Evaluating the Effectiveness of Multimedia Content in Teaching and Learning: A Survey of Primary Schools in Nakuru Town, Kenya

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Abstract

In today's digitally dependent environments, multimedia is a popular form of technology. The integration of this technology into education has been especially remarkable, providing pupils with options for learning that may enhance conventional teaching approaches. The study aimed to evaluate the adoption of multimedia content in primary school education in Nakuru Town and assess its effectiveness in improving teaching and learning in educational settings. The study adopted a combination of descriptive research designs. Diffusion of innovation theory was used as a theoretical framework since it seeks to illustrate how new innovations are transmitted through a particular channel by members of a society. This research focused on a specific group of 128 primary schools located in Nakuru Town. 79 primary schools were chosen by judgmental sampling. The researcher acquired primary data by administering a questionnaire and doing observational experiments. Descriptive statistics was applied in analyzing the data collected. The results were shown in tabular and graphical formats. An R squared value of 74.8% was achieved indicating a positive correlation with the parameters utilized, a result considered ideal for this study. The study covers important elements of multimedia teaching and learning, including quality indicators, descriptors, and scores. Hence, it will be important for the government and key stakeholders to evaluate multimedia content in primary schools in Kenya in order to have appropriate content in the Kenyan setup.

Keywords: *Multimedia, Teaching, Learning, Adoption, Evaluation methods*

1.0 Introduction

The adoption of information technology in teaching and learning has totally transformed the way education is imparted to learners in contemporary times (Baharul et, al., 2014). Research has revealed that the education sector all over the globe is fast being transformed from the traditional face to face environment to more advanced class environments

that even encourage the use of online teaching and learning where learners and teachers never meet physically (Lester & King, 2009). Multimedia technology has therefore emerged as a popular form of technology in contemporary technologically dependent learning environments. It basically involves the combination of both sound and motion in the classroom. In this scenario, the use of pictographic examples in the process of teaching and learning is extensively employed. This technology incorporates the simulation of moving pictures of objects that have been developed by an artist. Recently, the use of digital animation in the education industry has shown itself as one of the most fashionable instruments for delivering multimedia content to students. The use of this technology has also been credited for its ability to improve and enhance retention of knowledge and memory among learners. (Musa et al., 2013). Education content that happens to highly dynamic is better taught using multimedia technologies in many learning institutions (Lowe, 2004).

Participants acknowledged the value of multimedia as an important teaching tool that can enhance and support conventional teaching methods. This is according to a study by Vagg, Baltaet al. (2020). The study further noted that multimedia cannot take the place of conventional teaching methods. The use of multimedia tools was reportedly enjoyable for the participants as well, as it enhanced their learning. Students can interact with different learning methodologies on a single multi-media platform, which supports their preferred learning style. Multimedia learning can quickly adapt to the changing preferences of learners over time and across many topics.

In order to achieve this, the Kenyan government in 2013 launched the One Laptop Per Child Per Child (OLPC) project in class one in all public primary schools in Kenya. It was later renamed the Digital Literacy Programme (DLP) (Kenya. DLP Secretariat,

2016). In their 2014 study, Sheppard and Moldéus reported that the project was supposed to start in January 2014 but did not. However, in May 2026 due to cost implication during the roll-out, the policy was changed from laptops to tablets. (Wanzala & Nyamai, 2018). The introduction of laptop computers into primary schools was also in keeping with the recommendations of the Kenyan ICT policy framework, which pushed for complete integration of ICT in all educational institutions through the use of appropriate digital equipment with the goal of attaining vision 2030 (Kenya. MoE, 2006). Multimedia content loaded in this digital equipment is likely to play a key role in teaching in primary schools in Kenya and its evaluation is important in order to ensure it meets the desired objective. Therefore, there was a gap that existed and required to be bridged.

1.1 Research Objectives

The research was guided by the following objectives:

Main Objective

The main objective of this study was to evaluate the effectiveness of multimedia content in teaching and learning in primary schools of Nakuru town, Kenya.

Specific Objectives

i.   To evaluate the level of adoption of multimedia content in teaching and learning in primary schools in Nakuru Town.

ii. To evaluate the level of effectiveness of multimedia content in teaching and learning in primary schools in Nakuru Town.

Research Questions

iii. What is the level of adoption of multimedia content in teaching and learning in primary schools in Nakuru Town?

iv. How effective is multimedia content in teaching and learning in primary schools in Nakuru Town?

1.2 Justification

There is evidence that research on the use of

multimedia information in education and training is available. However, the majority of study is mostly concentrated on the use of multimedia information for educational purposes in developed nations, rather than in developing nations. Moreover, the government of Kenya introduced the use of information technology in primary schools in the country. This implies that the use of multimedia content is being implemented among primary schools in the country. To accomplish this goal, the government rolled out a program of equipping primary schools with computers preloaded with multimedia content for teaching and learning purposes. By introducing multimedia content, learners will find it easier to understand relate events. This implies that there is need to evaluate this multimedia content to ensure it meets the desired objective. The researcher conducted the study in Nakuru Town since it is among the regions that served as pilot project areas for the laptop project in Kenya. Use of multimedia content has therefore been in use in the town for a relatively long period of time hence will provide reliable data.

2.0 Literature Review

2.1 Theoretical Review

This study will be guided by the following theories: diffusion of innovation theory; Technology acceptance theory and the Transfer of learning Theory

2.1.1 Diffusion of Innovation Theory

The theory of Diffusion of Innovation aims to illustrate how new innovations are transmitted through a particular channel by members of a society (Rogers, 2003). For this to take place, there are four factors that may affect the diffusion process: Innovation, communication methods, time, and social structure are all factors mentioned by Rogers (2003).

In order for a new invention to be embraced, five essential features of the innovation must be fulfilled. These include comparative benefit, compatibility, intricacy, trialability, and observability (Rogers, 2003). Comparative benefit refers to extent to which a new innovation is considered better than the ones that have been in use before. If people regard some new innovation as being of greater benefit than the existing ones, they are likely to adopt the technology. Compatibility pertains to the consistency between the new technology and the pre-existing requirements of individuals who wish to embrace it. Any idea that is contrary to the needs of the adopters will be readily rejected or experience sluggish adoption. Intricacy on the other hand refers to the trouble associated with use of some technology. If an innovation is easier to comprehend and utilize then adoption rate becomes very high. Trialability entails the possibility of testing a new innovation before accepting it for implementation. Innovations that provide users a chance to test them before final adoption may enjoy greater or higher rate of adoption. Observability is the degree to which others can see or witness the new effects of an invention. If users are able to observe significant benefits of a new innovation, they are highly likely to adopt it (Rogers, 1995).

The relevance of the diffusion of innovation theory to this study lies in the fact that technology is an innovation that requires adoption by institutions. In the contemporary education environments new technologies are being introduced such as digital animation and have significantly affected the way teaching is carried out as well as acquisition of knowledge and skills by the learners. Multimedia is therefore considered an important technology that can be adopted to enhance teaching among primary schools.

2.1.2 Transfer of Learning Theory

This theory suggests that knowledge that is learnt in class can as well be transferred and applied in other environments. Knowledge transmission was one of the primary topics examined in the field of educational psychology. Edward Lee Thorndike (Kleibard, 2004) was a pioneering researcher in relation to this notion. His research uncovered that the occurrence of transfer was seldom, despite its

recognized importance in the learning process. In one of the experiments, he conducted where the learners estimate the size of some shape and then it was later changed, he observed that earlier knowledge obstructed learning (Kleibard, 2004).

One of the suggested hindrances of non-occurrence of transfer encompasses both superficial and underlying structure. Surface structure refers to the way in which a problem is presented or framed, whereas deep structure refers to the specific methods or techniques used to achieve a solution. The theory states that most people are usually controlled by the surface structure. However, to be more realistic, surface structure is not significant. The only reason why people get concerned with the surface structure is because it harbors foundational ideas on problem solving. The danger is that it erodes their comprehension of the real issue at hand. Regardless of one's efforts to concentrate on the underlying structure, the act of transferring becomes very difficult due to the often-inconspicuous nature of the deep structure. In conclusion, the surface structure is may block a person's effort to transfer the knowledge he has learned in order to use it in solving a problem (Willingham, 2009).

Sfard (1998) argues that contemporary education instructions primarily emphasize the transmission of regular information, regardless of the context that provides its significance. This is the reason why students may find it impossible to transfer the information to other environments of their learning process. Learners require more practical knowledge that relates to real life situations more than intellectual ideas. Critics of positioned reasoning, however, may assert that would argue that by discrediting abstract knowledge transfer may become difficult. Therefore, for transfer to take place, there need to be a balance between the two structures (Sfard, 1998).

Several theorists dispute the notion of transfer, saying that it inadequately portrays how students use their acquired knowledge in unfamiliar situations. Alternatively, they suggest that students actively modify their comprehension to align with new circumstances rather than just transferring information passively. According to this perspective, students actively participate in the process of creating and modifying knowledge to fit various situations. The student's desire to apply information is the driving force behind this transformation. If the learner does not recognize the need for transformation, it is unlikely to happen (Larsen-Freeman, 2013).

As the transfer of learning theory suggests that students find it difficult to conceptualize abstract knowledge, this theory helps support the adoption of multimedia as one way of making teaching and knowledge more realistic for the learners.
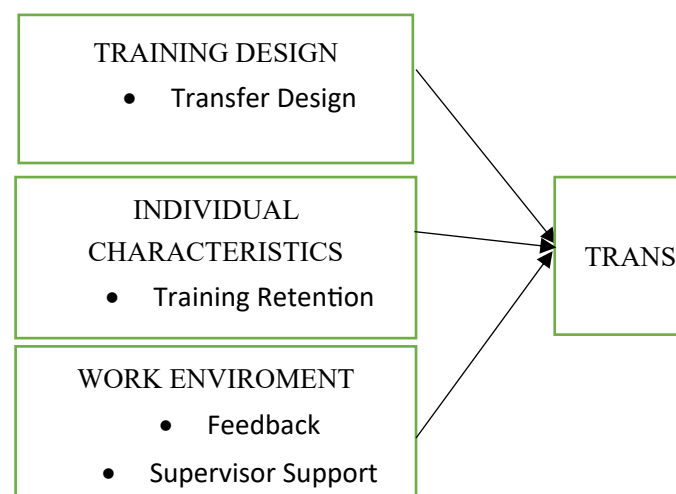

Figure 1: Simplified Model of Transfer of Training (Chen et al., 2005)

Evaluating multimedia content in teaching and learning is crucial for ensuring that it effectively supports educational goals and engages students in meaningful ways. Multimedia content can encompass various forms, such as videos,

animations, images, audio, and interactive simulations. By carefully evaluating multimedia content in teaching and learning, educators can enhance the overall educational experience and help students achieve their learning goals effectively. This process should be ongoing, with continuous assessment and improvement to adapt to changing educational needs and technologies.

The key considerations and methods for evaluating multimedia content in education encompasses.

1. **Learning Objectives Alignment:** -Ensure that the multimedia content aligns with the specific learning objectives and outcomes of the lesson or course. It should support the desired educational goals.

2. **Content Relevance:** Assess the relevance of the multimedia content to the subject matter and the needs of the learners. It should provide value and context to the topic being taught.

3. **Pedagogical Effectiveness**: - Evaluate how well the multimedia content supports different pedagogical approaches, such as active learning, problem-based learning, or flipped classrooms. It should enhance the chosen teaching methodology.

4. **Engagement and Motivation:** - Determine whether the multimedia content is engaging and motivates students to participate actively in the learning process. Interactive elements and compelling visuals can contribute to higher engagement.

5. **Inclusivity and Accessibility:** - Make sure that all pupils, including those with impairments, can access multimedia content. Check for features like closed captions, transcripts, and alternative formats to accommodate diverse learners.

6. **Usability and User Experience:** - Evaluate the ease of navigation and user interface of multimedia materials. User-friendly interfaces enhance the learning experience and reduce frustration.

7. **Interactivity:** - Assess the level of interactivity offered by the multimedia content. Interactive elements, such as quizzes, simulations, or branching scenarios, can enhance active learning and critical thinking.

8. **Media Quality:** - Consider the quality of multimedia elements, such as video resolution, audio clarity, and image resolution. High-quality media can improve comprehension and retention.

9. **Feedback and Assessment:** - Determine whether the multimedia content provides opportunities for students to receive feedback on their learning progress. Assess whether it supports formative and summative assessment.

10. **Learning Analytics**: - Utilize learning analytics tools to gather data on how students interact with the multimedia content. Analyzing data can help educators make data-driven improvements to their teaching materials.

11. **Student Feedback:** - Collect feedback from students regarding their experiences with the multimedia content. Their insights can reveal areas for improvement.

12. **Continuous Improvement:** - Multimedia content should be viewed as a dynamic resource. Regularly update and improve it based on feedback, changing educational needs, and emerging technologies.

13. **Alignment with Technology:** - Ensure that the multimedia content is compatible with the technology and devices used by students, whether they are accessing it on desktops, laptops, tablets, or smartphones.

14. **Legal and Ethical Considerations:** - Ensure that every copyrighted content utilized in the multimedia content has the appropriate licenses and rights. Respect ethical guidelines and privacy regulations.

15. **Cost-Effectiveness:** - Evaluate the cost-effectiveness of creating or acquiring multimedia content. Consider the return on investment in terms of improved learning outcomes.

2.2 Adoption of Multimedia in Teaching

Teachers choose lessons depending on the specific content they want to communicate to pupils. Derry, Pea, Barron, et al. (2010) propose that the method should include carefully choosing relevant material and ideas from the course and delivering them to students in the form of videos. Videos were used as the main method for elucidating the course ideas in

their case study. In addition, in the case of any intricate sections of the course, teachers would choose identify key aspects and deliver them via videos to streamline the ideas for students and engage their attention. Another factor to consider when selecting videos for classroom use is the narrative approach, as described by Derry, Pea, Barron, et al. (2010). In this method, teachers create a narrative framework for students.

Rajhi (2016) argues that the majority of educational institutions whether primary secondary or universities and colleges have adopted the use of multimedia I teaching. This practice, they argue, has been driven by the beef that use of multimedia technology in learning and teaching will significantly enhance learning outcomes among the students. However, the teachers do not select any content but specifically that which is pertinent to the knowledge they want to convey to the pupils. The use of some aspects of multimedia such as videos has also proved to be instrumental in simplifying complex issues for better understanding and attracting the attention of the learners. Selection of attractive multimedia content also Plays a crucial function in captivating learners' attention and facilitating their comprehension of the given material (Derry, Pea, Barron, et al., 2010).

The adoption of multimedia technology or content in teaching originated mainly from the United Kingdom. The country pioneered the adoption of visualizations in education and has made significant progress especially in adoption of multimedia content in primary schools. Among the technologies that have been adopted in the school sector in the UK include interactive whiteboards, mobile and handheld technologies as well as visual animations. It is evident that multimedia has been adopted in teaching in UK schools but scarce information exists on its use to evaluate learners (Cheung & Slavin, 2011).

The incorporation of information communications technology (ICT) such as multimedia in education is very important in preparing students for life in the 21st century where technology has proved to be the knowledge transfer superhighway. Simin and Wan (2015) argue that educational institutions that have a responsibility of developing students to live in a knowledge society have an obligation of ensuring complete integration of technologies such as multimedia into their curriculum.

The integration of Information and Communication Technology (ICT) in schools, namely in the classroom, is essential due to students' familiarity with technology and their enhanced ability to learn in a technology-driven setting. The integration of technology into education greatly improves pedagogical features, leading to more effective learning facilitated by ICT elements and components (Jamieson-Procter et al., 2013).

Bawden (2001) classifies multimedia literacy as a component of digital literacy, a comprehensive concept that includes other literacies such as network literacy, Internet literacy, and hyper-literacy. Nevertheless, digital literacy mostly pertains to comprehending information discovered on the internet. He provides a more specific definition of digital literacy as the capacity to understand and effectively use information obtained from different sources, presented in different forms, saved on computers, and shared and published on the Internet. Digital literacy involves the effective use of information accessed over the Internet and the skillful management of digital assets. It specifically emphasizes the ability to handle pictures, text, and audiovisual content in a nonlinear and dynamic hypertext structure. According to this notion, digital literacy is strongly related to multimedia literacy.

The goal of multimedia literacy is to improve students' understanding of the functioning, meaning generation, organization, and construction of media

within the context of reality. Additionally, it aims to provide students with the capacity to produce their own multimedia content. Proficiency in multimedia literacy requires basic computer abilities since multimedia content is transmitted via computers. Integrating visual and media literacy education into existing educational institutions is crucial for multimedia literacy education. The integration of media and technology in education, along with the promotion of literacy, are closely connected to the idea of multiliteracy. The goal is to introduce these tools into the classroom to facilitate the teaching of literacy and to assist in evaluating students' learning development (Nives & Boras, 2014).

2.4 Effectiveness of Multimedia Content in Teaching

The purpose of interactive multimedia is to provide the learner with autonomy, allowing them to have control over the study of content at their preferred speed and based on their own interests and needs. The objective of interactive multimedia content is not only to replace the instructor, but rather to entirely revolutionize the teacher's job. Thus, it is imperative that multimedia be carefully constructed and sufficiently sophisticated to replicate the attributes of an outstanding instructor, using several aspects of cognitive processes and cutting-edge technology in its composition (Friedland & Knipping, 2007). Contemporary multimedia courseware should include adaptability and flexibility, enabling tweaks and adjustments once the program has been created and built with suitable responsiveness.

Although multimedia cannot replace practical learning experiences, it may enhance and strengthen the efficacy of field activities and scientific education. Novel information methods, such as podcasts, blogs, and streaming video and audio, may be used to actively involve students and appropriately demonstrate scientific topics, while simultaneously strengthening their media literacy abilities. Students get the opportunity to engage

using digital media tools, such as platforms for sharing photos, uploading videos, and generating maps, in order to demonstrate their comprehension of a subject. This process also helps to improve their reading skills as they generate their own material. In the current day, almost every institution claims to have a plan to use the internet or digital media in order to improve and progress conventional education.

The term e-learning was established and created enthusiasm with the introduction of the Internet in the mid-1990s. Some experts predicted substantial changes in the educational field or even the possible extinction of conventional schooling. The question of whether multimedia technology can really improve learning experiences and make them more engaging and pleasurable remains unresolved (Friedland & Knipping, 2007).

According to Alina (2016), the use of multimedia in education may provide many benefits. One notable advantage is its ability to improve understanding at a more profound level. Research indicates that multimedia learning takes use of the brain's ability to build associations between verbal and visual representations of information, leading to a more profound comprehension that enhances the application of knowledge in many situations. These qualities have great importance in contemporary 21st-century classrooms, as students are being equipped for a future that requires advanced cognitive abilities, the ability to solve complex problems, and effective teamwork. Furthermore, multimedia learning environments have a direct influence on both academic achievements and individual development. Moreover, multimedia has been associated with its capacity to elicit profound emotions among learners.

2.7 Empirical Literature

The use of material in education and multimedia technologies have been the topic of several

research. The articles analyzed underlined the significance of multimedia technologies n enhancing the teaching and learning environment. According to several studies, multimedia technology has a positive effect on how professors impart knowledge and how pupils learn the material. The research also revealed that different educational institutions have a variety of multimedia-based tools available, most of which are based on subject, field, age, or level.

Additionally, using a variety of focus groups and descriptive, qualitative, and quantitative research approaches, a number of the reviewed articles examined the effects of multimedia-based instructional materials on teaching and/or learning in both pre-test and post-test scenarios.

Pinter, Radosav, and Cisar (2012)) conducted a study on the impact of using interactive animations in teaching. Two courses from Subotica a technical institute were included. These were: "Analog and Digital Electronics" and "Microcontrollers". The experiment lasted over a period of three years, and it involved the formation of two groups in every academic. Both groups' members participated in traditional frontal teaching, but the experimental group could use interactive Flash animations built from selected parts of those courses as supplementary tool. At the end of the semester, the exam marks were analyzed with a Two-Sample T-Test. The results revealed that learning with properly created interactive animations could have positive effects on most students' academic performance.
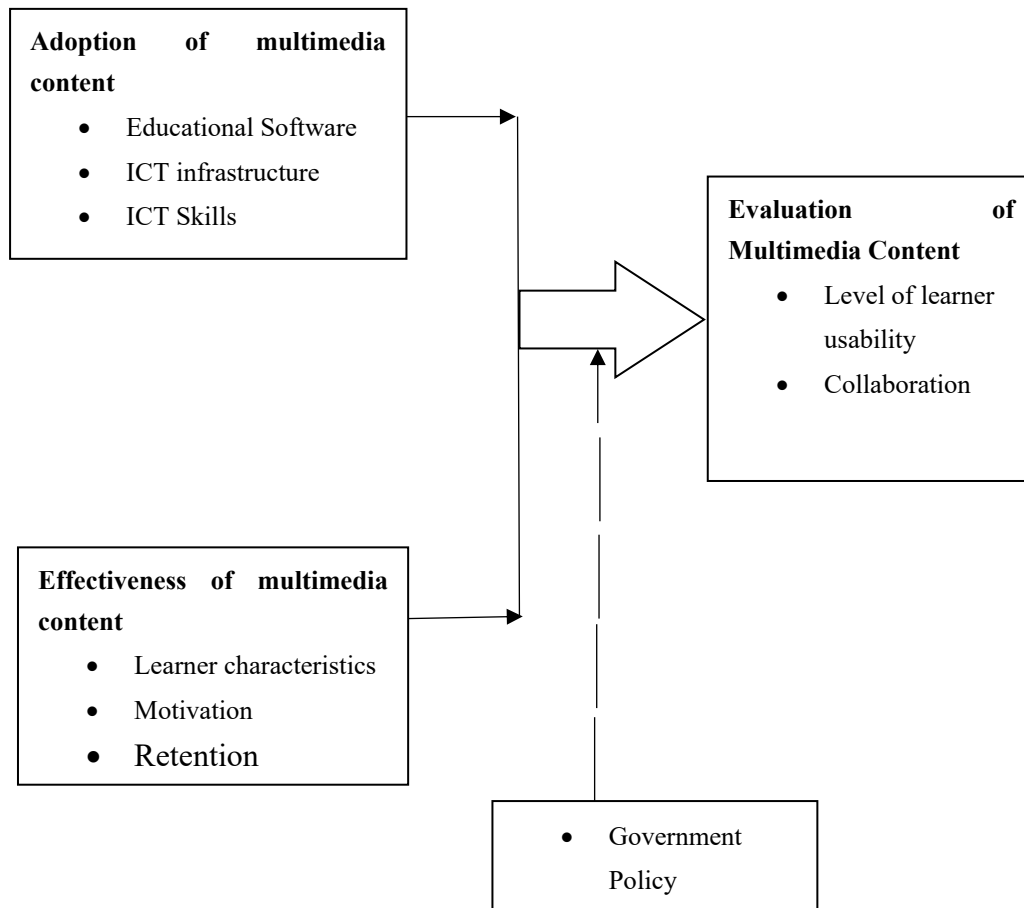
Aktas, Bulut and Yuksel (2011) carried out research on the effect of using computer animations and activities about teaching patterns in primary mathematics. The sample of the study was 28 eighth grade students in second semester of 2010-2011 educational years who were attending a public school at Ankara. The one group pretest- posttest design was used for research methodology. Data were collected by pre-test and

post-tests which were developed by researchers and it was revised in terms of reliability and administered to the students. The mathematics subject was presented by using computer to the students after pre-test. At the end of the teaching, that achievement test was applied on the group as the post-test. For data analysis, quantitative methods were used. According to the findings; academic performance of the students increased by using computer animations and activities about patterns. Also, it is found that there was a significant difference between academic performances of students about different pattern types.

Mtebe, Mbwilo, and Kisaka (2016) investigated the factors that influence teachers' use of multimedia-enhanced curriculum in Tanzanian secondary schools. Their findings revealed numerous important elements, including performance expectancy, effort expectancy, social influence, enabling circumstances, habit, behavioral intention, and

issue of evaluating multimedia content in teaching. Most of them (Aksoy, 2013; Pinter, Radosav & Cisar, 2012; Aktas, Bulut & Yuksel, 2011) focused on the effect of multimedia on teaching. This implies that research on the assessment of multimedia material in primary school teaching and learning is necessary.

2.8

Adoption of multimedia content
- Educational Software
- ICT infrastructure
- ICT Skills

Evaluation of Multimedia Content
- Level of learner usability
- Collaboration

Effectiveness of multimedia content
- Learner characteristics
- Motivation
- Retention

- Government Policy

Conceptual Framework

hedonic motivation. Hedonic motivation is the pleasure or happiness gained from utilizing a certain technology, which impacts consumers' adoption and continuous use of multimedia-enhanced material (Venkatesh et al. 2012). Teachers are more likely to accept and stick with multimedia-enhanced information if they feel good and satisfied from its utilization.

A conceptual framework establishes the correlation between the variables being studied. Figure 2 displays the independent variables and dependent variables, as well as the interconnections that exist between them.

It is also clear that the study was also focusing on the effect of digital animation rather than evaluating multimedia content in teaching.

3.0 Research Methodology

3.1 Introduction

This section provides comprehensive information on the study methods that guided the researcher in

It is evident that these studies have not dealt with the

conducting the study. The research design used is included. The text addresses the specific demographic group that is the focus of the investigation. The document provides a description of the number of participants included in the study and the methods used to choose them. This document provides a description of the research tools and data gathering procedures used. It examines the accuracy and consistency of the instruments. It provides an explanation of the data analysis techniques used as well as an account of ethical considerations.

3.2 Study Design
This study used a combination of descriptive and experimental research approaches. Descriptive research seeks to provide a detailed portrayal of a certain event or condition. It investigates several facets, including the views, skills, actions, knowledge, and beliefs of people, groups, or circumstances (Kothari, 2005).

The rationale for selecting this strategy was based on the fact that the research included a case study design, including many primary schools within Nakuru town. In addition, the researcher used the descriptive survey approach since it enabled the evaluation of connections between variables (Teddlie & Tashakkori, 2003). Singleton (2009) defines a descriptive design as a complete method that allows for the efficient collecting of considerable and diverse data in a short period of time. This technique also permits quantitative analysis, leading to a reliable presentation of results.

3.3 Population of the Study

According to Pole and Lampard (2002), a research population refers to all persons that are part of a certain group that is important to the study. Therefore, the research population consisted of all 128 primary schools located in Nakuru town. The selection of the study population was contingent

upon the authoritative roster furnished by the Ministry of Education. Consequently, in accordance with Bailey's (2006) definition, the research population included all 128 primary schools located in Nakuru town

3.4 Sample Size and Sampling Techniques

A sample, as described by Abikoye and Adekoya (2010), is a subset of items taken from a population to serve as a representative of the whole population. According to Mugenda and Mugenda (1999), a sample size of 30% of the population is considered enough for descriptive investigations. According to Stigler (1971), it is recommended to have a minimum of 30% for statistical analysis as a realistic guideline for the least number in each category within a sample. The sample size, which is a smaller group selected from the population, is deliberately designed to accurately reflect the characteristics of the full population. A total of 128 primary schools in Nakuru town were included in the sample. The research used judgmental sampling, commonly referred to as non-probability sampling, due to the unavailability of computers or laptops provided by the government in certain primary schools participating in the pilot plan. Judgmental sampling involves selecting the population based on specific criteria, rather than using equal probability of selection.
The source cited is Trochim (2004). Exclusive focus was placed on public primary schools, with not all of them having gotten the computers.
Consequently, the research focused on the primary schools in Nakuru town that had acquired laptops and were actively using them. The sample size was determined using Yamane's (1973) sampling formula.

$$n = {}^{N}\!/_{1 + N_{(e)^2}}$$

Yamane's, (1973) formula;
Where; n = Sample size
   N = Population size (128)
   e = the error of Sampling (7%)

Therefore; n= $\underline{\quad 128 \quad}$
$\qquad$ 1+128 (0.07)2

Sample = 78.66 ≈ 79 respondents (Sampling frame is shown in Appendix III)

Hence, a total of 320 participants were chosen from the primary schools to participate in the research.

The participants consisted of 320 teaching personnel.

3.5 Data Collection Tools and Procedure

This research used primary data acquired from teachers who utilized multimedia content in their teaching at selected primary schools in Nakuru town. Data collection was conducted via the use of a questionnaire and observation methods throughout experimental procedures. The questionnaire was designed in accordance with the study's objectives and used a Likert scale style, consisting of closed-ended questions. The Likert scale went from 1 to 5, with 1 indicating "strongly disagree" and 5 indicating "strongly agree." In addition, (2) and (4) were marked as "disagree" and "agree," respectively, while (3) represented "not sure."

There were four parts in the questionnaire. Section A included inquiries on the demographic data of the participants; Section B included inquiries on the extent to which multimedia content has been embraced, while section C focused on the efficacy of multimedia content in the realm of education. Section D contained questions that informed the development of the enhanced model. The questionnaires were completed by the teachers. The questionnaires were chosen due to their established efficiency in gathering demographic information

and user perspectives (Preece, Rogers, & Sharp, 2002). Experiments using multimedia content were conducted and they involved pupils who were subjected to pre and post exposure tests. The experiments were used to test the effectiveness of multimedia content in teaching. The learners will be divided into two groups. One group will be taught a lesson without the use of multimedia content whereas the other will be taught the same lesson using multimedia content. The two groups were examined and the scores recorded. This assisted in establishing whether the use of multimedia content had an effect in the comprehension and retention of the learners.

3.6 Data analysis

The acquired data underwent a process of cleaning and sorting to guarantee its completeness and consistency. Subsequently, it underwent coding to ensure its suitability for input into Statistical Packages for Social Sciences (SPSS) version 20. The data concerning demographic information of the respondents was analyzed using frequencies and percentages; data on level of adoption of multimedia content in teaching in primary schools in Nakuru Town and the effectiveness of Analyzed in this study were the measures of central tendency used to assess the effectiveness of multimedia content in education i.e., mean. The qualitative data that was collected was also analyzed using content analysis. Secondary data was also reviewed carefully in order to assist in developing an evaluation model that will be used to evaluate multimedia content used for teaching in primary schools in Kenya. The results were communicated using summarized numerical data, tables, and visual representations.

3.7 Ethical Considerations

The researcher acquired an ethical clearance letter from the University ethics review committee and a research clearance letter from NACOSTI. This study involved minors who could not participate in

a study without obtaining a written consent from the parents. The researcher therefore developed consent forms that were filled by the Parents granting permission for their children to participate in the research. Only those children who brought signed consents from the parents were included in the study. The researcher also guaranteed the anonymity for the information gathered during the investigation. The researcher used the data for the intended purpose only and did not divulge any part of the information to third parties.

4.0 Research Analysis and Findings

The objective of this study was to evaluate multimedia material in educational environments. The research focused on primary schools located in Nakuru Town, Kenya. The primary objectives were: evaluating the extent to which multimedia contents are utilized in teaching and learning and measuring the effectiveness of multimedia content in teaching and learning. This section presents the findings of the investigation.

4.1 Response Rate

The objective of the research was to recruit a total of 79 participants from primary schools located in Nakuru Town. The researcher selected a sample of 79 people from the targeted population. A total of 79 questionnaires were circulated for data collection, out of which 71 were returned, resulting in a completion percentage of 90%. Mugenda & Mugenda (2003) suggests that a response rate of 50% is sufficient for analysis, while a rate of 60% is considered favorable, and a rate of 70% or more is considered outstanding. Therefore, the response rate in this research was considered quite satisfactory. All persons in the chosen domain were given equitable chances for involvement. The demographic

information included age, gender, marital status, tenure, and educational achievement.

4.2 Results and Discussions

4.2.1 Demographic Information

The teachers were required to respond to a total of seven questions relating to their demographic

What is your designation?				
	Frequency	Percent	Valid Percent	Cumulative Percent
Class teacher	39	53.2	53.4	56.2
Deputy Headteacher	9	12.3	12.3	68.2
Headteacher	2	2.7	2.7	71.2
Subject teacher	21	28.8	28.8	100.0
Total	73	100.0	100.0	

information. The purpose of these questions was to establish the suitability of the participants that took part in the research. The following presentation illustrates the outcomes derived from their respective replies.

Table 1 Response rate

The data presented in Table 1 above reveal that 2.7 % of the respondents were headteachers, 12.37% were deputy headteachers, another 53.4% were class teachers whereas 28.8% were subject teachers. This distribution of respondents was considered appropriate because majority of the respondents were subject teachers who understood well the impact of usage of

Educational qualifications				
	Frequency	Percent	Valid Percent	Cumulative Percent
Degree	41	56.2	56.2	58.9
Diploma	14	19.2	19.2	78.1
Masters	4	5.5	5.5	83.6
Other (S	10	13.7	13.7	97.3
Ph.D	2	2.7	2.7	100.0
Total	73	100.0	100.0	

multimedia content in teaching and learning. The

distribution also included representatives in the hierarchy of primary school administration and this was important since they also provided important information relating to the current study as decision makers in the school setup.

The second question was to find out the academic qualification for the respondents.

Table 2 Educational qualifications

The results as illustrated in table 2 above revealed that 19.2 % percent of the respondents had attained diploma qualifications, 56.2% had degree qualifications and 5.5 % had master's degree qualifications while 2.7% had PhDs. This was an indication that all the respondents had the appropriate qualifications to work as teachers in their respective primary schools.

Table 3 Age of the Respondent.

Kindly indicate your age

- 18-25 Ye
- 26-33 Ye
- 34-41 Ye
- 42-49 y
- 50 years
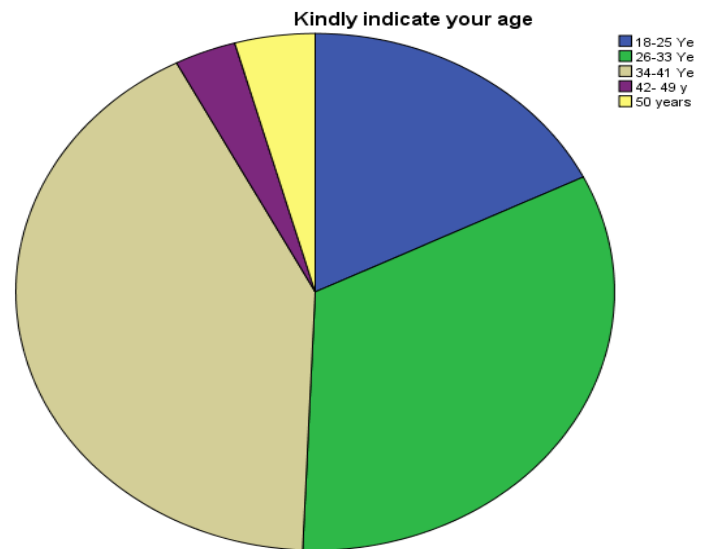
The study revealed that most participants were in the age range of 34-41, while the smallest number of participants were between 42-49 years old. This indicates that a considerable proportion of the teachers were relatively young and seen as skilled in technology, hence easily understood how multimedia content was used in schools.

4.2.2 Objective 1: Level of Adoption of Multimedia Content

The main purpose of the study's first specific aim was to assess the extent to which multimedia content is used in teaching and learning in primary schools in Nakuru Town. Participants were given a

			The school has functional computers and laptops in place	The school has properly trained computer personnel	The computers have multimedia content used in teaching	Teachers combine audio, video and other forms of media in teaching	Use of multimedia content is a must in all public primary schools
N	Valid		71	71	71	71	71
	Missing		0	0	0	0	0
	Mean		3.4225	3,2676	3,1268	3.4648	3.0282
	Minimum		1.00	1.00	1.00	1.00	1.00
	Maximum		5.00	5.00	5.00	5.00	5.00

set of questions specifically intended to assess the degree of acceptance and were instructed to rate the amount to which multimedia information has been included in the process of teaching and learning. The participants' answers were documented using a 5-point Likert scale, with 1 representing "strongly disagree," 2 representing "disagree," 3 representing "not sure," 4 representing "agree," and 5 representing "strongly agree." The data that was gathered was examined using descriptive statistics, with a special emphasis on the mean. The results are elaborated in Table 5 provided below.

Table 4 Level of adoption of multimedia content

The data shown in Table 4 above revealed that a significant proportion of the participants believed that the schools were equipped with operational laptops given by the government, as evidenced by a mean score of 3.42. Concerning the question on whether the computers had multimedia content used in teaching a mean of 3.12 The data suggested that a significant proportion of the participants agreed that the computers did, in fact, possess multimedia content for educational purposes. The school had properly trained computer personnel had a mean of 3.26.

A total of four statements had a mean score of between 3.06 to 3.41 and indication that majority of the respondents agreed with each one of them. These included: The school has functional computers in place (mean, 3.42); The school had properly trained computer personnel (Mean, 3.26); The computers have multimedia content used in teaching (mean, 3.12); Teachers combine audio, video and other forms of media in teaching (mean, 3.46).

The study's results revealed that there was just one statement about the level of adoption of multimedia content for teaching and learning. This statement had an average score of 3.02. These findings indicate that the majority of participants had a negative opinion towards the given statement. The findings provide evidence suggesting a significant absence of multimedia content use in teaching and learning in primary schools in Nakuru Town

4.2.3 Objective 2: Effectiveness of Multimedia Content in Teaching and Learning

The second objective of this research was to determine the effectiveness of multimedia content in the instruction and acquisition of knowledge in primary schools located in Nakuru Town. The "objective" was assessed by analyzing data collected from both the teachers and the students who took part in the research. The teacher respondents were provided with five questions relating to effectiveness and were required to rate on a 5-point Likert scale where 1=strongly disagree 2= disagree 3= not sure 4= agree and 5= strongly agree. The responses were analyzed using mean scores and are presented in Table 7. The pupil participants were

		Learner understanding has been enhanced	Learner retention and motivation has greatly improved	Complex issues are simplified for better understanding	Learners are able to relate abstract ideas to real life situations	Learners are equipped with appropriate knowledge for the future
N	Valid	71	71	71	71	71
	Missing	0	0	0	0	0
Mean		3.9296	3.9577	4.0000	4.0563	4.1408
Minimum		1.00	1.00	1.00	1.00	1.00
Maximum		5.00	5.00	5.00	5.00	5.00

separated into two groups. These were categorized as A and B. Both groups comprised of an equal number of pupils i.e., 22 pupils in each group. Group A pupils were taught a subject without using multimedia content whereas group B pupils were taught using multimedia content. Assessments were done before and after the teaching exercise. The mean scores of each of the groups before and after the experiment are presented in Table 5.

Table 5 Effectiveness of multimedia content: Teacher responses

The study results as shown in Table 5 above reveal that two statements on effectiveness of multimedia content in teaching and learning had a mean score of between 3.92 and 3.95. These were Learner understanding has been enhanced (mean, 3.92); Learner retention and motivation has greatly improved (mean, 3.95). Complex issues are simplified for better understanding had a (mean,4.0), Learners are able to relate abstract ideas to real life situations had a (mean 4.05) and Learners are equipped with appropriate knowledge for the future (mean of 4.14). This finding suggests that a large majority of the respondents expressed strong agreement that use of multimedia content enhances learner understanding, multimedia content enables learners relate abstract ideas to real life situations and multimedia content simplifies complex issues for better understanding.

5.0 Conclusion

This chapter includes an overview of the findings, conclusions drawn from the data, and suggestions for further study as well as policy development.

5.1 Level of Adoption of Multimedia Content in Teaching and Learning

This study sought to establish the level of adoption of multimedia content in teaching and learning in primary schools in Nakuru Town. The findings indicated that a significant proportion of the participants were in agreement on the presence of operational computers in schools, which were supplied by the government. This provided evidence that the multimedia hardware was available in the schools. It was further established that the computers were loaded with appropriate multimedia content used in teaching. The study results also indicated that there were enough trained teachers the use of multimedia content in education included the integration of audio, video, and several other types of media.

In addition to the above findings, there was evidence from the findings that there are statements that the respondents totally disagreed with. It was clear from the study that using multimedia teaching and learning was not mandatory in every primary school in the county. The study also indicated that the majority of teachers lacked the capacity to create multimedia content for instructional purposes. It was therefore established that there was significant level of usage of multimedia content in teaching and learning among primary schools in Nakuru Town

5.1.1 Effectiveness of Multimedia Content in Teaching and Learning

Several observations were drawn from the study about the effectiveness of multimedia material in teaching and learning in Nakuru Town's primary schools. It was discovered that the learners' comprehension had significantly increased as a result of the usage of multimedia information in teaching and learning. The study also made it clear that employing multimedia content in Nakuru Town's primary schools had made it possible for the learners to relate and apply abstract ideas to real life situations.

The results from the research further established that multimedia content use in primary schools in Nakuru town had made it possible to simplify complex issues for to facilitate better understanding on the part of the pupils. Still on the effectiveness of multimedia

content, the performance scores from the pupils who participated in the study revealed that the students who were taught using multimedia content had higher retention levels that were represented by higher performance in tests compared to low performance among those who were taught without multimedia content.

It was further clear that multimedia has a significant role in improving student performance in primary schools hence the need to emphasize on its adoption.

6.0 Recommendations

The usage of multimedia in the classroom is one way of improving retention and pupil performance in primary schools in Nakuru Town as evidenced by this study findings. It will be important for the government to roll out the use of multimedia content to all primary schools in Kenya in order to provide opportunity to all pupils in primary schools to access multimedia content.

The present study was conducted as a case study focusing on primary schools in Nakuru Town. It is necessary to conduct a nationwide survey to compare the results of this research with those of other counties. A replication of this research will be required in about five years to determine the status of multimedia teaching and learning in Nakuru Town. This is necessary due to the regular occurrence of technology breakthroughs in the contemporary setting.

References

Andresen, B., & Brent, K. (2013). Multimedia in education curriculum (PDF). United Nations Educational, Scientific and Cultural Organization.

Baharul, I., Ahmed, A., Kabirul I., & Abu, S. (2014). Child education through animation. *International Journal of Computer Graphics & Animation, 4*(4), 43-52.

Bawden, D. (2001). Information and digital literacies: A review of concepts. *Journal of Documentation, 57*(2), 218-259

Education Policy and Data Centre (2007) Nakuru Town Kenya District Primary Education Profile. Accessed on 15/6/2018

Friedland, G. W., & Knipping, B. L. (2007). Educational multimedia systems: The past, the present, and a glimpse into the future. Augsburg, Bavaria, Germany.

Jamieson-Proctor, R., Albion, P., Finger, G., Cavanagh, R., Fitzgerald, R., Bond, T., & Grimbeek, P. (2013). Development of the TTF TPACK survey instrument. *Australian Educational Computing, 27*(3), 26-35.

Kenya. DLP Secretariat. (2016). Digital literacy programme management guidelines (2nd Version). Nairobi: Information Communication and Technology Authority.

Kenya. MoE (2006). National ICT strategy for Education and Training. Nairobi: Ministry of Education

Kleibard, H. (2004). Scientific curriculum-making and the rise of social efficiency. In R. W. Proctor (Ed.), *The struggle for American curriculum* (pp. 77-105).

Kohn, K. (2018). Using logistic regression to examine multiple factors related to e-book use. *Library Resources & Technical Services, 62*(2), 54.

Larsen-Freeman, D. (2013). Transfer of learning transformed. *Language Learning: A Journal of Research in Language Studies, 63*(S1).

Lester, P. M., & King, C. M. (2009). Analog vs. digital instruction and learning: Teaching within

first and second life environments. *Journal of Computer-Mediated Communication, 14*(3), 457–483

Lowe, R. K. (2004). Animation and learning: Value for money? In R. Atkinson, C. McBeath, D. Jonas-Dwyer, & R. Phillips (Eds.), *Beyond the comfort zone: Proceedings of the 21st ASCILITE Conference* (pp. 558-561). Perth.

Malik, S., & Agarwal, A. (2012). Use of multimedia as a new educational technology tool-A study. *International Journal of Information and Education Technology, 2*(5), 468.

Ministry of Education, Republic of Kenya. (2012). Task force on the re-alignment of the education sector to the constitution of Kenya 2010. Towards a globally competitive quality education for sustainable development.

Mugenda, & Mugenda. (1999). *Research methods: Quantitative and qualitative approaches.* Nairobi: African Centre Technology Studies Press (ACTS).

Musa, S., Ziatdinov, R., & Griffiths, C. (2013). Introduction to computer animation and its possible educational applications. In M. Gallová, J. Gunčaga, Z. Chanasová, & M. M. Chovancová (Eds.), *New challenges in education: Retrospection of history of education to the future in the interdisciplinary dialogue among didactics of various school subjects* (1st ed., pp. 177-205).

Mtebe, J. S., Mbwilo, B., & Kissaka, M. M. (2016). Factors influencing teachers' use of multimedia enhanced content in secondary schools in Tanzania. International Review of Research in Open and Distributed Learning, 17(2), 65-84.

Nives, P., & Boras, D. (2014). Preschool and primary school children as multimedia learners. *International Journal of Education and Information Technologies, 8*, 171-178.

Pinter, R., Radosav, D., & Cisar, S. M. (2012). Analyzing the Impact of Using Interactive Animations in Teaching. *International Journal of Computers, Communications & Control, 7*(1), 147-162.

Preece, J., Rogers, Y., & Sharp, H. (2002). Interaction Design: Beyond Human-computer Interaction. Wiley & Sons, Inc

Rajhi, A. (2016). Using multimedia presentations in teaching (videos, films) in Oman: A case study of a primary school. Journal of Teaching and Education, 5, 127-136.

Rogers, Y., Helen, S., & Jenny, P. (2002). *Interaction design.* United States of America: John Wiley & Sons.

Sharples, T., & Moldéus, K. (2014). Ready or Not, Here ICT Comes: A Case Study on e-readiness and governance in Kenya's Laptop Project.

Sfard, A. (1998, March). On two metaphors for learning and the dangers of choosing just one. *Educational Researcher, 4*-13.

Tay, V. (1993). *Multimedia: Making it work* (first edition, ISBN 0-07-881869-9). Osborne/McGraw-Hill, Berkeley.

Vagg, T., Balta, J. Y., Bolger, A., & Lone, M. (2020). Multimedia in Education: What do the Students Think? *Health Professions Education, 6*(3).

Wanzala, O., & Nyamai, F. (2018, May 23). Big hurdles thwart Jubilee's laptops plan. *Daily Nation.*

Willingham, D. T. (2009). *Why don't students like school?* San Francisco, CA: Jossey-Bass.

Xu, X. (2017). Effective use of multimedia teaching system and its effect on enhancing teaching. *IJET, 12*(6), 187-195.