

Challenges Facing the Use of Multimedia in Teaching and Learning in Secondary Schools in Muhanga District, Rwanda

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Abstract: Research has confirmed several benefits of using multimedia in teaching and learning including increased students' interest in the lesson, and widening students' knowledge and understanding. Multimedia teaching is credited to create a context for subject teaching as it stresses the role of students and enhances the importance of "interaction" between teachers and students. In addition, also promotes the capacity of students to communicate, trains and improves their ability to listen and speak, and to develop the communicative competence, a process during which, the teacher's important role becomes that of a facilitator. In addition, using multimedia in teaching is also flexible; and the context can be created not only in the classroom but also after class. In a bid to improve the quality of education, the Government of Rwanda introduced the Competence-based curriculum in 2015; and rolled out a series of reforms to ensure the use of ICT and multimedia in teaching and learning in the country. Key initiatives for the high school education system included the creating smart classrooms in 2016, as well as the one-laptop per teacher program kicked-off in 2021. However, proper implementation relies on several factors such as availability and access to ICT and multimedia resources for teachers and students, as well as their expertise in using such tools. This study evaluates the challenges facing the use of multimedia in teaching and learning in Muhanga District, Rwanda; and draws pertinent recommendations to improve the quality of education through the use of multimedia in teaching and learning in Rwanda.

Keywords: Multimedia, ICT, Teaching and Learning, Challenges in Education, Rwanda.

I. INTRODUCTION

1.1 Background

According to **Schnotz and Lowe (2003)**, the term multimedia is defined as the combination of multiple technical resources for to present information represented in multiple formats via multiple sensory modalities. As emphasized by **Eady and Lockyer (2013)**, using technology in teaching and learning is very essential in our schools this time; and all over the world. Governments policies, systems of education, teachers, school leaders, parents and researchers consider ICT as foundation of children's education.

De Sousa, Richter, and Nel, (2017) reveal that when students use multimedia, it helps them to build their knowledge by using different teaching and learning styles, and different approach to learning. Multimedia induces curiosity developing problem-solving skills, critical and logical thinking. Indeed, as emphasized by **Guan et al. (2018)**, one of the key advantages of multimedia-aided teaching lies in turning the abstract into concrete, providing information within a limited time, stimulating students' interest in learning, and turning passive learning into active learning.

In a bid to improve the quality of education, the Government of Rwanda introduced the Competence-based curriculum in 2015; and rolled out a series of reforms to ensure the use of ICT and multimedia in teaching and learning in the country. Key initiatives for the high school education system included the creating smart classrooms in 2016, as well as the one-laptop per teacher program kicked-off in 2021. The use of modern technology in education has revolutionized society and changed the mind of educators and learners. The methods of teaching and learning are improved as “talk and chalk on the board” are reinforced by other sources of digital information in the form of text, sounds (audio), video, animation, or graphics. These tools facilitate access to rich content, and excite the sense organs, resulting in knowledge, skills acquisition, and their use in life. **As Patel (2013)** notes, multimedia technology featuring audio, and visual animation effects naturally and humanely make us more access to the information besides, with such characteristics as abundant information and crossing time and space, multimedia tools show the reality and help to explain functions, which highly stimulate the interest and motivation of students in the study and their involvement in classroom activities.

As of fact, active and participative learner-centered learning increases the students’ achievement. Multimedia provides learners with the necessary information for their learning and turn abstract concepts into a visible representation of materialized examples, students can easily have the link between what they learn and the world of work, and develop the critical thinking. it helps them to be creative and good innovators. **Abdulrahman et al., (2020)** emphasize that multimedia tools have the properties of interaction, integration, and diversity that help people to share information or ideas with digital content that deliver information to people for a better understanding of concepts. However, it is also very necessary to relate the use of multimedia to socio-cultural context and background of teachers and students when it comes to diversity and integration so that it becomes relevant in a given learning environment of the society.

As confirmed by **Ilhan and Oruç (2016)**; multimedia provides easiness and facilities in education, as it helps students to learn new information and increases their academic achievement compared to traditional instruction. However, in countries like Rwanda, particularly in Muhanga district, it is always important to integrate ICT and multimedia in teaching and learning, but it was revealed that ICT skills, the big number of students in classrooms, and the small number of computers can make difficult the management of ICT and multimedia-assisted teaching-learning classes in public schools. Indeed, students learn from multi-sources that is why multimedia is very much essential in the educational field simultaneously teachers’ knowledge of ICT and Multimedia is also required. **(Bhattacharjee and Deb, 2016)**. Therefore, teaching and learning effectiveness using multimedia depends on the capacity of teachers and learners to use ICT tools and to their ability to handle the troubleshooting issues, this shows the need to bridge the gap between those who have the mastery of ICT and Multimedia and those who do not have enough skills on it by supporting them in ICT tools and training.

1.2. Necessity of Multimedia Technology in Teaching and learning

According to **Patel (2013)**, using multimedia in teaching and learning increases students’ interest in the lesson, widening students’ knowledge and understanding through abundant information it offers. Multimedia teaching creates a context for subject teaching, stresses the role of students and enhances the importance of “interaction” between teachers and students. It promotes the capacity of students to communicate, trains and improves their ability to listen and speak, and to develop the communicative competence, during this process, the teacher’s role as a facilitator is particularly important. In addition, using multimedia in teaching is also flexible. The context can be created not only in the classroom but also after class. Where students can use the new technology to their advantage, such as using the network to contact teachers and receiving answers by email or WhatsApp, for example When compared to traditional instruction, multimedia use increases the academic achievement of the students. It affects education positively when designed properly compared to traditional instruction, in terms of academic achievement (Akkoyunlu and Yılmaz, 2005, cited in Ilhan and Oruç, 2016)

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The provision of ICTs can help in bridging the quantitative (access) and qualitative (standard) gaps in secondary education because ICTs could be used to make education accessible to more learners (**Evoh, 2007:10-11**). The deployment of ICTs in secondary schools, including training of teachers in the use of ICTs, could, also enable a country with huge inequalities between the rich and the poor, between the rural and urban areas' access to services, especially ICT) to utilize the existing limited resources more effectively to accomplish the goals of improved secondary education and human resource development (**Evoh, 2007:8**). However, in order to achieve this, according to **Beyers (2000)**, schools with fewer ICT resources must be shown how to use them more effectively. The use of ICT and multimedia in teaching and learning in Rwanda shows its advantages such as easy access to digital teaching and learning resources, lesson preparation and presentation using computer and projector. The shared teaching aids like videos, simulations, graphs, and images help teachers to explain difficult concepts and students self-learning. It can also present challenges as mentioned by **Abdulrahman et al. (2020)** related to access to ICT and multimedia tools, the level of ICT skills for teachers and their students. Therefore, their confidence in using ICT and multimedia tools is limited, they may also lack the technical and financial support from schools among others.

Teaching and learning using ICT has proven to be very important in achieving positive educational outcomes. Indeed, multimedia or digital learning resources assist learners to get on well with mental representations with the use of different media elements, which support information processing. Information, which is made up of content and sometimes learning activities, are presented with the use of the combination of text, image, video, and audio by digital learning resources and teachers observe that learners who combine picture and words achieve better than those who use words only. (**Chen and Liu, 2008; Mayer, 2008; cited in Abdulrahman et al, 2020**)

1.3. Benefits of Multimedia in Learning

According to **Chioran (2016)**, the benefits of multimedia in learning are deeper understanding, improved problem solving, increased positive emotions, fast access to information, and world exploration.

- **Deeper understanding:** to develop learners' competencies in terms of knowledge, skills, attitude, and values; using multimedia in learning helps learners to make the connections between verbal and visual representations of content, and its application in real life (**REB, 2015a**).
- **Improved problem solving:** Visual memory is very important in learning. Learners can easily identify the problem and find the solution. The reason why in Rwanda ICT should be integrated in all levels of education (**MINEDUC, 2016**).
- **Increased positive emotions:** learners' motivation is the key to effective learner-centred learning. Using multimedia during instructions impacts students' mood during the learning process. They are more active to participate in the lessons, the group works, assignments, projects, and other activities given by their teacher.

- **Fast access to information:** Using ICT tools like computers, tablets, smartphones, and the internet, students can find the information they need for their learning. It is good to know that the information we receive from the internet is not always correct, the role of the teacher is to help students to filter it, visit the academic sources, and recognise them.
- **World exploration:** multimedia can help learners to explore and learn about all places such as microscopic world. For example, in chemistry teachers can use simulations to explain the movement of electrons around the atomic nucleus and the reactivity between different substances.

1.4. Challenges of using multimedia in teaching and learning

Exclusion from ICT is dangerous, according to several experts, and others have compared it to suicide. ICT assets are now essential resources. ICT is now seen as one of the most important forces in socio-economic development as a result of this. Both failing to understand the consequences of ICT and being unable to access and utilize its contents come at a significant cost in terms of missed possibilities. Technical capability, or the ability to use ICT tools, is one of the issues (Pedrelli, 2001). Although using ICT and multimedia in teaching and learning has many advantages, previous research has also revealed some limitations, such as teachers' reluctance to adopt ICT, their lack of confidence in its use, their resistance to change, their lack of ICT skills, and their inability to access ICT resources. Other obstacles included a lack of assistance, insufficient time to master new technologies, a lack of educational materials, and the physical setting in which multimedia use occurred. According to certain surveys, respondents thought using multimedia had no benefits. These obstacles undoubtedly hinder both the use of the multimedia tool and its integration into teaching and learning. (**Abdulrahaman et al., 2020**)

In Rwanda, teachers are requested to use ICT and multimedia in teaching from primary to tertiary education but access to ICT resources remains a dream for many primary and secondary school teachers. One of the challenges, however, is limited ICT skills for teachers and learners and most graduates in ICT who do not join the teaching career, and this affects the use of multimedia in teaching and learning. As Habibu et al. (2012) notes, the problem lies in teachers' acceptance and adoption of ICT; and often teachers who don't utilize computers in the classroom often cite "lack of skills", and lack of confidence has also been highlighted as a key reason.

As **Abdulrahaman et al. (2020)** notes, each multimedia application used for effective teaching delivery, has its focus area, an unusual feature, target age, merits, and demerits. The digital divide is observed in Rwandan primary and secondary schools for teachers and students. Access to computers and other ICT tools is a continuous process that requires patience. Some teachers and students being unfamiliar with the use of multimedia can spend more time handling simple troubleshooting and sometimes judge it of low benefit to them. Schools struggle with a lack of instructional resources and a lack of qualified personnel to manage this fully digital system. As the researcher (Patel) notes, "teachers rich in technical experience are rare," the conclusions of Patel (2013) seem to be applicable in this situation. According to the research, this is one of the biggest problems that schools are currently facing (Sarowardy & Halder, 2019). According to **Ndagijimana (2016)**, the obstacles we feel in the exercise of a function must always generate the consequences that affect all the people who are in the circuit. In education, the first victims of the difficulties experienced by teachers are students. There is a necessity of research to evaluate the challenges facing the use multimedia in teaching and learning in secondary schools in Muhanga District and find the solutions to challenges.

1.5. Statement of the Problem

In a bid to improve the quality of education, the Government of Rwanda encourages teachers to improve their teaching methodologies, teaching-learning materials, and sometimes the content to fit in the fast technological change of the globalized world. In this regard, the curriculum was changed to CBC and prioritizes the integration of ICT and the use of multimedia tools at all levels of education (**MINEDUC, 2016**). Therefore, primary, secondary, and TVET, teachers

must use ICTs and multimedia tools in their teaching and learning practices to improve the quality of education in all subjects. ICTs and multimedia are expected to support the teaching and pedagogical student-centered approaches; encourage research and collaborative learning (REB, 2015b).

In this regard, Rwanda Basic Education Board (REB) has distributed more than 250,000 OLPC XO laptops to 1,624 primary schools and more than 79,199 Positivo Laptops computers and 1,412 projectors in 739 secondary schools in **computer lab classrooms** where 720 secondary schools were given the 4G internet making 64% in primary and 53% in secondary education up to 2016 (Sabiti, 2019) and more than 1,800 laptops associated with projectors and flash disc were distributed to Science, Technology, Engineering, and Mathematics teachers in 2021 (Teta Ufitiwabo, 2021) where in Muhanga District 28 teachers in public primary and 68 teachers in public secondary schools received them. Although some teachers have their personal laptop computers and others benefited from government support, teaching and learning using computer and other ICT tools presented as the solution to quality education may face challenges. Then teachers can continue to use their traditional way of teaching. The literature has revealed that ICT skills, support being technical and financial, teachers' confidence in the use of technology, and access to ICT resources, instructional content, time to learn new technologies, and the environment in which multimedia delivery takes place (Abdulrahman et al, 2020) constitute the main challenges that can limit its use in teaching and learning. Therefore, this study evaluates the challenges facing the use of multimedia in teaching and learning in Muhanga District, the findings will help the researcher to suggest possible solutions to the above-mentioned problem.

1.6. Objectives of the Study, Research Questions & Hypotheses

1.6.1 Objectives

The general aim of this study is to evaluate the challenges facing the use of multimedia in teaching and learning in secondary schools in Muhanga District.

This study has the following specific objectives:

- To analyze the availability of ICT resources to teachers and students in secondary schools in Muhanga District.
- To analyze the expertise (skills) of teachers and students to use multimedia for teaching and learning.
- To suggest possible solutions which will help teachers and learners in efficient use of multimedia in teaching and learning.

1.6.2 Research Questions

The following are research questions considered for this study

1. Why is the availability of ICT resources a challenge in using multimedia in teaching and learning in secondary schools in Muhanga District?
2. How is the expertise (skills) of teachers and students in ICT a challenge in using multimedia in teaching and learning in secondary schools in Muhanga District?
3. How can the provision of ICT resources and training be solutions to challenges facing the use of multimedia in teaching and learning in secondary schools in Muhanga District?

1.6.3 Hypotheses

The availability of ICT resources is not a challenge in using multimedia in teaching and learning in secondary schools in Muhanga District.

The expertise (skills) of teachers and students in ICT is not a challenge in using multimedia in teaching and learning in secondary schools in Muhanga District.

The provision of ICT resources and training cannot be solutions to challenges facing the use of multimedia in teaching and learning in secondary schools in Muhanga District.

II. METHODOLOGY

The research design used in this study was a descriptive survey to present the data collected understandably. Primary data and information was collected by the researcher to respond to the research questions. In addition to this, this research used a survey method, that is, the researcher used forced-choice questions to assess the challenges facing the use of multimedia in teaching and learning in secondary schools in Muhanga district, Rwanda and suggested solutions. To collect secondary data, documentation was very useful and important. This technique helped the researcher to be equipped with a strong knowledge of the research topic and available data on previous similar research on the Challenges facing the use of multimedia in teaching and learning. Primary data were gathered through classroom observation, a survey questionnaire tool, and interview. The questionnaire was designed to get opinions and perceptions from teachers and students while the interview was given to Directors of studies and head teachers in selected secondary schools in Muhanga District on the Challenges facing the use of multimedia in teaching and learning and possible solutions to overcome them.

The collected data were transformed, analyzed, and interpreted using SPSS version 22. The SPSS enabled the researcher to show the status of the Challenges facing the use of multimedia in teaching and learning in Muhanga secondary schools, and possible solutions to overcome them. In addition, the analysis of frequency and percentage allowed the researcher to test the relationship between Challenges facing the use of multimedia in teaching and learning, and the solutions to overcome them. The target population included 380 students, 46 teachers, 2 Directors of Studies, and 2 Head-teachers from Groupe Scolaire de Shyogwe and Groupe Scolaire Gitarama located in Shyogwe Sector and Nyamabuye Sector respectively in Muhanga District selected from 17 schools whose science teachers were given computers. Because the two selected schools have Science Combinations. Respondents were selected from Senior Five and Senior six students in Advanced Level Science Combinations, the researcher considered them as mature enough and had a sufficient learning experience so that they can give reliable responses, the teachers, Directors of Studies and Head-teachers. The population was 430.

For students participating in this study, the sample size was calculated using Slovin's formula (with a margin error of 5% and confidence level of 95%) presented here as follows: $n = \frac{N}{1+N(e^2)}$; where N=total population, n=sample size, e= margin error (0,05). The sample size estimated was n=207 [$n=430/(1+1.075) = 207$]. This formula was chosen because the researcher did not have enough information about the challenges facing the use of multimedia in teaching and learning in the population of the study. [Sample students in classes = number of students x 181/380, the number of teachers (22), Directors of Studies, and Head-teachers (purposive sampling) remains the same.]

Random sampling was used to choose the students and teachers who participated in the study. However, for Directors of Studies, and Head-teachers, the researcher used purposive sampling to choose leaders to interview at two selected secondary schools participating in the study, because they were the right respondents to provide necessary information that can help to verify the research questions.

In analyzing data, the researcher based his judgment on the strengths and weakness of the indicators as translated in terms of very high, high, moderate, low, and very low. The following were the scores and the response modes on the Likert scale: Strongly agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly disagree (1). In addition, the researcher's decisions were based on the following mean ranges: very low (1.00-1.75), low (1.76-2.50), moderate (2.51-3.25), high (3.26-4.25), and very high (4.26-5.00). Primary data were processed through SPSS version 22 in terms of frequencies, percentages, and mean.

The validity and reliability of the research tool was ascertained through verification by the supervisor and pre-testing the survey questionnaire with 18 students and 3 teachers randomly selected at Teacher Training College Muhanga. The School did not participate in the study. Two weeks later, the same questions were re-administered to the same students and teachers and revealed the similarity of responses, this implies that the instrument was valid and reliable. To ensure confidentiality of the information provided by the respondents and to ascertain the practice of ethics in this study, the following activities were implemented by the researcher: All the respondents were briefed about the study, and those who agreed to participate in it voluntarily showed a consent by attesting that they agree to participate in the study as respondents. In addition, the respondents' names were not displayed in the study report. The findings were presented in a generalized manner. Permission was solicited from the concerned officials of the District and the leadership of respective schools to authorize the collection of the necessary data for this study. The researcher always recognized the authors quoted in this study through citation and referencing. The researcher claims the level of 5% margin of error at 0.05 significance given the pertinent threats such as respondents' honesty, personal biases, and uncontrolled setting of the study.

III. RESULTS & DISCUSSION

The purpose of this study was to evaluate the challenges facing the use of multimedia in teaching and learning in secondary schools in Muhanga District. This chapter is the presentation, analysis and interpretation of findings from the data collected from respondents.

3.1 Questionnaires Return Rate

The questionnaires return rate was 100%, that is, 181 questionnaires distributed to students and 22 questionnaires distributed to teachers. In addition, a total of 4 interviews were successfully conducted with 2 school Head-teachers and 2 Directors of Studies. Campion (1993) suggested that authors need to make reasonable efforts to increase questionnaires return rate so as to ensure that they do not contain any obvious biases. Thus, the researcher approached the respondents in person and requested their participation in the study, providing information about the purpose of the study, how the results would be used, and clearly explained to them difficult terms and confidentiality. Respondents agreed and were given sufficient time to respond and the researcher should wait for them until they finish.

3.2 Personal characteristics of respondents

Personal characteristics of respondents are very important for research in social sciences, since they influence the respondents' view of the study problem, their perception and expression of their responses.

3.2.1 Teachers' Characteristics

The personal characteristics of teachers who participated in the study includes gender, age, level of education, teaching experience, and ICT training acquired.

Table 1: Teachers Characteristics

Variables	Categories	Frequency	Percent	Cumulative Percent
Gender of respondent	Male	13	59.1	59.1
	Female	9	40.9	100.0
	Total	22	100.0	
Age of respondent	23-29 years	1	4.5	4.5
	30-39 years	6	27.3	31.8
	40-49 years	10	45.5	77.3
	50-59 years	5	22.7	100.0
	Total	22	100.0	

Level of education/Professional qualification	Diploma (A1)	5	22.7	22.7
	Degree (A0) with Education	11	50.0	72.7
	Degree (A0) + PGDE	5	22.7	95.5
	Master	1	4.5	100.0
	Total	22	100.0	
Teaching experience	Below 5 years	2	9.1	9.1
	5-10 years	2	9.1	18.2
	11-15 years	7	31.8	50.0
	15-20 years	2	9.1	59.1
	More than 20 years	9	40.9	100.0
	Total	22	100.0	
ICT training acquired to date	Professional development	10	45.5	45.5
	Course or module at university	12	54.5	100.0
	Total	22	100.0	

As the collected data in the above table indicates, teachers' gender accounted for about 59% male teachers and 41% female participating in this study. The researcher observed a majority of male teachers in the studied population (schools) with science combinations but there is no very large difference in number of female and male teachers who participated in this study.

Age is also one of the characteristics in understanding respondents' views about particular problems; as higher age may indicate the level of maturity. In this study, nearly 23% of teachers are above 50 years, 4.5% are below 30 years, nearly 32% are below 40 years, and at least 77% of teachers are below 50 years, this workforce is known to have grown up with frequent ICT inventions during prosperous times (Robbins & Judge, 2010) and familiar with diversity, technology, and online communication. It would be expected that teachers within this age easily integrate multimedia in teaching.

Education has an impact on a person's attitudes, perspective, and capacity to comprehend any given societal issue. As a result, people's responses are probably influenced by their level of schooling. As shown in the table, nearly 23% of teachers who responded were educated up to Diploma (A1) and at least 77% of teachers were graduated Bachelor Degree (A0) to Master degree which indicated they have the high professional qualifications. Riddell and Song (2012) reported that education increases the probability of using computers on the job.

The research findings also indicate that 91% of teachers who participated in this study have the teaching experience of at least 5 years and many of them (40.9%) have more than 20 years of experience.

In addition, among 22 teachers who participated in the study, 45.5% have received the Professional Development in ICT and 54.5% have studied ICT as a course or module in higher education. Thus, they would be expected to have the basic skills in ICT.

3.2.2 Students' characteristics

The students are very important in teaching-learning activities and formed a large number of respondents in this study. Their characteristics contained the gender and age (Table 6)

Table 2: Students' characteristics

Variables	Categories	Frequency	Percent	Cumulative Percent
Gender of respondent	Male	106	58.6	58.6

	Female	75	41.4	100.0
	Total	181	100.0	
Age of respondent	16-20 years	157	86.7	86.7
	21-25 years	24	13.3	100.0
	Total	181	100.0	

The findings show that of 181 students who participated in the study 58.8% were male and 41.4% were female. The researcher observed that majority of students in science combinations were male.

In addition, the students involved in the study were in senior five and senior six in science combinations, they were found in two ranges: 16-20 years forming nearly 87% and 21-25 years having at least 13%. They were mature enough to give reliable responses.

3.3 Availability of ICT resources to teachers and students

The access to ICT resources is an important factor in using multimedia in teaching and learning. The first objective of this study was to analyze the availability of ICT resources to teachers and students in secondary schools in Muhanga District. The ICT resources considered in this study were computers, projectors, flash disc and internet. Presented here below are the findings on the availability of ICT tools to teachers and students, the monthly time of using them, and analysis of access to those tools to use multimedia in teaching and learning:

3.3.1 Availability of ICT resources to teachers.

In response to Question 1 about how teachers access ICT and multimedia tools, teachers indicated that they had some ICT resources and used the school resources while others had no access.

Table 3: Source of available ICT tools used by teachers

	Frequency	Percent	Cumulative Percent
School	6	27.3	27.3
Both own and school	10	45.5	72.7
No access	6	27.3	100.0
Total	22	100.0	

The overall responses to this question indicated that more than 27% of teachers who responded had no access to ICT resources and never use multimedia in their teaching. This part represents almost one-third (1/3) of teachers. The other part of more than 27% accessed ICT tools only at school and at least 45% of teachers used both own and school ICT resources.

a. Teachers' access to own resources

The teachers' access to own ICT and multimedia tools helps teachers to use them at home in lesson preparation which is a valued stage in teaching, increase the ease and confidence of using them in teaching. The data related to access to own computer, projector, flash disc and internet are presented here below:

Table 4: Teachers' access to own resources

Variables	Categories	Frequency	Percent	Cumulative Percent
Access to own computer	No	13	59.1	59.1
	Yes	9	40.9	100.0
	Total	22	100.0	
Access to own projector	No	19	86.4	86.4
	Yes	3	13.6	100.0

	Total	22	100.0	
Access to own flash disc	No	13	59.1	59.1
	Yes	9	40.9	100.0
	Total	22	100.0	
Access to own internet	No	20	90.9	90.9
	Yes	2	9.1	100.0
	Total	22	100.0	

The findings from this study (Table 4) indicated that of the 22 teachers who responded the questionnaire, more than 59% did not have their own laptop computers, only less than 14% had projectors, less than 41% had flash discs, and about 91% did not have own internet access.

b. Teachers' access to school resources

Table 5: Teachers access to school ICT resources

Variables	Categories	Frequency	Percent	Cumulative Percent
Access to school computer	No	15	68.2	68.2
	Yes	7	31.8	100.0
	Total	22	100.0	
Access to school projector	No	15	68.2	68.2
	Yes	7	31.8	100.0
	Total	22	100.0	
Access to school internet	No	7	31.8	31.8
	Yes	15	68.2	100.0
	Total	22	100.0	

The School ICT resources accessed by teachers were laptop computers, projectors and internet. The findings (Table 5) indicated that only less than 32% of teachers use the school computers and projectors and about 68% of teachers used the school internet. The responses presented in Table 8 and Table 9 revealed that 27% of teachers did not use computers, 23% of teachers did not use internet, and 55% of teachers did not use projectors for teaching. Which indicated the challenges of lesson presentation in the use of multimedia in teaching.

The primary barriers to ICT adoption in schools were examined by Pelgrum (2001) based on the opinions of practitioners from 26 different nations. He came to the conclusion that four of the top ten hurdles had to do with ICT accessibility. These obstacles included an insufficient number of computers, peripherals, copies of software, and immediate Internet connection.

According to Toprakci (2006), obstacles to the successful adoption of ICT in Turkish schools include a lack of computers, aging or slow ICT systems, and a lack of educational software. Similar findings were made by Al-Alwani (2018), who discovered that the absence of hardware and access to the Internet throughout the school day prevented Saudi schools from integrating technology. Recent studies on Syrian schools found that one of the biggest barriers to classroom technology integration was a lack of computer resources (Albirini, 2006).

c. Teachers' time spent on using ICT tools

The integration of multimedia in teaching can be regarded though the time taken by teachers using ICT and multimedia tools in their teaching timetable.

Table 6: Teachers' Monthly time spent on using ICT tools

	Frequency	Percent	Cumulative Percent
1-5 days	9	40.9	40.9
6-10 days	3	13.6	54.5
Above 10 days	3	13.6	68.2
Not at all	7	31.8	100.0
Total	22	100.0	

This study found that only 27% of teachers responded that they had the opportunity to use ICT tools and multimedia for teaching their students at least 6 days in a month, 41% used ICT and multimedia for at least 1 day and at most 5 days, while 32% did not use ICT and multimedia at all. These data (Table 10) indicated that 73% did not practically use multimedia in their teaching

3.3.5 Students' access to ICT resources

The responses of 181 students showed that they used ICT tools at home and/or at school.

Table 7: Source of available ICT tools used

	Frequency	Percent	Cumulative Percent
At home	5	2.8	2.8
At school	100	55.2	58.0
Both at home and at school	5	2.8	60.8
No access	71	39.2	100.0
Total	181	100.0	

A minority of participants near 3% indicated that they used ICT resources for learning at home, the other 3% used them at home and at school, 55% used ICT tools only at school, while 39% had no access to ICT and multimedia tools in their learning. Therefore, less than 61% of students who responded had access to ICT tools at school or at home and use multimedia in learning.

3.3.6 Students' time spent on using ICT tools

The frequency of using ICT and multimedia in learning was represented by the number of days in which students used ICT tools in a month (Table 12).

Table 8: Students' Monthly time spent on using ICT tools

	Frequency	Percent	Cumulative Percent
1-5 days	51	28.2	28.2
6-10 days	29	16.0	44.2
Above 10 days	30	16.6	60.8
Not at all	71	39.2	100.0
Total	181	100.0	

In response to many days in a month students use ICT tools, the data obtained from 181 students; a high percentage of participants (39%) indicated that they did not use ICT tools at all, 28% used ICT tools between one and five days, while less than 33% had the opportunity to use ICT and multimedia tools in at least six days. Which showed that in practice 67% of students did not use multimedia in their self-learning.

3.3.7. Availability and Access to ICT within Schools (Leadership Insights)

In interview to school leaders (Head-teachers and Directors of Studies) the following responses were donated:

Table 9: Perceptions of School Leaders on Availability & Access to ICT Resources by Students and Teachers in their Secondary Schools.

School Leadership	Question 1: Does your school have ICT and multimedia tools for teachers and students? What are they? How many?	Question 2: Are the school ICT resources accessed by teachers and students for teaching and learning?
Head-teacher	Yes, the school has 105 laptop computers, 6 projectors and internet. Where 4 laptops and 4 projectors were donated by REB to four Math and science teachers. The remaining ICT resources are in two computer labs and can be used by teachers and students during working hours. The total number of teachers and students is 28 and 874 respectively. (Head-teacher 1)	Some teachers use computers and projectors to teach their lessons; students use them in ICT subject and research. The access is very limited as teachers cannot go home with school computers. The internet is very slow and make its use in teaching and learning. (Head-Teacher1)
	Yes, we have 50 laptop computers, 2 projectors in one computer lab and internet; used by 18 Advanced level teachers and 763 students. (Head-teacher 2)	The access to ICT resources is limited due to many students and teachers. (Head-teacher 2)
Director of Studies (DOS)	Yes, the school has 105 laptops, 6 projectors and internet utilized by 28 teachers and 874 students. Few teachers have their own laptop computers. (DOS 1)	ICT resources are accessed but they are very few and are only used in working hours. (DOS 1)
	Yes, there are 50 laptop computers, 2 projectors and internet. (DOS 2)	Yes, with limited access due to unavailable shared ICT resources. (DOS 2)

The content analysis of responses obtained from interviewed secondary school leaders highlights the presence of few laptop computers in the surveyed schools, very few projectors and slow internet. All school leaders confirmed the limited access to ICT resources to teachers and students as the challenge to the use of multimedia in teaching and learning in their schools.

According to Odhiambo and Onyango (2015), one of the biggest obstacles to fully integrate multimedia into teaching and learning is a lack of access to ICT equipment. As a result, no teachers nor students are given the chance to use ICT whenever it is needed. In majority of the cases it was found that teachers and students had to share limited ICT resources with other teachers. (Habibu et al. 2012) The few computers and projectors were present in the computer labs and teachers had to move their students to the computer labs. As Deutscher (2009) notes, teachers frequently bring their classes into computer labs at schools. Many teachers complained about how challenging it was to use the lab because they had to sign up in advance. The challenge of moving the entire class to a new place is another. Due to its high demand, teachers said that getting access to the lab was challenging.

The findings of this section were used to verify the first research question using the analysis of data obtained from responses of teachers, students and the interview to school leaders: ***Why is the availability of ICT resources a challenge in using multimedia in teaching and learning in secondary schools in Muhanga District?***

The Simple statistical analysis was used to analyze the access to ICT resources to teachers and students during the use of multimedia in teaching and learning. The findings from this study revealed that majority of teachers difficultly access the school computers (32%) and more than 27% of teachers confirmed the no access to ICT resources used to integrate multimedia in

teaching. The responses from interview to schools' leaders indicated that school computers and projectors were used in working hours and could not be taken home by teachers. Therefore, teachers who did not have their own computers (59%) did not use computers to prepare their lessons due to overloaded timetable.

Projectors are very few and three of them are fixed in the computer labs, the two schools have a total number of three computer labs. The remaining projectors included 4 projectors donated by REB to science teachers, which make the lesson presentation difficult and force teachers to use the blackboard in their teaching. Only 32% of teachers who responded confirmed their access to school projectors. Head-teachers and Directors of Studies mentioned that internet is slow and cannot effectively serve teacher in teaching. The students access to school computers with the limited accessibility was at 55% and 39% of them did not use ICT in their self-learning, forming 94 % of students who responded.

Even where computers are available and sufficient, their use in the classroom for teaching and learning will be limited since output devices like projectors, which must be connected to the computer in order to project the learning content, are not present. A necessity for integrating ICT and multimedia into education is having access to ICT resources in schools (Plomp et al., 2009). There are a number of causes for the lack of access to technology, according to several research reports. Teachers in Sicilia's (2005) research complained about how challenging it was to always have access to computers. When the teacher wished to work on multiple assignments with the students, they could not book computers for lots of times in a succession because they had to be reserved in advance, according to the author (p. 50). In other words, since most ICT resources were shared by teachers, a teacher would not have access to them.

Becta (2004) asserts that the lack of availability of ICT materials within the school does not always result in the inaccessibility of ICT resources. It could be the result of a number of things, including a lack of personal access for teachers, inadequate resource organization, low-quality hardware, improper software, or malfunctioning hardware (Becta, 2004).

The availability and accessibility of ICT resources, such as hardware, software, etc., have a major role in the adoption and integration of multimedia into teaching in schools. Obviously, if teachers cannot access ICT resources, then they will not use them. Access to computers, updated software, and hardware are therefore essential components for successful technology adoption and integration (Wanga, 2014). The first set of analyses examined the availability of ICT resources in secondary schools in Muhanga District and this study found that availability of ICT resources is a challenge in using multimedia in teaching and learning. Therefore, the first hypothesis stating that availability of ICT resources is not a challenge in using multimedia in teaching and learning in secondary schools in Muhanga District was rejected.

3.4. Skills of teachers and students to use ICT and multimedia

The skills of utilizing the computer and other ICT facilities is an important determinant of how easy or difficult teachers and students would use multimedia in teaching and learning. This section presents the data of teachers' training and the practical knowledge and skills they acquired as well as the students' practical knowledge and skills in using various ICT tools.

3.4.1 Teachers' training and skills acquired

The respondents were asked to rate their ICT training background to cope with the use of multimedia in teaching and learning, on a given rating scale ranging from 1-5, where 1= Not trained, 2 = Poor, 3 = Moderate, 4 = High and 5 = Very high. The frequency and percentage are presented in Table 13.

Table 10: Teacher's quality of ICT training received

	Frequency	Percent	Cumulative Percent
Not trained	1	4.5	4.5
Moderate	21	95.5	100.0
Total	22	100.0	

The results in the table above revealed that majority of teachers (95.5%) who responded received a moderate training in the form of Professional Development or have studied ICT as course or module at university and 4.5% were not trained.

Table 11: Teacher's practical knowledge and skills in ICT

	Frequency	Percent	Cumulative Percent
Very low	1	4.5	4.5
Low	16	72.7	77.3
High	5	22.7	100.0
Total	22	100.0	

The respondents were also asked to rate their practical knowledge and skills in using various ICT and multimedia, on a given rating scale ranging from 1-5, where 1= Very low, 2 = low, 3 = Moderate, 4 = High and 5 = Very high. The frequency and percentage are presented in Table 11. The findings from this study revealed that more than 77% of respondents (teachers) have very low and low practical knowledge and skills in using ICT tools and less than 23% have the high skills.

3.4.2 Association between ICT training received and practical knowledge and skills

The comparison between teachers' ICT training and practical knowledge and skills acquired show the contradiction because 95.5% of teachers received the moderate training but 76% of them have low practical skills in ICT while 24% have high practical skills in ICT (Table15). These findings may explain that teachers were trained but did not used the skills acquired in ICT and then they have slowly forgotten what they learnt due to the unavailable computers and other ICT equipment or trainings were not effective. As Deutscher (2009) notes, during professional development, most of trainers gave an overview of the multimedia but did not demonstrate how to use it with students. In addition, because they did not have enough time to study the software, the majority of teachers lack the ability to use ICT in the teaching-learning process. It has been noted that teachers lacked the necessary knowledge and abilities, and they resisted making modifications or incorporating multimedia into their teaching practices (Habibu et al. 2012). According to Pelgrum (2001) in the global study of nationally representative samples of institutions from 26 different countries, teachers' lack of knowledge and expertise is a significant barrier to the use of ICT in educational institutions.

Table 12: Teacher's quality of ICT training received & Teacher's practical knowledge and skills in ICT

Teacher's quality of ICT training received	Teacher's practical knowledge and skills in ICT			Total
	Very low	Low	High	
	N(%)	N(%)	N(%)	
Not trained	1(100.0%)	0(0.0%)	0(0.0%)	1(4.5%)
Moderate	0(0.0%)	16(76.2%)	5(23.8%)	21(95.5%)
Total	1(4.5%)	16(72.7%)	5(22.7%)	22(100.0%)

The ability of students to use multimedia in their learning depends to their knowledge and skills in ICT; then students were asked to rate their practical knowledge and skills in using various ICT and multimedia tools on a given rating scale ranging from 1-5, where 1= Very low, 2 = low, 3 = Moderate, 4 = High and 5 = Very high. The frequency and percentage are presented in Table 16.

Table 13: Student's practical knowledge and skills in ICT

	Frequency	Percent	Cumulative Percent
Very low	26	14.4	14.4
Low	90	49.7	64.1

Moderate	41	22.7	86.7
High	24	13.3	100.0
Total	181	100.0	

The findings obtained from 181 respondents (students) revealed that more than 64% of students have the very low and low skills in ICT, less than 23% have moderate ICT skills, and only about 13% have the high ICT skills. The author understood the low percentage of students with moderate and high ICT skills because their teachers had presented the same challenge of lack of practical knowledge and skills in using computer and other ICT resources. If most of students learn ICT and how to use multimedia in their learning at school with low number of computers and other ICT tools, low skilled teachers, and limited access to computer lab; they are unlikely to develop competencies of using computer and multimedia in their self-learning.

Table 14: One sample statistics and t-test for ICT training received and practical knowledge and skills in ICT

One-Sample Statistics						
	N	Mean	Std. Deviation	Std. Error Mean		
Teacher's quality of ICT training received	22	2.91	.426	.091		
Teacher's practical knowledge and skills in ICT	22	2.41	.908	.194		
One-Sample Test						
Test Value = 0						
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Teacher's quality of ICT training received	32.000	21	.000	2.909	2.72	3.10
Teacher's practical knowledge and skills in ICT	12.443	21	.000	2.409	2.01	2.81
Test Value = 0						
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Student's practical knowledge and skills in ICT	35.683	180	.000	2.348	2.22	2.48

The results in **table 14** indicated that the mean of teachers' quality of ICT training received (2.91) ranged in **moderate training** while the mean of teachers and students' practical knowledge and skills (2.41) and (2.35) respectively, were in the range of **low practical knowledge and skills**. There were statistically differences in the means of teachers' quality of ICT training received (t-value=32.000; df = 21; P<0.05), teachers' practical knowledge and skills (t-value=12.443; df = 21; P<0.05), and students' practical knowledge and skills (t-value=35.683; df = 180; P<0.05), this shows that teachers did not applied what they have trained in ICT, and some of their students coming from other schools all over the country can sometimes have more ICT skills than them.

Table 15: Perceptions of School Leaders on the Use of ICT by Students and Teachers in their Secondary Schools and Challenges Encountered.

School Leadership	Question 3: (a) How would you describe the level in ICT among your teaching staff? (b) What challenges are they facing? (c) How does it impact the use of multimedia in teaching?
Head-teacher	Head-teacher 1 (a) Teachers have the basic knowledge in ICT. (b) Using ICT in teaching is not successful due to limited ICT resources and very slow internet. (c) Many teachers use the traditional method. They use ICT by constraint of inspections and have difficulties in lesson preparation. But some teachers with high ICT skills use multimedia in their teaching and it facilitate them.
	Head-teacher 2 (a) Many teachers were trained in ICT. (b) Only one computer lab is present. It can only be used by one teacher and others are obliged to use the traditional method of teaching. (c) The use of multimedia is limited by the lack of ICT resources to teachers and students.
Director of Studies (DOS)	DOS 1 (a) Many teachers show the low level in using ICT and multimedia in teaching. They can only type their exam and record marks in computers. (b) ICT resources are very few, the skills of using them is generally low among the teaching staff. Many teachers are not confident to use ICT in their teaching. Electricity is sometime absent. (c) There is a limited use of multimedia in teaching due to low ICT skills and lack of ICT resources. ICT subject is not taught by qualified and skilled teachers in ICT; as result, students are likely to be weak in ICT. Which prevent them to use multimedia in their learning.
	DOS 2 (a) The teaching staff has the basic knowledge in ICT. (b) ICT resources are very few and the internet is very slow. Electricity is sometimes interrupted. (c) Teachers are attracted to use the traditional teaching.

The author's analysis of the content of the four school leaders' responses can mention that:

- Teachers have basic ICT skills obtained from training.
- Schools have few computers, internet is slow, and the skills of using them is generally low among the teaching staff. Many teachers are not confident to use ICT in their teaching. Electricity is sometime absent.
- There is a limited use of multimedia in teaching and due to low ICT skills and lack of ICT resources to teachers and students.

According to Salajan et al., (2015), the teachers' desire to utilize blackboard in their instruction is significantly influenced by their perception of the effectiveness of their instruction, which also serves as a predictor of their intention to use multimedia and ICT. A significant predictor of perceived usefulness was perceived simplicity of use.

During observation, the researcher has found that teachers who have their own computers and projectors use multimedia in teaching more than those who use the School computers and projectors of the computer lab. Teachers having their computers also have the high skills to use them and are confident to use multimedia in teaching. It should be remembered that as users gain expertise, individual perceptions change over time (Venkatesh et al., 2003). For instance, after using multimedia content for some time, teachers will develop knowledge and discover that it is

easy to use (Mtebe et al., 2016). The second set of analysis focused on expertise (skills) of teachers and students to use multimedia for teaching and learning. Findings revealed the low skills in ICT and multimedia use for teachers and students, many teachers are not able to integrate multimedia into their subject teaching. According to research done by Gomes (2005) on a variety of topics, using new technologies in the classroom is hindered by a lack of digital literacy training, pedagogic and didactic training on how to use ICT in the classroom, and a lack of training on the use of technology in particular subject areas. The above findings and analysis show that expertise (skills) of teachers and students in ICT is a challenge in using multimedia in teaching and learning in secondary schools in Muhanga District. Therefore, the second hypothesis stating that **expertise (skills) of teachers and students in ICT is not a challenge in using multimedia in teaching and learning in secondary schools in Muhanga District** was rejected

3.5. Suggested solutions to challenges facing the use of multimedia in teaching and learning.

The respondents were required to suggest the solutions to overcome the challenges they face in using ICT and multimedia in teaching and learning. The change in teachers and students' behavior towards the use of multimedia in teaching and learning would depend on how they perceive it useful to them and easy for use (Alwahaishi & Snasel, 2013). Therefore, respondents showed their perceptions the provision of ICT resources that they use in teaching or learning and training in ICT and multimedia use were solutions to challenges.

3.5.1 Teachers' suggested solutions

The teachers were asked to indicate whether the provision of ICT tools (Computers, Projectors, Internet,), provision of software (multimedia technology), Training by internal experts, Training by external experts, and formal learning with certificate or degree were solutions to challenges they face when they need to use multimedia in teaching. The perception related to personal experience was obtained using the Likert scale: 1= Strongly disagree, 2= Strongly agree, 3= neutral, 4= agree, and 5= Strongly agree. The study's findings in this section are presented in the **Table 16**; as frequency, percentage and cumulative percentage of respondents in each category of perception to suggested solutions.

Table 16: Teachers' suggested solutions

Variables	Categories	Frequency	Percent	Cumulative Percent
Provision of ICT tools (Computers, Projectors, Internet,...)	Agree	2	9.1	9.1
	Strongly agree	20	90.9	100.0
	Total	22	100.0	
Provision of Software (multimedia technology)	Disagree	1	4.5	4.5
	Agree	6	27.3	31.8
	Strongly agree	15	68.2	100.0
	Total	22	100.0	
Training from internal experts	Disagree	1	4.5	4.5
	Agree	7	31.8	36.4
	Strongly agree	14	63.6	100.0
	Total	22	100.0	
Training from external experts	Disagree	6	27.3	27.3
	Agree	2	9.1	36.4
	Strongly agree	14	63.6	100.0
	Total	22	100.0	

Formal learning with certificate or degree	Disagree	3	13.6	13.6
	Neutral	2	9.1	22.7
	Agree	6	27.3	50.0
	Strongly agree	11	50.0	100.0
	Total	22	100.0	

Provision of ICT tools (computers, projectors, internet, ...)

This study found that 91% of respondents (teachers) strongly agreed and 9% agreed that the provision of ICT tools to them can remove the main barrier of lack of computers and other ICT tools that they need to use in lesson preparation and delivery. After accessing ICT tools, teachers will understand the usefulness of ICT and multimedia in their teaching and the facilities it brings to better explain the subject content. According to Cox et al. (1999), teachers are more likely to be in agreement of employing multimedia in the classroom if they believe that ICT is beneficial to them, their teaching, and the learning of their students.

Provision of Software (multimedia technology)

The teachers' responses to the provision of multimedia technology as solution to the use of multimedia in teaching revealed that 95.5% agree with it where 68% in them strongly agreed. It is important for teachers to have the common subject related multimedia tools that they can use to implement in the same way the centralized competence based curriculum. This multimedia technology to be accepted and adopted by teachers should be easy to learn and easy to use (Venkatesh & Davis, 2000). According to Juan & Yahaya (2019), The function of multimedia technology can only be optimized and maximized when teachers harmoniously combine the modern with the traditional and integrate them into classroom instruction, not as a replacement for it; multimedia technology is a potent complement to traditional classroom teaching, not as a replacement. Teachers should not allow the PPT to dominate and should not substitute the chalkboard for the students since they are always the focus of the class and its key constituents.

Teachers' training from internal experts

The teachers' responses to training from internal experts show that 95.5 % of teachers agree with it to be the solution to the use of multimedia in teaching, including about 64% who strongly agreed. Internal experts are expected to be School subject teachers having high skills in ICT who can be trained in their subject related educational technology and come back to train their colleagues in departments during CPD. They can also provide assistance to support teachers to be familiar with multimedia use in lesson preparation and delivery. Teachers will be more likely to deliver the multimedia to their students in that engaging format if they experience it during professional development in the manner in which it would be best used in the classroom (e.g., small groups, individual use, etc). (Deutscher, 2009). Such teachers should have enough time to train and support their peers, and incentive to motivate them. As Becta (2004) notes, because it is crucial to take into account a number of factors in order to ensure training effectiveness, the topic of training is complicated. These are time for training, pedagogical training, skills, and ICT use in initial teacher training.

Teachers' training from external experts

This study found that more than 27% disagreed with ICT training from external experts, 9% agreed, and 64% strongly agreed. The highest disagreement can be explained by the moderate training they received in similar way, but many of them are still having low practical knowledge and skills to use ICT and multimedia in teaching. Such trainings are rare and not specific to subject and classroom teaching. The training from external experts would be necessary to equip trainers of using multimedia in teaching. Habibu et al., (2012) said that most of the teachers lack the skill to use the ICT in teaching-learning process because they did not review software and prevent them to use ICT. Therefore, external trainers can help teachers to learn how to use new multimedia technologies.

Formal learning with certificate or degree

The findings of this study indicates that more than 77% of teachers agreed that formal learning with certificate or degree can be the solution to challenges facing multimedia use in teaching, 9% were neutral while less than 14% disagreed. Majority of teachers need to study at university their subject related educational technology in short course certificate or long term degree in order to fill the gap they have and understanding how multimedia can support pedagogy for a particular subject content. According to Johnson et al., (2016), teachers need training on the integration of multimedia technology, pedagogy, and content knowledge.

Table 17: One sample statistics and t-test for teachers’ suggested solutions

One-Sample Statistics						
	N	Mean	Std. Deviation	Std. Error Mean		
Level to which teachers want provision of ICT tools (Computers, Projectors, Internet,...)	22	4.91	.294	.063		
Level to which teachers want provision of Software (multimedia technology)	22	4.59	.734	.157		
Level to which teachers want training from internal experts	22	4.55	.739	.157		
Level to which teachers want training from external experts	22	4.09	1.342	.286		
Formal learning with certificate or degree	22	4.14	1.082	.231		
One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Level to which teachers want provision of ICT tools (Computers, Projectors, Internet,...)	78.253	21	.000	4.909	4.78	5.04
Level to which teachers want provision of Software (multimedia technology)	29.331	21	.000	4.591	4.27	4.92
Level to which teachers want training from internal experts	28.868	21	.000	4.545	4.22	4.87
Level to which teachers want training from external experts	14.299	21	.000	4.091	3.50	4.69
Formal learning with certificate or degree	17.929	21	.000	4.136	3.66	4.62

The results in **Table 17** revealed that the level to which teachers want provision of ICT tools (Computers, Projectors, Internet,) was very high with the mean of 4.91 (t-value= 78.253; df= 21; p<0.05), the level to which teachers want provision of Software (multimedia technology) is also very high with the mean of 4.59 (t-value= 29.331; df= 21; p<0.05), the difference of 0.32 between the two mean values shows that some teachers can have access to online multimedia tools when they have computers and internet. The above results indicated that the provision of ICT resources is at very high level the solution to challenges facing the use of multimedia in teaching and learning. The level to which teachers want training from internal experts was very high with the mean of 4.55 (t-value= 28.868; df= 21; p<0.05), level to which teachers want

training from external experts was high with the mean of 4.09 (t-value= 14.299; df= 21; p<0.05), and level to which teachers want formal learning with certificate or degree was high with the mean of 4.14 (t-value=17.929; df = 21; p<0.05).

This study found that training by internal experts was more trusted by teachers than training by external experts and they also preferred the formal learning with certificate or degree.

3.5.2 School leaders' suggested solutions

In interview to school leaders, the researcher asked a question to capture their insights on their suggested solutions. The question and their proposed solutions appear in the table below:

Table 18: School leaders suggested solutions

Question 4: What possible solutions can you suggest to help teachers and learners in efficient use of multimedia in teaching and learning? 5: Strongly agree, 4: Agree, 3: Neutral, 2: Disagree, 1: Strongly disagree. (R=Respondent)						
Provision of ICT resources	R1	R2	R3	R4	Average	Observation
Provision of computers, projectors and internet	5	5	5	4	4.75≈5	<i>Strongly agree</i>
Provision of software(multimedia technology)	5	5	5	4	4.75≈5	<i>Strongly agree</i>
Training in ICT and Multimedia	R1	R2	R3	R4	Average	Observation
Training by internal experts	5	5	4	5	4.75≈5	<i>Strongly agree</i>
Training by external experts	3	4	2	4	3.25≈3	<i>Neutral</i>
Formal learning with certificate or degree	5	5	5	5	5	<i>Strongly agree</i>

The results of **Table 18** show that school leaders strongly agreed that the provision of computers, projectors, internet, and software (multimedia technology) which are ICT resources used in teaching and learning, to teachers and Schools for students would be the main solution to challenges facing multimedia in teaching and learning. They also indicated the need of competent teaching staff in ICT and multimedia use would require a **special university program on educational technology**; and all strongly agreed with the formal learning as the solution to challenges facing multimedia use in teaching and learning.

The school leaders were neutral to training of teachers from external experts, some of them disagree with it because teachers received the same trainings but did not changed their teaching practice. They said that such trainings are not specific to subjects and classroom teaching. The training by internal experts was appreciated and school leaders strongly agreed with it because school based trainers would also provide the support to the peer teachers but presented the concern of trainers' workload to be reduced. Akuhm (2011) emphasized that teachers' workloads should be at a level that allows for creative expression and efficient use of instructional technologies.

In addition, school leaders presented the following suggestions:

- Computers, projectors and other resources given to schools have a given lifetime, they have to be repaired or replaced.
- Electricity in schools should be coupled by generators to avoid the interruption of current.

3.5.3 Students' suggested solutions

The students were asked to suggest possible solutions to overcome the challenges they face in using multimedia in learning. Using the scale 1= Strongly disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Strongly agree. The findings were presented in **Table 19** in form of frequency and percentage.

Table 19: Students' suggested solutions

Variables	Categories	Frequency	Percent	Cumulative Percent
Provision of ICT tools (Computers, Projectors, Internet,...)	Neutral	1	.6	.6
	Agree	19	10.5	11.0
	Strongly agree	161	89.0	100.0
	Total	181	100.0	
Provision of Software (multimedia technology)	Neutral	3	1.7	1.7
	Agree	50	27.6	29.3
	Strongly agree	128	70.7	100.0
	Total	181	100.0	
Training in ICT and multimedia use through practical learning of ICT subject	Disagree	1	.6	.6
	Neutral	3	1.7	2.2
	Agree	32	17.7	19.9
	Strongly agree	145	80.1	100.0
	Total	181	100.0	

The results obtained from 181 students to the provision of ICT tools (computers, projectors, internet, ...), 99.5% agreed with it to be the solution to challenges of multimedia use in their learning where 89% in them Strongly agreed. This study also found that more than 98% of respondents agreed with the provision of software (multimedia technology) to be the solution to challenges of multimedia use in their learning where near 71% in them strongly agreed.

The students' responses to training in ICT and multimedia use through practical learning of ICT subject revealed that near 98% of them agreed that it was the solution to challenges of multimedia use in their learning and more than 80% in them strongly agreed.

Table 20: One sample statistics and t-test for students' suggested solutions

One-Sample Statistics						
	N	Mean	Std. Deviation	Std. Error Mean		
Level to which students want provision of ICT tools (Computers, Projectors, Internet,...)	181	4.88	.338	.025		
Level to which students want provision of Software (multimedia technology)	181	4.69	.498	.037		
Level to which students want training in ICT and multimedia use through practical learning of ICT subject	181	4.77	.493	.037		
One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Level to which students want provision of ICT tools (Computers, Projectors, Internet,...)	194.402	180	.000	4.884	4.83	4.93
Level to which students want provision of Software (multimedia technology)	126.671	180	.000	4.691	4.62	4.76
Level to which students want training in ICT and multimedia use through practical learning of ICT subject	130.319	180	.000	4.773	4.70	4.85

The results in **Table 20** revealed that the level to which students want provision of ICT tools (Computers, Projectors, Internet), level to which students want provision of Software (multimedia technology), and level to which students want training in ICT and multimedia use through practical learning of ICT subject were very high with the mean values of 4.88 (t-value= 194.402; df= 180; p<0.05), 4.69 (t-value= 126.671; df= 180; p<0.05), and 4.77 (t-value= 130.319; df= 180; p<0.05) respectively.

The above findings and analysis show that the provision of ICT resources and training can be solutions to challenges facing the use of multimedia in teaching and learning in secondary schools in Muhanga District. Therefore, the third hypothesis stating that the provision of ICT resources and training cannot be solutions to challenges facing the use of multimedia in teaching and learning in secondary schools in Muhanga District was rejected.

IV. CONCLUSION

The findings of this study show that the availability of ICT resources and expertise (skills) in ICT and multimedia use in secondary schools in Muhanga District constitute the challenges that prevent many teachers and students to use multimedia in teaching and learning. Many teachers do not have their own computers, projectors, and internet. The access to school computers, projectors, and internet was found to be very limited because these ICT tools are very few and internet is slow.

Teachers have received the moderate training but many of them have the low ICT skills. Only teachers having their own computers have the high ICT skills, they use their projectors or school projectors to teach students using multimedia. A high percentage of students has no access to ICT and multimedia tools and many students are low skilled in ICT.

To overcome these challenges, the study found that the combined solutions can be the provision of ICT resources like computers, projectors, internet, and multimedia technology (software); Training teachers by internal experts and formal learning with certificate or degree were more preferred than training by external experts, and training students in ICT and multimedia use through practical learning of ICT subject.

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