INFLUENCE OF CURRICULUM DIGITAL CONTENT UTILISATION ON LEARNERS' ASSESSMENT AND ACHIEVEMENT IN BIOLOGY AMONG SECONDARY SCHOOLS IN KENYA

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Abstract

The curriculum support materials used in an instructional process may influence assessment and achievement of learners. Curriculum support materials are both print and electronic in nature. One of the main electronic curriculum support materials used in schools is interactive digital content. In recent years, there has been rapid expansion in curriculum digital content access and utilization in Kenyan schools. However, little has been done to establish how utilization of curriculum digital content in the instructional

process influences learners' assessment and achievement. The study reported in this paper therefore investigated the influence of curriculum digital content utilisation on secondary school learners' assessment and achievement in Biology. It was guided by two specific objectives including to: investigate the influence of the utilisation of Biology digital content on learners' assessment and examine the influence of the utilisation of Biology digital content on learners' achievement. A mixed methods approach that employed triangulation design was used in this study. Data was obtained from fifteen Economic Stimulus Programme-ICT phase 1 secondary schools in Nairobi County. Three instruments including Biology teacher questionnaire, learners' focus group discussion guide and documents analysis sheet were used for data collection. The collected data was analyzed using both descriptive and inferential statistics and presented in form of notes, tables, and graphics. This study found out that most assessment aspects improved with curriculum digital content utilization. In addition, utilisation of curriculum digital content had a positive influence on the achievement of secondary school learners in Biology. The study recommended that all schools, and not only ESP-ICT schools, be provided with proper infrastructure to enable learners and teachers access and utilize curriculum digital content in the instructional process. This would enhance assessment modes and learners achievement in secondary schools in Kenya.

Key Words: Curriculum Support Materials, Curriculum Digital Content, Assessment, Achievement

1. Introduction

Biology is one of the science subjects that are offered at the secondary school education cycle in Kenya (KIE, 2002). According to Maundu et al (2005), Biological information has by and large, been used to improve the welfare of humankind. The knowledge in Biology contributes to scientific literacy so that people can appreciate the world around them and enable them to make well-informed choices about their healthcare, their environment and the society in which they live (Karen, 2008). As outlined by KIE (2002), the study of Biology aims at equipping the learner with knowledge, skills, and attitudes that are necessary for controlling and preserving the environment; enables the learner to appreciate humans and as part of the broader community of living organisms; is a foundation for careers in health, agriculture, environment and education; and is the precursor of biotechnology which is a tool for industrial and technological development.

Despite the significance of Biological knowledge, learners' achievement in this subject at Kenya Certificate of Secondary Education (KCSE), which is offered by the Kenya National Examinations Council (KNEC), has been low over the years (MoE, 2005; Muraya and Kimamo, 2011). This does not auger well for Education for All (EFA) which adopted learning achievement as a key indicator of the quality of education during the World Conference on Education for All in Jomtien, Thailand, (UNESCO, 2000). Many factors contribute to low scores in science at KCSE. These factors include: student attitude towards the subjects which they perceive as difficult, inappropriate teaching approaches that are teacher centered rather than learner centered, inadequate mastery of teaching subject content by some teachers, inadequate teaching and learning resources, poor terms and conditions of service for teachers and heavy teaching loads (Kibe, JICA-Kenya in Muraya and Kimamo, 2011).

Utilization of appropriate curriculum support materials like interactive curriculum digital content may address factors such as inadequate teaching and learning resources and teaching approaches. The Centre for Digital Education (2010) posits that modern education environments require a new model that engages learners who are technologically savvy and who expect interactive experiences and desire to learn collaboratively. KNEC (2011) noted that schools should use e-learning to enable learners access diversified content for easy understanding of science concepts. Digital content is one of the important curriculum support materials that can be used to improve the quality of education, increase access and eventually ensure equity in education. It offers the suppleness to make learning learner cantered and an enduring endeavour that can promptly convey reliable and engaging learning experiences. It is malleable, enabling teachers and learners to more easily utilise, manipulate and control information to address specific learning objectives and to better match individual learning styles.

In educational context, digital content refers to all materials or programs stored on an electronic or digital medium that can be transmitted or utilised through computers, over networks and the Internet (Centre for Digital Education 2010). Digital Content is any content that can be consumed from an electronic device such as personal computer, mobile devices or digital television (Kenya ICT Board, 2011). It comprises of text, images, sounds, animations, games and videos that have been digitised, or brought into a computer. By virtue of one vital feature, flexibility, digital media surpasses traditional media in their ability to meet diverse learners' desires in a variety of instructional contexts. For hundreds of years, educational materials have mostly been static text with pictures printed on paper and in books. Flat text and pictures are outdated and are being replaced with digital resources. The digital transformation brings us an interactive world of electronic text, animations, illustrations, photographs, audio, simulations and video. Digital educational materials are dynamic and interactive. The conveyance medium is also changing from textbooks to desktop computers, laptops, tablets, smart boards, interactive whiteboards and all kinds of mobile, handheld devices.

The task-force on re-alignment of the education sector to the 2010 constitution recommended that ICT institutional framework needs to be strengthened to allow efficient integration of ICT in the entire education sector with enhanced ICT capacity at all levels. It also recommended the establishment of a National Centre for ICT Integration in Education (NACICTIE) as a semi-autonomous government agency (SAGA) which should be devolved to county levels. All these efforts suggest that Kenya is ready for digital transformation in its education system.

In an endeavour to mainstream ICT use in the education sector and equip students with modern ICT skills, Kenya's Vision 2030 envisages a computer supply program to schools, colleges and public universities (Government of Kenya, 2008). According to vision 2030 indicators handbook, one hundred and forty schools received computers in year 2009/10 while two hundred schools received computers in year 2010/11. More computers were distributed to an additional set of three hundred schools in the year2011/2012 and to a further four hundred during the 2012/13 fiscal year.

Development of digital content on Kenyan curriculum is also one of Kenya's vision 2030 flagship projects (Government of Kenya, 2008). This task is undertaken by the Kenya Institute of Curriculum Development. According to the Institute's website (August, 2013), one thousand and fifty secondary schools were issued

with digital content in the year 2011/12 a process dubbed ESP-ICT phase I. Moreover, four hundred and eighty-six secondary schools were issued with digital content in the year 2012/13 named ESP phase II and an additional two hundred and ten for ESP III in the year 2013/2014. In every constituency, one teacher was trained as an ICT champion. The ICT champion has a key role of coordinating the training of other teachers on ICT integration in education.

Various assessment methods in Biology including practical work, project work, field trips feature in the syllabus of this subject. MoE (2011) pointed out that there is a lot of software available to assist in student assessment. Elements of these software are designed to manage the process of setting, collecting and returning assignments. According to SEG research (2008), digital content can demand responses and answers from the learner to promote timely self-assessment and immediate feedback. These features of digital content may improve the frequency of assessment as well as the duration taken to give feedback.

The study reported in this paper therefore investigated the influence of curriculum digital content utilisation on secondary school learners' assessment and achievement in Biology. It was guided by two specific objectives namely; to investigate the influence of the utilisation of Biology digital content on learners' assessment and to examine the influence of the utilisation of Biology digital content on learners' achievement.

2. Methodology

This study used a mixed methods approach where the triangulation design was applied. The purpose of triangulation design is to obtain different but complementary data on the same topic to best understand the research problem (Morse, 1991). Johnson et al. (2007) termed mixed methods as a type of research in which a researcher combines elements of qualitative and quantitative research approaches such as use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques for the purposes of breadth and depth of understanding and corroboration.

To obtain sufficient data required to deal with the research problem in this study, both qualitative and quantitative data were essential. As highlighted by Creswell et al. (2003), triangulation design involves concurrent but separate collection and analysis of quantitative and qualitative data so that the researcher may best understand the research topic. In the case of this study, data on the learners' achievements was quantitative and yet vital. Similarly, data on learners assessment was qualitative but also very significant for this study. A combination of data collection instruments was also utilised in this study. Both textual data, for example the one obtained through focus group discussions and numeric data such as learners' achievement coverage acquired through documents analysis were collected. In addition, the study used existing information from the official school documents such as the progress records while generating new data through questionnaires and focused group discussions. University of Southern California (2015), pointed out that mixed methods approaches can utilise existing data while at the same time generating new information. In data analysis, both descriptive and inferential statistics were used.

2.1 Target population

A population refers to any group of institutions, people or objects that have common characteristics (Ogula, 2005). A target population of a study is the totality of persons, events, organizations, units or other sampling units which concern the research problem (Mohlokane, 2004). The target population for this study was secondary school Biology teachers and Form Three Biology learners drawn from fifteen ESP-ICT phase I secondary schools in Nairobi County. Table 1 summarises the target population in this study.

Table 1: Target population for the study

Target Group	Total Number
Form 3 Biology learners in the selected 15 ESP-ICT Phase I Secondary Schools in Nairobi County	1,617
Biology teachers in the selected 15 ESP-ICT Phase I Secondary Schools in Nairobi County	68
Total	1,685

2.2 The sampling procedures and the sample

Sampling is a procedure, process or technique of choosing a subgroup from a population to participate in the study (Ogula, 2005). This study employed both non-probability and probability sampling techniques to obtain the required sample size.

In non-probability sampling, purposive technique of sampling was used. This technique involves selecting certain units or cases, based on a specific purpose (Tashakkori and Teddlie, 2003). This technique of sampling is essential when a researcher is studying a definite characteristic, feature or function. The researcher decides what needs to be known and looks for subjects who can provide the data by virtue of knowledge or experience (Bernard, 2002). This study involved investigating the influence of the utilisation of curriculum digital content on the Biology assessment and achievement. Purposive sampling technique was therefore used to select ESP ICT phase I schools, Form Three Biology learners and Biology teachers. ESP-ICT phase 1 secondary schools were selected using this technique since they had digital content which was a key resource required for this study. In addition, information on utilisation of digital content was obtained from these schools. Form Three Biology learners were considered to be the most suitable for this study and therefore purposively sampled. This is because they have had adequate time to utilise and interact with the digital content since it was disseminated in the ESP-ICT phase I secondary schools in the year 2012 while they were in Form One. Since this study was based on Biology instruction, Biology teachers were also purposively chosen for data collection. For comparison purposes, it was important to purposively select a group of teachers who frequently utilised Biology digital content and another one that rarely or never utilised the content for instructional purposes. Charles and Yu (2007) argued that purposive sampling may be used to achieve comparability across different types of cases on a dimension of interest.

Under probability sampling, stratified random sampling was employed. This is a technique whereby the researcher divides the entire population into different subgroups or strata then randomly selects the final subjects proportionally from different strata (Barreiro and Albandoz, 2001). The subgroups are based on

various aspects such as geographical location, gender, performance or age. This technique was used to subdivide Nairobi county into eight geographical regions based on the eight constituencies that existed in 2011/2012 when ESP-ICT phase I was implemented. Two schools were then randomly selected from each of the seven constituencies while the only ESP-ICT school in the eighth constituency was also selected. A total of fifteen ESP-ICT phase I secondary schools in Nairobi county were therefore selected for this study. Selection of fifteen ESP-ICT phase I secondary schools in Nairobi was necessitated by the limited resources available for study since this research was privately funded. Further, the technique was used to subdivide the Form Three learners into two groups, that is, a group that frequently utilised Biology digital content and another one that rarely or never utilised the content for instruction. Some learners utilised curriculum digital content frequently while others rarely or never utilised it for instruction since the Biology digital content available in schools was mainly general reference and revision material. Ten learners were then randomly selected from each stratum to form Groups A and Group B. Thus, twenty learners were involved in every sample school. Both groups were selected from the same schools since data that were used for comparison in learners' achievement were obtained from progress records. Progress records for the six school terms, that is, term III in Form One to term II in Form Three had already been filled in Form Three term III when collection of data for this study took place. In this regard, the data could not have been influenced by the study or presence of the researcher during the data collection process.

2.3 Sample Size

A sample is a finite part of a statistical population whose properties are studied to gain information about the whole (Webster, 1995). A sample size of between ten to twenty percent is generally ideal for study (Amedahe, 2002; Aryl et al., 2002). Mugenda and Mugenda (2003) also noted that a sample size of ten to fifty percent is acceptable in research. This suggests that a sample size of at least ten percent is ideal for a study. Considering the experts view in addition to the nature of the accessible population and available resources, a proportionate sample size of 300 Form Three Biology learners and 30 Biology teachers was used for this study. Table 2 shows a summary of the sample size used in this study.

Table 2: Sampling matrix

Population Description	Target Population	Sample Size	Sample Size Percentage
Form 3 Biology Learners (Group A and B)	1,617	300	18.6%
Biology Teachers	68	30	44.1%

2.4 Research Instruments

Three instruments were used in this study, namely: Biology Teachers Questionnaire, Learners Focus Group Discussion Guide and Documents Analysis Sheet. Biology Teachers Questionnaire was used to gather data on the influence of digital content on learners' assessment and achievement in Biology. Learners Focus Group Discussion Guide was used to gather data from the learners on the influence of digital content on

their conceptualization of Biology concepts and achievement. The instrument also enabled the researcher to find out whether there was any change in terms of type of test items, frequency of assessment and the time taken to get feedback from assessments. Documents analysis sheet was used to analyze progress records to establish learners' achievement in Biology.

2.5 Data collection procedure

Before embarking on the data collection process, the researcher obtained permission from National Commission of Science, Technology and Innovation, Nairobi County Commissioner and Nairobi County Director of Education. The study schools were visited and permission obtained from the school principals. The researcher then met with the Biology teachers, explained to them about the study and assured them about the confidentiality of the information that they were going to provide. Two Biology teachers were then sampled purposively and requested to fill the Biology teachers questionnaire. They gave information on the utilisation of curriculum digital content and how it influenced the Biology assessment and achievement.

Guided focus group discussion then took place with learners in Group A and B separately. The two groups of learners were selected and placed in groups through stratified random sampling. The learners were probed to give information on digital content utilisation in Biology. In addition, they were explored on the influence of digital content utilisation on their assessment and achievement in Biology. Learners' scores for end of term Biology tests for term III in Form One, term I, II & III in Form Two and term I & II in Form Three were recorded using the documents analysis sheet. These were used to compare Biology achievement of learners who frequently used digital content and the ones who rarely or never used the content for instruction.

3. Study Findings and Discussion

3.1 Influence of the utilisation of Biology digital content on learners' assessment

Assessment is one of the most important elements of any curriculum. According to Brown and Knight (1994), Assessment is at the heart of the student experience. Ramsden (1992) argued that assessment always defines the actual curriculum from learners' point of view. He continues to argue that assessment defines what students regard as important and how they spend their time. In education, the term assessment refers to the wide variety of methods that educators use to evaluate, measure, and document the academic readiness, learning progress, and skill acquisition of students from preschool through college and adulthood (Hidden curriculum, 2014).

This study therefore sought to investigate whether use of digital content influenced assessment of learners in Biology. Teachers were asked to indicate whether use of digital content had any influence on the learners' assessment. A significant number of teachers (56.7%) indicated that learners' assessment was affected by utilisation of digital content. A list of Likert items was then used to get teachers views on various factors related to learners' assessment. These factors included frequency of assessment, variety of test items, feedback duration, adequacy of assessment and interactivity of assessment methods. The six factors were rated using a five-level rating scale. These levels included 1-strongly agree, 2-agree, 3-not

sure, 4-disagree and 5-strongly disagree. The data were then analysed in percentages to get the highest and lowest ratings.

A reasonable proportion of teachers (57.7%) indicated that the frequency of learners' assessment had improved as a result of Biology digital content utilisation in the instructional process. They explained that since digital content had ready assessment items, it was very easy to administer assessment questions after covering a few Biology concepts. Marking these test items was much easier since the systems had an inbuilt feedback mechanism. On the variety of items used for assessment of learners, majority of teachers (60.3%) agreed that digital content provided more varieties of assessment items in Biology. They observed that the content test items like *drug and drop, word puzzles, click on the answer, jumbled words, jumbled letters, cross words and hot spots* are not found in the ordinary assessment methods they use which has no digital content. Nearly three quarters of the teachers (70.1%) also pointed out that learners could receive immediate feedback when they take the assessment provided in the digital content.

On the adequacy of assessment, most teachers (85.1%) recorded that digital content did not provide adequate assessment to learners. They argued that the assessment items provided in the digital content were not enough for the learners. As per the interactivity of the assessment, a considerable number of teachers (69%) agreed that digital content made Biology assessment more interactive and interesting to learners. The results obtained from teachers on the influence of various assessment factors is summarised on Table 3.

Table 3: Results from teachers on learners' assessment

	Assessment factors (n=30)	SA	A	NS	D	SD
1	Learners assessment is more frequent with Biology digital content	37.3	20.4	21.1	12.3	9.9
2	Learners can be assessed using a variety of test items	41.1	19.2	18.6	19.9	1.2
3	Learners are given feedback immediately	35.4	34.7	2.1	17.2	10.6
4	Assessment of learners is adequate	12.1	11.6	3.3	38.7	46.4
5	Assessment methods are more interactive	43.4	25.6	7.8	18.6	4.9

A list of Likert items was also used to explore the learners' opinion on how utilisation of Biology digital content affected their assessment. Learners were given five items related to digital content and assessment and were asked to rate them during their guided group discussion sessions. An overwhelming majority of learners (97.4%) indicated that digital content made it possible for them to assess themselves during their personal study timings. All the learners agreed that digital content provided them with immediate feedback after an assessment test while most of the learners (84.3%) also indicated assessment through digital content was more interesting than assessment through the ordinary methods used by teachers. In addition, majority of the learners (89%) indicated that they were in control of their own assessment when using digital content to study Biology. However, 70% of the learners felt that Biology digital content did not provide adequate assessment items for them. Table 4 summarises the data from learners on digital content and assessment.

Table 4: Data from learners on digital content and assessment

	Assessment factors (n=150)	SA	A	NS	D	SD
1	I am able to assess myself during my personal studies	87.1	10.3	1.1	1.5	0
2	I receive immediate feedback after assessment	91.3	8.7	0	0	0
3	The assessment provided in the digital content is interesting	45.2	39.1	2.1	11.0	2.6
4	Enough assessment items are provided	11.2	12.1	6.7	30.6	39.4
5	I am able to control my own assessment	43.4	45.6	7.1	3.9	0

From these results, it can be observed that both teachers and learners indicated that most assessment factors improved with the use of digital content apart from the adequacy of assessment. Black and William (1998) observed that improvement in classroom assessment will make a strong contribution to improvement in learning. Factors like frequency of assessment, variety of assessment items, interactivity of the assessment and duration of feedback are shown to have improved with the utilisation of the Biology digital content. Black and William (1998) outlined that studies show firm evidence that innovations designed to strengthen the frequent feedback that students receive about their learning yield substantial learning gains.

Both teachers and learners indicated that digital content provided immediate feedback to the learners. Crooks (1988) indicated that Feedback to learners should be given regularly and while still relevant. Keller (1983) pointed out that that providing immediate, positive, verbal praise and informative feedback in a context that does not control the consequences of the performance may improve intrinsic motivation of the learners. Proper use of Biology digital content could therefore improve learners' assessment and consequently improve their conceptualization and performance in the subject.

3.2 Influence of the utilisation of Biology digital content on learners' achievement

Achievement is a quantifiable behavior in a standardized series of assessment tests (Simpson and Weiner, 1989). Conferring to Bruce and Neville (1979), educational achievement is measured by achievement tests developed for school subjects. Normally, achievement in such tests is expressed in form of test scores. A test score is a summary of the evidence contained in examinees responses to the items of a test that are related to the subject being tested (Thissen and Wainer, 2001). Achievement is therefore very important in teaching and learning since it gives information about learners' performance in a specific area or subject. This study therefore sought to find out whether utilisation of curriculum digital content for instruction had any influence on the learners' achievement in Biology.

During the study, teachers were asked whether utilisation of Biology digital content had any influence on the learners' achievement. Slightly more than half of the teachers (52.1%) indicated that learners who used digital content in Biology scored higher in the tests than their counterparts who did not utilize the content. They pointed out that Biology digital content enhances understanding of difficult concepts, promotes content retention and stimulates learners' interest in the subject. However, 41.3% of the teachers argued that use of digital content had no influence on learners' scores in Biology while 6.6% were not sure. When

the same question was posed to learners during guided group discussions, nearly three quarters of the learners (73.3%) said that use of Biology digital content could make them get better scores in Biology. They also pointed out that digital content was very interesting to them and made them understand some concepts better than when they use textbooks. Some of the learners (36.7%) nevertheless thought that use of Biology digital content would not have any influence on their achievement.

Teachers' progress records for the sampled learners in six end- of- term assessment tests were then examined and the scores recorded in the document analysis sheets. The learners scores were categorized into two based on the utilisation of Biology digital content. Group A consisted of scores of the learners who frequently utilised Biology digital content in their studies while group B consisted of the scores of the learners who rarely or never used Biology digital content in their studies. The means, standard deviation and standard error for scores obtained from the teachers' progress records for both Group A and Group B were then computed. Table 5 gives a summary or the results obtained.

Table 5: Mean, standard deviation and standard error of the learners' achievement

Group	Number of learners (n)	Mean	Std deviation	Std error mean
Group A	150	6.40	0.98	0.19
Group B	150	5.79	1.12	0.21

A comparison of the means from the achievement between the learners who utilised Biology digital content frequently (Group A) and the ones who rarely or never utilize the content to learn Biology (Group B) was then done. This was achieved by comparing the means using a two sample Student's t-test at 0.05 level of significance. Equal variances were assumed since the p-value for F-test (0.63) was greater than 0.05. The results are summarised on table 6.

Table 6: Comparison of learners' achievement in Biology

Number of learners (n)	t-value	p-value	Confidence interval (95%)	
300	2.166	0.036	0.078	1.171

From the results, it can be observed that the p-value of 0.036 for the t-test is smaller than α value of 0.05. This suggests that there was a statistically significant difference between the two means at 0.05 confidence level. Thus, there is evidence to conclude that there is a difference between the achievement of the learners who utilised digital content frequently to study Biology (Group A) and the ones who rarely or never utilize the content (Group B). This implies that utilisation of digital content has a positive influence on learners' achievement in Biology. These results are consistent with various studies that have been conducted by scholars in this area before. Sterling and Gray (1991) conducted a study on the influence of the computer stimulation programs on the students' tendencies and their response to the statistics course. After analyzing the study results, it was found out that there was a statistically significant difference in the cognitive achievement in favor of the experimental group.

Fraser and Walberg (1995) noted that the use of computers for instruction resulted in increased student interest, cooperation and achievement in science. Allen (1998) conducted a study to find out the efficiency of multimedia software in the academic achievement of a sample from Texas University in the microorganism curriculum, their knowledge retention, and their attitudes toward using multimedia computers in teaching the microorganism course. The study result revealed statistically significant difference, in the academic achievement, knowledge retention and attitude towards computer, in favor of the experimental group which studied using the multimedia method over the control group which studied using the traditional method. Salem (2000) dealt with the effect of using computer as an educational tool in teaching the curriculum of statistics on the development of statistical skills among the third-grade commercial secondary school students. The study results showed statistically significant difference in the average grades of the experimental and control groups in favor of the experimental group after teaching the program.

In a meta-analysis (Bosco, 1986; Fletcher,1990; Kulik, Kulik, & Schwalb 1986) examined various studies that compared learning content presented in some traditional instructional methods to learning the same content presented using multimedia instruction. The data was collected in Biology and Chemistry among other disciplines. The control group usually learned the information via classroom lecture practical. The comparison group covered the content using interactive videodisc or some other kind of computer-based instruction. The researchers measured learning using achievement tests. The analyses found that learning was higher when the information was presented via computer-based multimedia instruction than traditional classroom teaching methodologies.

AbuYunis (2005) studied the effectiveness of multimedia software to teach Geometry in the second grade of preparatory schools. The results revealed a statistically significant difference in the average of academic achievement of the experimental and control groups in the test conducted after the experiment in favor of experimental group. Nasr (2005) carried out a research to study the Effectiveness of the use of multimedia computer material on teaching geometry to the third preparatory grade students on students' academic achievement and the development of innovative thinking. The study revealed that there was a statistically significant difference between the average grades of the experimental and control group at the level of academic achievement. Ayere, et al. (2010) reported that there was a significant difference in academic performance between NEPAD and non-NEPAD schools attributed to e-learning. Jesse al. (2014) noted that there was a statistically significant difference in performance between the group that utilised computer assisted instruction and the one that utilised convention instructional techniques in Biology, Chemistry and Physics.

On the learners' assessment, teachers were asked whether use of curriculum digital content had any influence on the learners' assessment. A moderate number of teachers (56.7%), indicated that learners' assessment would be positively affected by the utilisation of digital content. A Likert scale with a list of items was then used to get the teachers' opinion on some factors related to learners' assessment. These factors included frequency of assessment, variety of test items, feedback duration, adequacy of assessment and interactivity of the assessment.

4. Conclusion

Teachers and learners indicated that utilisation of curriculum digital content improved various aspects of Biology assessment. Such aspects include the frequency of learners' assessment, types of test items, feedback duration and interactivity of the assessment. A comparison of the achievement between groups that utilised curriculum digital content and those that did not revealed that the ones that utilised the digital content scored better. Utilisation of curriculum digital content hence improves the mode of assessment and learners' achievement in Biology.

5. Recommendations

The findings of this study disclosed that that utilisation of curriculum digital content improved learners' assessment and achievement in Biology. In assessment, factors like assessment frequency, test items, feedback duration and assessment interactivity improved. A comparison of the achievement between the group that utilised curriculum digital content and the one that rarely or never utilised the content revealed that the one that utilised digital content had better scores. This implied that utilisation of curriculum digital content had a positive influence on Biology assessment and achievement. It is therefore recommended teachers and learners should be provided with adequate curriculum digital content for utilisation in the instructional process. In addition, all schools, and not only ESP-ICT schools, should be provided with proper infrastructure to enable them access and utilise curriculum digital content in the instructional process.

This study also found out that assessment through curriculum digital content was not adequate. Curriculum digital content developers should therefore ensure that they develop content with sufficient assessment items. This would enhance assessment modes and learners' achievement in secondary schools resulting to improved performance. Finally, this study is based on data from Biology only. Further research is therefore recommended on the influence of the utilisation of curriculum digital content on assessment and achievement in other science subjects.

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