biology. 55.9% of teachers reported that they do not use instructional Videos and compact disks for teaching. Only 29.4% of teachers use videos and compact disks for teaching at times. About

94.1% of teachers do not use PowerPoint for teaching, only about 5.9% of teachers reported using PowerPoint at times. All teachers reported that they do not use video players.

When the study sought to determine how often teachers use the available ICT resources from students it was revealed that about 98% of teachers use them rarely and 2% of teachers use them often as Table 7.0 shows. This is a very low score on the side of teachers bearing in mind that modern technology has provided radios, televisions, videos computers, and myriads of other media devices, which the teacher can use in class.

Table 7.0 Frequency of Using ICT Resources: Students Responses

Responses Percentage	Very of often	often	Rarely	Never
	0	0	98	2

N=408

ICT resources can be very important instructional materials in the introduction, development and conclusion of the lesson, hence the teachers in Imenti North Sub-county need to understand it's essential to use ICT resources and cultivate a habit of always using them in teaching of Biology. Use of ICT resources greatly improve methodology, reduce chalk, and talk method, which has low level of knowledge retention and comprehension. Teachers can blend ICT resources in their teaching because each medium of instruction has its own strengths and weaknesses for instruction; hence, it is

important to use a variety of media while teaching. Since there is no single, medium that can cater for all the learners needs. Instructional technology as supplementary strategy in teaching Biology is very effective because ICT can be used in every topic with any kind of teaching methods and to all types of learners. Therefore, a creative teacher will find out that instructional aids are not an impediment in lesson delivery but rather an asset. Teaching without ICT resources, is frustrating students in class because from the study all students believed that they would do better if teachers use instructional media. Failure for schools in Imenti North

Sub-County not only compromises the quality of teaching in biology but also jeopardizes the Sub-County economic development. This might explain the low performance of biology in KCSE over the years in Imenti North Sub-County; this implies that the INSC is not able to compete with other Sub-counties in the country in taking students for competitive and rewarding courses in the tertiary colleges and universities. Countries, which have invested in ICT and early exposure of their citizens in ICT particularly in education, will muscle out others in tapping the benefits of digital revolution. As argued by Mutula (2008) the wider the digital divide the broader the gap in the development in knowledge based economy. Therefore, with low use of ICT resources in teaching and learning in secondary schools in Imenti North should jolt every stakeholder to realize that, all is not well and the future is not promising since with shrinking of economic opportunities and other myriad of challenges such as disease pandemic, climate change upheavals and terrorism investing in ICT is mandatory.

IV. CONCLUSION

Therefore, it has been established from a study that use of ICT resources in teaching of Biology in secondary schools in Imenti north district is far below the expectation. The place of ICT in education in the 21st century is well known. It is indisputable fact that a country to position itself at a vantage in competing for knowledge-based economy it must integrate ICT in all spheres of life, the entry point being education. There is an urgent need in for the sub-county to come with strategies of ensuring there is concerted effort by all stakeholders in education in instituting measures to ensure the level of ICT use in teaching and learning are escalated and and more proactive policy approach developed on the usage of ICT education in Imenti North Sub-County secondary schools.

V. RECOMMENDATION

All schools and teachers should make an effort to use ICT in teaching and learning of biology. Therefore, school curriculum should be revised and tailored to incorporate use of ICT resources such as digital curriculum. All teacher training institutions and secondary schools should ensure computer studies are a compulsory subject. This will enhance availability and use of ICT resources Kenya Institute of Curriculum Development (KICD) should prepare more ICT materials and make them more accessible to teachers, in addition there is need to carry study on the teachers perceptions on the effects ICT of ICT resources in teaching of Biology to secondary school find out whether their perceptions might also have contributed to low use of ICT resources in teaching and learning of biology in Imenti North Sub-County.

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