

EFFECTS OF INFORMATION AND
COMMUNICATION TECHNOLOGY ON STUDENTS'
LEARNING BEHAVIOUR IN RWANDAN SECONDARY
SCHOOLS IN MUSANZE DISTRICT

Cyprien Sikubwabo

Department of Education,
University of Kigali, Rwanda

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Pascal Habihirwe

Department of Education,
University of Kigali, Rwanda

Abstract

This study was to investigate the effect of ICT on students learning behavior in Rwandan secondary school Musanze district in Rwanda. This study adopted the correlational research design involving quantitative approach. The study was carried out in 4 selected public secondary school in Rwanda. The study involved a population of 3000 populations and a sample of 338 participants. The data was collected using a structured questionnaire with 5-point Likert scales. The data was analyzed using percentages, frequencies, means, standard deviation and regression analysis. The results of this study revealed that availability of ICT resources has no significant effect on the students learning behavior in Rwandan secondary school. However, it was found that accessibility of ICT resources has no significant effect on the student learning behaviors in Rwandan secondary school while user-ability of ICT resources have no significant effect on the student learning behaviors in Rwandan secondary school. The study recommended that Educational monitoring and evaluators should look at the completion of all core module and non-core, as some students complained that in ordinary level ICT is replaced by core modules of the curriculum. Besides that, Ministry of education (MINEDUC) should develop infrastructure within secondary school because some school situated in area where there is no electricity, internet connectivity and computers.

Keywords: effect, ICT, students learning behavior, secondary school

In Rwanda Vision 2020 aims at moving Rwanda from “an agriculture based economy system to a knowledge-based society “and middle-income country 2020. Education is a key sector to this social and economic transformation, tapping into the limitless potential of an empowered population. At the same time, the Vision 2020 places ICTs at the heart of the transformation across all sectors. The use of ICT in education is seen as a strategic lever for achieving this transformation. This policy complements the overall “Smart Rwanda” Strategy, it implements the smart education policy.

Technology in education can be used to achieve these goals and address the key challenges of access, quality, equity, relevance and management efficiency with tangible advantages that can be seen and measured in numerous ways. At primary and secondary levels, gross enrolment ratios are growing and more children are in school. However, the number of trained teachers to sustain these enrolment ratios is still low. At higher education levels, the levels of enrolment are still very low. Here technology to support Open and Distance Learning (ODEL) can play a critical role train new teachers, up-skill existing unqualified teachers and increase access to tertiary education. In 2011, MINEDUC has issued Early Childhood Development (ECD) Policy and the Integrated Early Childhood Development Strategic Plan (2011/12-2015/16). In this Policy, the vision of ECD in Rwanda is stated that “All infants and young children will achieve fully developmental potential: mentally, physically, socially and emotionally” (MINEDUC, 2011).

Analysis revealed the many challenges to be overcome in order to disseminate the use of ICT throughout the nation generally and in education specifically. With a poor infrastructure 16% of electricity coverage in households by 2012, 47% in public schools, low connectivity rates, lack of equipment and high costs access to ICT in the education system is very limited (computer to students’ ratio in secondary schools 40:1; 16% of primary schools use XO laptops (MINEDUC, 2015). In addition, due to a lack of ICT culture and of understanding of its possible applications and benefits in education, communities and educational institutions are often reluctant to adopt ICT and adapt their teaching methods. Even when such material and cultural barriers are overcome and ICT in Education initiatives are taken up, other challenges arise, such as, limited availability of digital learning material, lack of expertise in project management skills and poor coordination of initiatives, systematic road map for ICT Teachers Professional Development, e-readiness survey, analysis and ICT infrastructure plan and technical support.

Rwanda is well on the way to meeting the education MDGs, with net primary enrolment at 94%, and the ratio of girls to boys enrolled in primary schools at 100%. Secondary education is divided into two levels. The lower level is a three-year program of general studies for all students following primary education. The higher level, also three years, offers both academic and technical/vocational options (MINEDUC, 2017). Since 2008, MINEDUC has implemented the One Laptop per Child (OLPC) program at primary schools and computer labs for secondary schools. 250,000 OLPC devices were deployed in 764 schools thus reaching only 10% of primary students. The program faced challenges in capacity building of teachers due to a high learning curve, the cost of deployment was also high while it only reached a few students and lastly, the lack of integration of the program in the normal learning and teaching activities was the main

challenge. For Computer labs, only 5% of secondary schools benefited from the program and the labs were used only for ICT lessons.

Due to the above situation we found it is crucial to conduct a study with the purpose of investigating the effect of ICT on students learning behavior in public Rwandan secondary school Musanze district in Rwanda. Consequently, this study aims at answering the following research questions: What is the effect of availability of ICT resources among public selected Rwandan secondary school? What is the effect of accessibility of ICT resources among public selected Rwandan secondary school? What is the effect of user-ability of ICT resources among public selected Rwandan secondary school? The following are the findings for each research question? We believe that this research would provide insights on the effect of ICT on students learning behavior in public Rwandan secondary school Musanze district in Rwanda. and the findings of this study would serve as a good tool in improving student learning behaviors within secondary school.

Literature Review

Historical background of secondary school in Rwanda: In Rwanda, education is provided in four levels: pre-primary (kindergarten), primary, secondary and tertiary (MINEDUC, 2013). In 2009, there were 686 schools providing secondary education (age 13 to 18). This number almost doubled to 1,362 in 2011 (MINEDUC, 2012). However, the number of schools and their facilities are not sufficient yet to fully accommodate increasing enrollment (Interview with MINEDUC, 2012). According to the types of institutions, a larger number of students are now enrolled in public secondary schools than the private institutions. The rate of students enrolled in private schools decreased from 45.3% in 2000 to 37.1% in 2008 (WB, 2011). The number of enrolled students in secondary education was 218,517 in 2005, which more than doubled to 486,437 in 2011. In 2005, there were more boys enrolled than girls by 12,183.

However, the girls outnumbered the boys by 14,937 in 2011 (MINEDUC, 2010 & 2012). The Gross enrolment rate (GER) increase from 16.6% in 2005 to 35.5% (MINEDUC, 2012). In 2011, the GER was 34.9% for boys, and 36.2% for girls. This trend contrasts with the situation in 2007, when the rate for boys at 21.9% was above girls at 19.1% (MINEDUC, 2012). The ratio of girls' enrolment against boys was 1.02 in 2010, and 1.06 in 2011, girls achieving higher number. In secondary education from S1 to S6, the repetition rate has decreased from 6.0% in 2008 to 3.8% (Ruzigiro, 2010).

Significant improvement was observed among at risk students, as teachers cited that "attendance and behavior has improved, along with their motivation, engagement, and class participation" While research may support the infusion of laptop technology in schools with a goal of providing students anytime, anywhere access, the significant costs of computer hardware acquisition and maintenance continues to challenge schools across the nation (Rogera, 2012). The digital native of the 21st

Century, however, will continually question how districts can afford not to fund such initiatives (Pitler et al., 2004, p. 6). Recent developments in handheld computing have resulted in devices with a standard operating system and markedly reduced costs as compared to laptop computers, providing a lower-cost alternative to schools and districts seeking to embrace the digital age.

However, consecutive reports of the Ministry of Education (from 2015 to 2020 on ICT secondary school, statistics) revealed an increase in the rate of student enrolments (37.2 % in 2015 to 5.1% in 2019) in public secondary school. This is a big concern within the secondary school because it hampers their proper functioning. The Shortage of students' ICT resources in Rwandan secondary school has made difficult in their learning behavior because the students complained to the outdated contents delivered by the teacher, on the other hand teachers complained to shortage of internet connectivity so that they got updated contents in order to promote effective teaching.

The availability of ICT resources and student's learning behaviors in

Rwandan secondary school: Available literature consists of a number of studies which investigated the effect of ICT resources on public student of secondary school. However, most of the studies are on the effect of availability of ICT resources in public Rwandan secondary school. The study of Bonnet (2011) investigated the variables affecting students' learning in selecting secondary school. In classrooms for teachers and their students, the availability of modern computers, peripherals, networking and resources within an increasingly diverse range of technologies is an essential part of learning and teaching in the 21st century. ICT constitutes an input in the student learning process that should help produce better learning output. The availability of ICT resources can enhance learning by making education less dependent on differing teacher quality and by making education available at home throughout the day, the use of ICT can positively transmit knowledge to students. (Mbwesa, 2012). Furthermore, the availability and use of ICT can help students exploit enormous possibilities for acquiring information for schooling purposes and can increase learning through communication (MINEDUC, 2013).

According to the Swedish National Agency for School Improvement (2008), ICT provide a positive impact on learning and student performance when it becomes an integrated element in the classroom and teaching. Bonnet (1997) argues that the availability of visual digital technology (such as animation, simulation and moving images) involves students and reinforces conceptual understanding. ICT use also encourages development from a teacher-focused or teacher-led model to a more student-focused model in which students work together, make their own decisions and take an active role in learning (Swedish National Association for School Improvement, 2008).

Davis (2000) asserts that increased availability of ICT is especially useful for students who suffer from learning disabilities since ICT use allows teachers to prepare suitable tasks for individual needs and each individual more effectively. However, authors like Cox (1999) believe that allowing certain students to use computers distracts them from focusing on the task at hand. Central to the argument of availability are the issues of whether or not the teachers and students have ample and convenient access to computers and their accessories let alone the software that is necessitated in the context of their day-to-day research, collaboration, teaching and student evaluation (Fabry, et al., 1997).

Furthermore, students and teachers should have confidence in these facilities, which is in turn reliant on the facilities' reliability or degree to which the teachers and students are sure that they will have access to them at all expected times and utilize them predictably to the betterment of their academic work, an issue on which consensus is enormous as is clear from ICT in education scholars like Russell (1997), Ross (1997), Guha (2000), Mumtaz (2000) and Pelgrum (2001).

To conclude, this section reviewed different studies on the effect of ICT on student learning behavior in Rwandan secondary school. A few studies confirmed that availability of ICT resources have high effect in teaching and learning process, as computers are part of subset of the information communication technology facilities in classrooms necessitated in schools and that even then, they have to be equipped with quality accessories, installed with appropriate software and linked to necessary networks to allow access to rich resources beyond the school rather than serve as a resource for minor typesetting and other word processing activities. Although the above studies attempted generally to explain how availability of ICT resources impact students learning behaviors.

Methods

This section discusses the methodology adopted in conducting this study. It comprises of research design, the target population and sample, data collection instruments and procedures, data analysis tools and procedures.

Research design

This study employs a correlational research design. A correlational research design measures a relationship between two variables without the researcher controlling either of them. It aims to find out whether there is either: positive correlation where both variables change in the same direction, negative correlation where the variables change in opposite directions and zero correlation in which there is no relationship between the variables. Creswell (2012) opined that correlational research designs are measures in quantitative research by which researchers measure the level of association (or relation) between two or more variables using the statistical procedure of correlational analysis. The study design is adopted since it

allows exploration of the phenomena and reported as it is and further it allowed the collection of both primary and secondary data.

The term research design refers to the conceptual structure within which research would be conducted, (Lodico, et al., 2010). The purpose of this study, as stated previously, was to examine the effect of ICT resources on students learning behaviors in Rwandan secondary schools.

Participants: This study was conducted in 4 public secondary school only. These are namely: ESC Musanze, GS Musanze, GS MUHE, GS CYABAGARURA while the target population of the study was concerned with a set of 2100 populations including 86 teachers and 2014 students. The choice of these secondary school was made bearing in mind that this is a good number to represent all 26 public secondary school, Musanze district operating in Rwanda (REB, 2018). Similarly, the choice was made as per the assumption that at least 30 percent of the entire population is appropriate for the sample (Borg and Gall, 2003). Given the preferred scope of the study, only those which were 2 years old of experience by the end of 2018-2020 academic year were involved in the study. The 4 Public secondary school were selected using systematic sampling technique whereby the institutions were firstly sorted out alphabetically, and then the interval of four numbers was used to select the ones to be involved in this research.

This research concerned with a set of 2100 populations including 86 teachers and 2014 students. This study was conducted in Musanze sector and the researcher uses the Yamane formula of sample calculation to determine the sample that is used in this research, as cited by Kasunic (2005). The formula assumes a 95% confidence level and the maximum variance ($p = 0.5$). The formula is $n = \frac{N}{1 + Ne^2}$ (c) ², Where: n is the sample size, N is the population size, e specifies the desired level of precision, where precision $e = 1 - \text{precision}$, $p = 0.95$ In this study, N is equal to 2100, $e = \text{margin of error} = 1 - 0.95 = 0.05$

$$n = \frac{N}{1 + Ne^2} \quad \text{this becomes} \quad n = \frac{2100}{1 + 2100(0.05)(0.05)} = 336$$

Measures: This study used structured questionnaire to collect primary data. The study also used documentary review to collect secondary data (from journal articles, books, theses, etc.). The questionnaire contained close-ended questions only in the form of Likert scales ($1 = \text{Strongly Agree}$, $2 = \text{Agree}$, $3 = \text{Neutral}$, $4 = \text{Disagree}$, $5 = \text{Strongly Disagree}$). The questionnaire was to be filled by ticking in the appropriate box with regard to the participants' understanding. Before collecting data, the researcher sought the authorization to collect research data from the Musanze district of the 4 sampled public secondary school. Prior to gathering any data, the researcher sought the informed consent from the respondents using an appropriate form. Before collecting the data, a pilot study was done to establish the validity and reliability of the instruments. This was made by means of

Cronbach alpha analysis. The pilot study was done by having 10 students to fill the questionnaire and giving their feedback on it. This exercise was conducted in one public secondary school that was randomly selected. However, the selected institution for pilot study was not involved again in collecting the data for the main study. The data was taken out from the questionnaires and got into the SPSS 20. The Cronbach alphas scored were extracted as shown in the following table.

Table 1 : Reliability Results

	Number of Items	Cronbach's Alpha	comments
Availability	10	.600	Accepted reliability
accessibility	10	.600	Accepted reliability
User-ability	10	.700	Accepted reliability
Overall	40	.633	Accepted reliability

Hinton et al. (2004) have suggested four cut-off points for reliability, which includes excellent reliability (0.90 and above), high reliability (0.70-0.90), moderate reliability (0.50-0.70) and low reliability (0.50 and below) (Hinton et al., 2004). The Cronbach alphas were above 60%, This indicated that most items in this questionnaire had moderate squared multiple correlations, an indication that the questionnaire passes reliability test. Cronbach alphas more than 0.7 are considered as satisfactory (George & Mallery, 2003).

In analyzing the data, the researcher used SPSS (Statistical package for Social Sciences) version 20 to make all the due calculations and to design all the important tables. According to Frey (2017), SPSS is commercially distributed software suitable for data management and statistical analysis and whose first version was developed by Norman Nie, Dale Bent, and C. Hadlai Hull in 1968. As earlier mentioned, the analyzed data was in the form of 5-point Likert scales whereby each point has been assigned a number which was entered into SPSS for data analysis. The data was made up three items containing 10 options each. The first item was about demographic characteristics of respondents, the second was about availability of ICT resources among Rwandan secondary school and the third accessibility of ICT resources among Rwandan secondary school. Each option in the items was representing one variable related to availability of ICT resources, accessibility of ICT resources and user-ability of ICT resources.

The variables under availability of ICT resources which implies the presence of these ICT resources within the school were namely: Availability of Computers in secondary school, Internet Connectivity for students and teachers, Television Set within the school, projectors in teaching and learning process, Printers in teaching and learning process, Updated Software for both teaching staff and students, Scanners, equipped laboratory for academic purpose and e-Library. The variables under accessibility of ICT resources in secondary school, implies the degree to which these ICT resources are easily accessed by many people as possible at school are namely: accessibility of Computers in secondary school,

Internet Connectivity for students and teachers, Television Set within the school, projectors in teaching and learning process, Printers in teaching and learning process, Updated Software for both teaching staff and students, Scanners, equipped laboratory for academic purpose and e-Library. The variables under user-ability of ICT resources in Rwandan secondary school, which refers to the capability of the students and teachers to use these resources to achieve specified goals were namely: user-ability of Computers in secondary school, Internet Connectivity for students and teachers, Television Set within the school, projectors in teaching and learning process, Printers in teaching and learning process, Updated Software for both teaching staff and students, Scanners, equipped laboratory for academic purpose and e-Library in Rwandan secondary school. In the same strain, the researcher used descriptive statistics (percentages, frequencies, means and standard deviation) and inferential statistics (simple linear regression) in data analysis. In the same manner, the researcher used descriptive statistics (percentages, frequencies, means and standard deviation) and inferential statistics (simple linear regression) in data analysis.

Findings

Demographic characteristics of respondents: This study involved, a total number of 225 students and 111 teachers were sampled giving a total of 336 questionnaires that were distributed. A total of 238 (70.1%) fully completed questionnaires were returned of which 158 (70.2%) and 80 (72.8%) were filled by students and teachers respectively. The most of the respondents (128, 53.8%) were males while 110 (46.2%) of them were females. This scenario is associated with the fact that, in the area where this study was conducted, female education is lower than male. This is further supported by the Rwanda examination board (MINEDUC, 2016) which shows higher enrolment among male than female students in Rwanda's public school. The majority of the respondents 128 (53.8%) were males while 110 (46.2%) of them were females. This scenario is associated with the fact that, in the area where this study was conducted, female education is lower than male. The majority are single 128 (53.8%), For third position we have widow/widower with 3(1.3%) while for last position of marital status separated people 1 who corresponds with 0.4%. The majority (68.1%) of the teaching staff were less than bachelor 'degree. This partly was due to the fact that the secondary school is still young. About 21.0% were holder of bachelor 'degree they were more senior in terms of qualification and experience than their advanced diploma teaching counterparts. There were also master 's holder in secondary school 10.1% besides that above master's level is about 0.8% teaching in the secondary school.

The findings in research showed that the majority of the respondents were students 66.4 % compared to their teachers 33.6%, The crucial data for this study came from students and teachers who dealt with the dairy situation, besides that the teaching staff are considered central in this study because

they are directly involved in the teaching and learning process using ICT. For students this is good opportunity to express their thoughts in the preparation for the bright world of academic as they are future employees and also they expected to have sufficient exposure to ICTs at the school. This was intended to ascertain the respondents’ level of responsibilities and seniority in both the decision making processes and the teaching and learning process.

The Descriptive statics on availability of ICT resources, accessibility of ICT resources and user-ability of ICT resources on students learning behaviors: This section presents the descriptive statistics with regard to the variables under study as well as the level of agreement and disagreement with the provided options by the respondents.

Table 2 : Descriptive statics on availability of ICT resources

	N	Mean	Std. Deviation
Availability of Computers	238	4.3193	.78952
Availability of Computer accessories	238	3.6050	.86876
Availability of Internet Connectivity	238	2.9454	1.13682
Availability of Television Set	238	3.4958	.88469
Availability of projectors	238	3.3697	1.11276
Availability of Printers	238	3.8655	1.08635
Availability of Updated Software	238	4.1807	1.01306
Availability of Scanners	238	3.3697	1.12032
Availability of equipped laboratory	238	3.3739	1.11703
Availability of e-Library	238	2.8109	1.09176
Valid N (list wise)	238	3.53359	1.022107

Source: Research of field data, 2021

Note: Strongly Disagree= [1-1.8]=Very Low Mean; Disagree= [1.9-2.6]=Low mean; Neutral= [2.7 – 3.4]=moderated mean; Agree= [3.5-4.2]=High mean; Strongly Agree = [4.3-5]= Very High mean.

The results in above table 2 show the extent to which computers are available within the school as one of the major aspects affecting integration of ICT in learning of secondary school $\mu=3.6050$ and $STD=.78952$. while others respondents agreed on Computer accessories in order to facilitate teaching and learning process within the school at rate of $\mu=3.6050$ and $STD=.86876$. The findings suggest that the general presence of computers in the school is still wanting which directly hinders full integration of ICT in the teaching and learning process as some students said that some computer accessories are old version and is not relatively available to the increasing number of the students. It also revealed that internet connection within the school is not good. Following a discussion with the school leader and students, it was revealed that the school has not had internet connectivity ($\mu=2.9454$ and $STD=1.13682$) for a very long time majorly because of financial constraint in regards to internet subscription thus the difficulty for the students and teachers to use the internet to access web based learning resources like online journals and general information for research and creation of knowledge.

The results revealed that also television set as a tool for learning in the secondary school was there at some school with a majority ($\mu=3.4958$ and $STD=1.11276$) of respondents responding that they agreed on availability of TV set but on the other hand TV set was unavailable. The researcher's discussion with some students exposes that the school has only one TV sets and these are mainly used for students' entertainment rather than for academic purposes. This suggests that, the entire school doesn't utilize Television as a learning tool and as such important television based educative programs like national geographical channel, discoveries etc. which may be very useful source of information for the students are missed out. The results in Table 2 further show that projectors for presentation of some course materials were present in the school as supported by some of the respondents said that they don't know availability of projector ($\mu=3.3697$ and $STD =.88469$). During the process of data collection, the researcher saw several students of computer sciences using the projector to present their course works. Besides, discussion with the students revealed that the class representatives are responsible for picking and connecting the projector both for teachers and students use.

The availability of Printer $\mu=3.8655$ and $STD =1.08635$ while for scanners $\mu=3.3697$ and $STD=1.12032$ in the school most of the respondents they don't know as supported by a majority of respondents not sure to the availability of scanners. The availability of updated software ($\mu=3.3697$ and $STD=1.12032$). The discussion with the school manager and director of study revealed that it is true the school have only one scanner to be used in academic services and students have no access to school scanners.

Table 2 also reveals that equipped laboratory in the school is still not perfect as supported by the respondents ($\mu=3.3739$ and $STD =1.11703$) accepting that they are agree to availability. The discussion with the school manager and director of study revealed that it is true the school have moderate amount of printers to be used in different academic services including printing examinations, reports, etc. and students have no access to school printers. It shows that majority of the respondents responded that equipped computer laboratories in the school were fairly agree to availability, closely supported by ($\mu= 3.3739$ and $STD=1.11703$) while availability of e library ($\mu= 2.8109$ and $STD=1.09176$) respondents who consented that equipped computer laboratories were not sure to the availability. In the open ended questionnaire, the students noted that there is a good equipped computer laboratory in the secondary school which have advanced level than ordinary level; they however get difficulty to get easy access to computers for use especially for the non-advanced level classes. They also said that some computers did not have all programs they could use and others were faulty. This suggests that though limited in number, computer laboratories in the school are available. The biggest challenge being that students should compete to access the laboratories which competition may hinder their

interest in accessing and using the laboratories. Besides that, bigger number of computer in laboratory they are not connected to internet network and this hinder access to information all over the world to students.

Table 3: Descriptive Statistics on accessibility of ICT resources

	N	Mean	Std. Deviation
Accessibility to Computers	238	3.9412	1.14953
Accessibility to Computer accessories	238	3.1891	1.19509
Accessibility to Internet connectivity	238	2.4916	1.23501
Accessibility to Television Set	238	3.2647	1.09530
Accessibility to Printers	238	3.3782	1.20121
Accessibility to Updated Software	238	3.4496	2.16307
Accessibility to Scanners	238	3.3487	1.18367
Accessibility to computer laboratories	238	3.3571	1.19182
Accessibility to e-Library	238	2.1471	1.40501
Accessibility to projectors	238	3.3697	1.12032
Overall	238	3.1937	1.294003

Source: Research of field data, 2021

Note: Strongly Disagree= [1-1.8]=Very Low Mean; Disagree= [1.9-2.6]=Low mean; Neutral= [2.7 – 3.4]=moderated mean; Agree= [3.5-4.2]=High mean; Strongly Agree = [4.3-5]= Very High mean

The results in Table 3 shows that the secondary school library and computer laboratory are the most popular places for students to access ICT for general use notably accessibility of computer, the respondents strongly agree ($\mu= 3.9412$ and $STD=1.14953$), the students always accessed ICT resources in the computer laboratory at rate of ($\mu= 3.3571$ and $STD=1.19509$), For e library ($\mu= 3.1891$ and $STD=1.40501$) of the respondents accepted that sometimes they do access ICT resources especially computer accessories.

This suggests that restricted access to ICT facilities in both the Computer laboratory and library tends to deny students exploration of ICT resources for acquisition of information, and knowledge necessary for their academic pursuits. The results in table 3, shows that the respondents disagree to the accessibility ICT resources from the e-library and internet connectivity respectively at rate of ($\mu= 2.1471$ and $STD=1.40501$) and $\mu= 2.4916$ and $STD=1.23501$). The researcher’s discussion with some respondents revealed that this access was not frequent. This was further confirmed by the teachers and students who asserted that access to the few computer laboratories for non-advanced students were dependent on the laboratory being free which is not frequent. Only ($\mu= 3.2647$ and $STD=1.09530$) of the respondents were not sure to the accessibility of television set, this means that TV set within the school accessibility is not perfect in secondary school.

The findings from table 3, shows that the accessibility to printers ‘respondents don’t have access at rate of ($\mu =3.3782$ and $STD=1.20121$) but some respondents agreed to access scanners ($\mu =3.3487$ and $STD=1.18367$) on other side students and teachers have no access to projectors ($\mu = 3.3697$ and $STV=1.12032$). The accessibility of updated software ($\mu =3.4496$ and $STD=2.16307$). This suggests that restricted

access to ICT facilities in both the Computer laboratory and library tends to deny students exploration of ICT resources for acquisition of information and knowledge necessary for their academic pursuits. The findings reveal that access to ICT resources in the classrooms is still limited and if the classroom is a typical learning environment, then access to ICT resources should be improved to allow both student’s and lecturer’s access to and production of, resource materials associated with the processes of teaching and learning.

The results in 3, the findings in the open ended question revealed that few ICT resources in the school remains the most serious challenge affecting accessibility of ICT facilities in secondary school as a majority of respondents to computer laboratory ($\mu= 3.3697$ and $STD=1.14953$) and updated software ($\mu= 3.4496$ and $STD=2.16307$) while printers ($\mu= 3.3782$ and $STD=1.20121$). The respondents stated that students are given limited time to practice since are always competed for by students from the different levels. Since most levels in secondary school do not have computer laboratories, priority is always given to the students of computer science and other advanced level. This is further supported by some of respondents who consented that limited access to the computer laboratory remains the biggest challenge of accessing ICT in the smart room. This is further supported by more respondents who consented that limited access to the computer laboratory remains the biggest challenge of accessing ICT in the computer laboratory, besides that there are some secondary schools don’t have the electricity to incorporate ICT in the school. As a result, students continually have limited access and use computers for their academic purposes.

Table 4 : Descriptive Statistics of user-ability of ICT resources

	N	Mean	Std. Deviation
User-ability of Computer in general	238	4.2647	.95538
User-ability of Internet in Learning	238	2.2941	1.36473
User-ability of Television Set	238	3.3403	1.20378
User-ability of Projectors in learning	238	3.0630	1.11388
User-ability of Printers	238	3.0924	1.12502
User-ability of updated Software	238	3.1008	1.11677
User-ability of Scanners	238	3.0966	1.12654
User-ability of equipped laboratory	238	3.3697	1.12032
User-ability of e-library	238	2.2311	1.15157
User-ability of computer accessories	238	3.1008	1.12430
Overall	238	3.09535	1.140229

Source: Research of field data ,2021

Note: Strongly Disagree= [1-1.8]=Very Low Mean; Disagree= [1.9-2.6]=Low mean; Neutral= [2.7 – 3.4]=moderated mean; Agree= [3.5-4.2]=High mean; Strongly Agree = [4.3- 5]= Very High mean.

The Results from Table 4, show that majority of the respondents ($\mu =4.2647$ and $STD=.95538$) emphasized that skills to use computer in general is very good because most of the respondent they are strongly agree but their skills are limited to Microsoft word, excel and power point. The

others respondents not sure about user-ability of computer accessories were not enough within the school at rate of ($\mu = 3.1008$ and $STD = 1.12430$) which is neutral for most of the respondents.

The finding reveals that the student's capabilities to use MS Word for their academic purpose like preparation of course work is relatively good which suggest that ICT can influence positively teaching and learning in Rwandan secondary school. The results in Table 4, shows that respondents recorded only ($\mu = 2.2941$ and $STD = 1.36473$) on the User-ability of Internet in learning process which is low mean and the fact appears less within the school; During a discussion with the researcher, some students revealed that the content taught to them is very shallow and even one teacher consented that "we train them only basic components" which was a further proof of the shallowness of the contents taught.

Besides that, some students complained to the use of internet connectivity by the way the students want to make their own research so that they got from internet adequate technical skills to supplement the content delivered by their teacher. User-ability of scanner ($\mu = 3.0966$ and $STD = 1.12654$), while for user-ability of printer ($\mu = 3.3403$ and $STD = 1.20378$). The findings obtained from Table 4, above, show that only ($\mu = 3.3697$ and $STD = 1.12032$) of all the respondents" agreed that student's skills to use equipped laboratory in performing learning tasks were good. On the other hand, a big number of the respondents totaling to ($\mu = 3.1008$ and $STD = 1.11677$) believed that their skills to use updated computer software program in performing learning tasks were remained neutral, as it is indicated by the mean. About ($\mu = 2.2311$ and $STD = 1.15157$) rated their use of e-library as Low mean and the fact appears less within the school. The above findings suggest that the students were fairly capable and skilled in using presentation software like Power Point to present their course materials during discussions and lessons. The findings also reveal that students are not well equipped to use online instruction like blackboard to share learning materials while the user-ability of television set within secondary school ($\mu = 3.3403$ and $STD = 1.20378$). Besides, discussion with the students also reveals that no active online instruction system was in place since the school has not had internet connection for a long period of time. Discussions with the teachers confirmed that teaching students how to create a simple software program, it is a problem. A teacher from the advanced level of computer science said that time and financial resources doesn't allows for this program thus students are not provided with the knowledge and skills in this packages which affects their learning in this information age.

The Results from Table 4, further reveal that ($\mu = 3.0630$ and $STD = 1.11388$) the mean of the students and teachers 'use had relatively moderate, meaning that some of them they didn't know how to use a projector in presenting their course work. Some of the respondents said their skills to use

projectors were not relatively good. The findings showed that some ordinary level students didn't learn computer science properly because for some teachers instead of teaching ICT they teach core course module which included in curriculum of national examinations, this hinder the performance of students in ICT courses and others non-core courses.

Table 5 : The Descriptive statistics on students' learning behaviors

The Respondents were asked to give their judgment on the different tasks.			
Options	N	Mean	Std. Deviation
Majority of learners are committed to their learning	238	3.3529	1.12575
Majority of learners have Very high Concentration	238	3.3697	1.12032
Majority of learners have positive attitudes towards learning	238	3.3739	1.12080
Majority of learners are punctual to their learning	238	3.3571	1.12629
Majority of learners' Dropout rate is very low	238	4.2563	1.02163
Majority of learners' Absenteeism rate is very low	238	3.5378	1.10075
Majority of learner help one another in learning	238	3.3824	1.11038
Majority of learners respect the School Staff	238	3.3697	1.12032
Majority of learners have good Performance	238	3.9958	1.03320
Majority of learners have Very high Concentration	238	3.3697	1.12032
Overall	238	3.53653	1.099976

Source: Field Data, 2021

Note: Strongly Disagree= [1-1.8

[=Very Low Mean; Disagree= [1.9-2.6]=[Low mean; Neutral= [2.7 – 3.4]=[moderated mean;

Agree= [3.5-4.2]=[High mean; Strongly Agree = [4.3-5 [= Very High mean.

The results in table 5 indicated that the respondents committed to their learning and they agreed to that assertion with ($\mu=3.3529$ and $STD=1.12575$) Learning by using ICT resources facilitate the students to become an independent in terms of knowledge, skills and creativity The finding implies that despite the difficulty in accessing computers, students were putting enough effort to use computers in their daily learning processes. The respondents agreed that they have very high concentration due to integration of ICT resources in learning sector as ($\mu=3.3697$ and $STD=1.12032$) agreed to own learning using computer and internet. They are willing to use computers resources as a supplement to other teaching activities and internet for own learning. The above finding suggest that ICT offers tools for thinking more deeply, pursuing curiosity and exploring and expanding intelligence as students build mental models with which they can visualize connections between ideas on any topic. These finding is consistent with Bataineh and Baniabdelrahman (2015) who pointed out that computers can be used as a supplement but cannot fully replace the teacher's job.

The results from Table 5 revealed that students agreed to having very positive attitude towards learning by using information technology as indicated by the mean ($\mu=3.3739$ and $STD=1.12080$). The respondents use computers to complete course works, projects, reports, exchange of information and making research over internet so that they become the school leavers who is able to compete to national or international labor market of work all over the world. Table 5 further reveals that Majority of

learners agreed to be punctual to their learning ($\mu=3.3571$ and $STD=1.12629$) agreed that ICT improve students' organizational skills by respecting scheduling of time table in order to curb loss of any contents. IT improving students' organization skills. The findings suggest that interactive educational technologies help students to learn to organize complex information, recognize patterns, draw inferences, communicate findings and learn better organizational and problem solving skills.

The results in Table 5 also revealed that Majority of learners' Dropout rate is very low about ($\mu=4.2563$ and $STD=1.02163$) of the respondents were strongly agree. It means that ICT resources within the school have great effect on reduction of dropout rate within the secondary school, the integration of ICT resources should be maintained properly so that attendance for students minimized.

Table 5 reveals that Majority of learners' Absenteeism rate is very low at rate of ($\mu=3.5378$ and $STD=1.10075$) which is High mean and the fact appears more within the secondary school. It means that when the students are motivated in their learning this reduces students' absenteeism rate. The results from table 5 indicates that Majority agreed that learner help one another in learning at rate of ($\mu=3.3824$ and $STD=1.11038$). The findings imply that the students have the ability and work co-operatively with others and apply a variety of skills to communicate with and understand others. This is supported by the fact that clusters of students working together on computers learn more than individual students working alone and attending class regularly (Ames, 1999).

The results in Table 5 reveals that Majority agreed that learners respect the School staff within the secondary school at rate of ($\mu=3.3697$ and $STD=1.12032$) by using ICT resources students are able to incorporate and maintain a good discipline from peers group or from other students through internet connectivity. The above table 5 also indicates that Majority agreed that learners have good Performance ($\mu=3.9958$ and $STD=1.03320$), Majority of the students are familiar with technology and are usually able to judge its potential agreed to acquiring some of the pre-requisite skills needed for workplace preparation. This is further supported by some of the respondents consented that technology can help students link academic subject to work place demands. Only a small number of technology providing pre-requisite skills to students for work place preparedness. The findings suggest that technology provides students with knowledge based and skillful intellectual work required in industrial, professional and business occupation since a workers' ability to use ICT is a necessity in more and more occupations. Table 5 further shows that a majority agreed that learners have Very High Concentration ($\mu=3.3697$ and $STD=1.12032$) it means that respondents agreed to ICT linking academic subjects to work place demands. The evidence in this finding suggest that

students use ICT for personal growth by analyzing subject context critically and using it productively in better preparation for the real employment world. **The regression analysis on availability of ICT resources on students learning behavior of Rwandan secondary school.**

Table 6: Model Summary on availability of ICT resources

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.141 ^a	.020	-.103	.33731

Source: Field Data, 2021

The results on primary data indicated that the predictor variables were able to explain much of the movement of the dependent variable as shown in Table 6. The R square was 02.0%. Based on the regression model, the study tested the hypothesis that the predictor variables collectively have effect on the dependent variable.

Table 7 : ANOVA On the Availability Of ICT Resources

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.018	1	.018	.162	.698 ^b
	Residual	.910	8	.114		
	Total	.929	9			

a. Dependent Variable: Students Learning Behaviors

b. Predictors: (Constant), Availability of ICT Resources

This test is directed by F statistic in Table 7 which indicated that its *p* value of 0.698 is greater than α of 5% for each variable’s coefficient hence statistically insignificant different from zero. This meant that at 5% insignificance level, the study rejected the null hypothesis and inferred that the independent variables in focus were jointly statistically insignificant in predicting the value of changes in availability of ICT resources and students’ learning behavior in Rwandan secondary school. Based on results above, the study concluded that the independent variables insignificantly influence the dependent variable.

Table 8 : Regression coefficient on the availability of ICT resources on students learning behavior

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.867	.829		4.663	.002
	Availability of ICT Resources	-.094	.233	-.141	-.402	.698

Source: Field Data, 2021

The Results in Table 8 revealed that there was a negative and insignificant relationship between independent variable and dependent variable ($\beta = -.094$, *p* value >0.05). This means that a unit of change in both variables decreases by 0.094 units while holding constant. Furthermore, there was a negative and insignificant relationship between availability of ICT resources and students learning behaviors.

$Y = 0.698 - 0.094X_1$: Where: Y refers to factor 2 as dependent variable (students learning behaviors); X_1 refers to factor 1 (availability of ICT resources)

Regression analysis on accessibility of ICT resources on students' learning behavior

Table 9: Model Summary on accessibility of ICT resources

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.315 ^a	.099	-.014	.32340

Source: Field Data, 2021

a. Predictors: (Constant), Accessibility of ICT Resources

The results on primary data indicated that the predictor variables were able to explain much of the movement of the dependent variable as shown in Table 9. The R square was 9.9 %. Based on the regression model, the study tested the hypothesis that the predictor variables collectively have effect on the dependent variable.

The findings show that the independent variables (accessibility of ICT resources) has impact of 9.9 % of the variation in level of students learning behavior as explained by adjusted R² of 0.099 which shows that the model is a good improvement.

Table 10 : ANOVA on accessibility of ICT resources

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.092	1	.092	.879	.376 ^b
	Residual	.837	8	.105		
	Total	.929	9			

Source: Field Data, 2021

a. Dependent Variable: Students Learning Behaviors

b. Predictors: (Constant), Accessibility of ICT Resources

This test is directed by F statistic in Table 10 which indicated that its *p* value of 0.376 is greater than α of 5% for each variable's coefficient hence statistically insignificant different from zero. This meant that at 5% insignificance level, the study rejected the null hypothesis and inferred that the independent variables in focus were jointly statistically insignificant in predicting the value of changes in accessibility of ICT resources and students' learning behavior in Rwandan secondary school. Based on results above, the study concluded that the independent variables insignificantly influence the dependent variable.

Table 11 : coefficients of accessibility of ICT resources

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.170	.684		6.099	.000
	Accessibility of ICT Resources	-.198	.212	-.315	-.937	.376

Source: Field Data, 2021

a. Dependent Variable: Students Learning Behaviors

The Results in Table 11 revealed that there was a negative and insignificant relationship between independent variable and dependent variable ($\beta = -.0,198$ *p* value>0.05). This means that a unit of change in both variables decreases by 0.198 units while holding constant. Furthermore, there was a negative and insignificant relationship between availability of ICT resources and students learning behaviors.

$Y = 4,170 - 0.198X_1$; Where: Y refers to factor 2 as dependent variable (students learning behaviors); X_1 refers to factor 1 (accessibility of ICT resources)

Regression analysis on user-ability of ICT resources on students' learning behavior

Table 12: Model Summary On user-ability of ICT resources

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.342 ^a	.117	.007	.32012

Source: Field Data, 2021

a. Predictors: (Constant), User-Ability of ICT Resources

The results on primary data indicated that the predictor variables were able to explain much of the movement of the dependent variable as shown in Table 12. The R square was 11.7%. Based on the regression model, the study tested the hypothesis that the predictor variables collectively have effect on the dependent variable. The findings show that the independent variables (user-ability of ICT resources) has impact of 11.7 % of the variation in level of students learning behavior as explained by adjusted R² of 0.117 which shows that the model has good improvement.

Table 13 : ANOVA on user-ability of ICT resources

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.109	1	.109	1.062	.333 ^b
	Residual	.820	8	.102		
	Total	.929	9			

Source: Field Data, 2021

a. Dependent Variable: Students Learning Behaviors

b. Predictors: (Constant), User-Ability of ICT Resources

This test is directed by F statistic in Table 13 which indicated that its *p* value of 0.33 is greater than α of 5% for each variable's coefficient hence statistically insignificant different from zero. This meant that at 5% significance level, the study rejected the null hypothesis and inferred that the independent variables in focus were jointly statistically insignificant in predicting the value of changes in user-ability of ICT resources and students' learning behavior in Rwandan secondary school. Based on results above, the study concluded that the independent variables insignificantly influence the dependent variable.

Table 14: Coefficients on user-ability of ICT resources

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.137	.591		6.996	.000
	User-Ability of ICT Resources	-.194	.188	-.342	-1.030	.333

Source: Field Data, 2021

The Results in Table 14 revealed that there was a negative and insignificant relationship between independent variable and dependent variable ($\beta = -.0,194$ *p* value >0.05). This means that a unit of change in both variables decreases by 0.198 units while holding constant. Furthermore, there was a negative and insignificant relationship between user-ability of ICT resources and students learning behaviors in Rwandan secondary school.

$Y = 4,137 - 0.194 X_1$. Where: Y refers to factor 2 as dependent variable (students learning behaviors); X_1 refers to factor 1 (user-ability of ICT resources)

Discussion

As stated earlier, this study aimed at investigating the effect of ICT on the students learning behaviors in selected public secondary school in Rwanda by answering the following research questions: What is the effect of availability of ICT resources among public selected Rwandan secondary school? What is the effect of accessibility of ICT resources among public selected Rwandan secondary school? What is the effect of user-ability of ICT resources among public selected Rwandan secondary school? The following are the findings for each research question.

Concerning the research question number one, the study established that the availability of ICT resources in the secondary school and student learning behavior there is an insignificant and negative effect of the independent variables to dependent variables. The study by Inter-secondary school Council for East-Africa (ISCEA) in 2015 revealed that 43% of ICT resources in Rwandan secondary school were available within the public selected school (Mbwesa, 2016). In Africa continent the application of ICT faces many challenges including Analysis revealed to overcome in order to disseminate the use of ICT throughout the nation generally and in education specifically. With a poor infrastructure 16% of electricity coverage in households by 2012, 47% in public schools, low connectivity rates 6% in public primary while 18% in secondary school are only connected to internet in Rwanda, lack of equipment and high costs, access to ICT in the education system is very limited (computer to student's ratio in secondary schools 40:1; 16% of primary schools use XO laptops). In addition, due to a lack of ICT culture and of understanding of its possible applications and benefits in education, communities and educational institutions are often reluctant to adopt ICT and adapt their teaching methods. The study by Rwanda education board (REB) in 2017 revealed that 49% school leavers in secondary school of Rwanda complained to shortage of ICT resources within the school (Mugege, 2018). Even when such material and cultural barriers are overcome and ICT in Education initiatives are taken up, other challenges arise, such as, limited availability of digital learning material, lack of expertise in project management skills and poor coordination of initiatives, systematic road map for ICT Teachers Professional Development, e-readiness survey, analysis and ICT infrastructure plan and technical support. The study further reveals that ICT resources in the school are inadequate.

The availability of computers and related technologies without being made adequate in regards to student's needs may make no difference in the teaching and learning processes. Greenleaf (2009) further explained that inadequacy of ICT facilities translates into lack of skills in the use of ICT equipment and software which results in a lack of confidence in utilizing ICT tools among the students. This is consistent with Herman and Joan

(2007) who concluded that lack of enough ICT tools to be key inhibitor to the use of ICT in classroom.

With regard to research question number two, the study revealed that the accessibility of ICT resources in the secondary school and student learning behavior there is an insignificant and negative effect of the independent variables to dependent variables. The study by Rwanda education board (REB) in 2016 revealed that 38% school leavers in secondary school of Rwanda complained to the degree in which ICT resources are easily accessed by many people as possible at school (Bigozi, 2017). Learning using ICT is hindered by accessibility to different ICT resources. Bardwell (2002) emphasized the issue of accessibility as a feature of ICT integration into teaching and learning process. The study revealed that, because of the limitation in the numbers of functional computers and laboratories, the computer laboratories are timetabled and time for accessibility is limited. Teachers and students from the different secondary school are supposed to adhere to time schedules which do not promote accessibility at convenience. Nonetheless, timetabling is aimed at better organization and management of the scarce resources and most respondents agreed that there is access though insufficient in the school.

The study indicates that easy access of ICT facilities was a problem in all the secondary school's sector. According to the findings majority of the students hardly accessed ICT facilities from school. Resource centers were not in place and in public libraries there were no ICT facilities for students use. No time was allocated for students practice in the computer lab. Besides, the teachers also compete for facilities in the computer lab with students. However, the study also shows that computer lab and school library remains the two most popular places to access ICT resources. It is worth noting that accessibility to the internet which is one of the major indicators of ICT in learning in an institution is not fully implemented in every sector especially, the halls of residence, teacher rooms. Alessi and Trollip (2012) precisely hint that the internet will transform many activities including teaching and learning within the school.

This makes ICT in learning to manifest and be limited to computer lab and the library only. Learning on the internet conforms to constructivist approach to instruction (Jonassen, 2010) so the limit to places is not an ideal practice. UNESCO (2015) points out that the success of ICT in teaching and learning process in education sector shall base on the degree with which students and teaching staff access ICT facilities. Findings from respondents limited ICT resources as the biggest challenge affecting students' access to ICT facilities ($\mu=3.542$). This was closely followed by financial constraints cited by some 12 % of the respondents. The researcher's discussion with the school manager and deputy school manager reveals the need for increment in ICT facilitation so as to increase on the number of technology accessories in the school. Limited time to access the computer lab (10%),

Internet connectivity (7%) and power fluctuation (3%) were some of the other reasons cited as affecting students access to ICT resources.

With regard to research question number three the study also established that the user-ability of ICT resources in the secondary school and student learning behavior there is an insignificant and negative effect of the independent variables to dependent variables. According to UNESCO (2012), the safe way to bring computers to institutions is teaching students skills of how to use word processors, spread sheets, data bases and graphic tools. These are the productive tools required later on in life. The developments of appropriate strategies to use these tools productively are through identifying and developing the level of user-ability skills. The study has shown that more of respondents rated their skill as good in Ms. office including Word, and Spreadsheets. Although the respondents scored high on ICT user-ability skills, this does not mean that they use ICT effectively. Only what can be inferred is that the respondents rate their skills highly and rating the user skill is not based on any standard measure. It is just a way one perceives his or herself. However, perceiving oneself positively is a very important basis on which to judge the ability to participate effectively in an activity.

The study reveals that computer user-ability skills influence learning. Students and teachers with such skills were seen to be more comfortable in their application of the various computer programs, meaning that those who rated their ICT user-ability skills high also have high skills to gage ICT into learning processes. This was also observed in practice where learners with good user-ability skills were more proficient than their colleagues who had rated themselves low.

It was found out that emphasis was put on training students' basic concepts of ICT. The introductions were based on students' identification and use of computer terminology appropriately such as hardware and software. Students were trained to identify the main components of the hardware in use (i.e. Central Processing Unit (CPU), input devices, output devices and storage devices); students demonstrated an understanding of the functions of the main components of the hardware in use; identified various peripheral devices (e.g. printers, scanners, plotter, scanner, digital camera); and use of email, demonstrated an understanding of the functions of the various peripheral devices which was in agreement with UNESCO's module one for skills in ICT curriculum (UNESCO,2010). Just like Jonassen, emphasis was put on this section because it formed a rich examinable area for ICT assessment Like Tearle (2013), Drenoyianni (2014) agrees that variations in the ICT skill base of individuals can impede the use of ICT for teaching and learning. Drenoyianni (2014) advocates a phased approach where students are required to complete a mandatory initial introduction to ICT and this in turn leads on to training in the more complex ICT packages. In this way the introduction to ICT is a preparatory stage allowing students to build their ICT confidence where they later learn

to utilize ICT in the learning context. Minimum standards of expertise are maintained and standards met but not ending on the Microsoft office suite like what the school was doing (Mbwesa 2010).

Overall, the study found no significant effect of ICT resources on the student learning behavior in public secondary school in Rwanda. These findings are similar to those of kiokyr (2017); Thaniob (2012); pafyir (2014) and merrinkn et al. (2007) whose studies confirmed that availability of the ICT resources does not significantly affect student learning in secondary school. However, the findings suggested that wanivrrth (2010); Rh, Getyfoo and Hendry (2017; Souter and Turner (2012); varary and amenity (2010); Nurentry et al. (2013); Jeckylina and Grownney (2012); Shrilly (2010) and aminol (2009) whose studies found that accessibility and user-ability of ICT resources have no significant effect on student learning behavior in Rwandan secondary school.

Conclusion

As per the above findings, it was concluded that in this era, ICT plays an important role in day- to-day activities, including education, so it is worth time to evaluate the effect of ICT resources on education sector and to ensure its positive use. In this context, this study was carried out using correlational design, descriptive statistics, reliability analysis. The study exposes the negative impact of the ICT resources of the students learning behavior including some Students spent most of the time with ICT in non-academic purpose as the use of ICT if it is not used properly. The study also shows that if academic or related institutions take the right steps to use the ICT for academic purposes, education as a whole and students learning behavior in particular will benefit greatly.

The ICT infrastructure within the school is poorly developed, unevenly distributed and inadequate. However, some ICT resources like computer lab, projectors, scanners, printers and television sets were considered to be available but used for academic purpose only while the students have no access to them. Besides That, the biggest challenge still affecting easy access to ICT facilities in the school remains the limited number of ICT resources which does not match with the ever increasing student population. But there was at least something in place to build on though still was limited to computers. Indeed, in ordinary level classes, some students complained that their teachers focused on core module in our Rwandan curriculum, meaning core module most of the time replace non-core modules.so this hinder student's achievement in ICT courses.

Recommendations

Basing on the findings of this study, in order to improve ICT resources and students learning behavior in Rwandan secondary school, the following recommendations may be considered.

The ministry of education should need to invest more in computers and related technology as means of not only solving accessibility problem but

improving on the presence of the facilities especially computers in the classroom and computer lab. More infrastructures: printers, computers, projectors should be put in place for more practice and utilization; The study also recommended to secondary school to maintain internet connectivity in the school and connect more computers to the internet. The school should then liberalize accessibility of internet connectivity in the institution in form of establishment of ICT resource where all software can be accessed, students' packages and all versions of technology. All in all, the school shall take time and even not get there to afford a 1:1 ratio of Student, ICT access to facilities thus students should also endeavor to acquire themselves what can be afforded or visit commercial ICT providers like internet café to access ICT facilities; Teachers should conduct their classes by using ICT. Indeed, Training in ICT skills should not be limited to Ms Office suits; the secondary school should go ahead to integrate the other programs and packages as recommended by MINEDUC (2017) curriculum for schools. Clearly a basic level of ICT skill must be achieved but this should be followed by an integrated approach to ICT and learning. The aim should be for embedding ICT firmly into the teaching and learning process so that it is no longer considered a separate and discrete element. Such changes may offer the potential to improve on teaching and learning using modern technology; Educational monitoring and evaluators should look at the completion of all core module and non-core, as some students complained that in ordinary level ICT is replaced by core modules of the curriculum.

References

- Adewola, T. (2014). Sampling Methods in Research Methodology; Sampling Technique for Research. *International Journal of Academic Research in Management*, 5(2):18-27.
- Adewole, A. P., Akinwale, A. T., & Omokanye, B. M. (2008). A consulting information and communication technologies (ICTs) teacher model for teaching secondary school curriculum. *College of Natural Sciences Proceedings*, 1(3), 38-46.
- Adomi, E. E., & Kpangban, E. (2010). Application of ICTs in Nigerian secondary schools. *Library Philosophy and Practice (e-journal)*, 12(3), 45-52. Retrieved April 18, 2019, from <http://www.webpages.uidaho.edu/~mbolin/adomi-kpangban.htm>
- Akerman, A., Gaarder, I., and Mogstad, M. (2015). The Skill Complementarity of Broadband Internet. *The Journal of Economics*, 130(4). 1781–824.
- Ampofo, Y.S., Bizimana, B., Mbuthi, J., Ndayambaje, I., Ogetta, N. & Orodho, A.J. (2014). Information Communication Technology Penetration and its Impact on Education: Lessons of Experience from Selected African Countries of Ghana, Kenya and Rwanda. *Journal of Information Engineering and Applications*, 4, pp.84-95, ISSN 2224-5782

(print) ISSN 2225-0506 (online) Available online at <http://www.iiste.org/Journals/index.php/JIEA/article/view/17336/17535>

- Anderson, R. E., & Becker, H. J. (2001). School investments in instructional technology. Irvine, CA: *Center for Research on Information Technology and Organizations*, University of California, Irvine.
- Bauer, J., & Kenton, J. (2005). Toward technology integration in schools: Why it isn't happening. *Journal of Technology and Teacher Education*, 13(4), 519-546. Retrieved on 16 march 2019 from www.editlib.org/p/4728
- Bitner, N. & Bitner, J. (2002). Integrating technology into the classroom: eight keys to success. *Journal of Technology and Teacher Education*, 10, 95-100.
- Brooks, J. G. (2004). Constructivism as a paradigm for teaching and learning. *Educational Broadcasting Corporation*. Retrieved April 15, 2020, from <http://www.thirteen.org/edonline/concept2class/constructivism/index.html>
- Buckenmeyer, J. (2008). Revisiting teacher adoption of technology: Research implications and recommendations for successful full technology integration. *College Teaching Methods & Styles Journal (CTMS)*, 4, 7-10. Retrieved from <http://www.cluteinstitute.com/ojs/index.php/CTMS/article>
- Bulman, G. and Fairlie, R. W. (2016). Technology and Education: Computers, Software and the Internet. *National Bureau of Economic Research*, NBER Working Paper No. 22237.
- Cristia, J., Ibararan, P., Cueto, S., Santiago, A., and Severín, E. (2017). Technology and Child Development: Evidence from the One Laptop per Child Program. *American Economic Journal: Applied Economics*, 9, 295–320.
- Ezza EY. *EFL Teacher's Role in ICT-oriented Classroom: The case of Majma'ab University*. *TESA Proceedings*.
- Fairlie, R. W. and Kalil, A. (2016). The Effect of Computers on Children's Social Development and School Participation: Evidence from a Randomized Control Experiment. *National Bureau of Economic Research*, NBER Working Paper No. 22907.
- Hennessy, S., Harrison, D. & Wamakote, L. (2010). Teacher Factors Influencing Classroom Use of ICT in Sub-Saharan Africa. *Itupale Online Journal of African Studies*, 2, 39- 54
- Jaber, W. E. (1997). *A survey of factors which influence teachers' use of computer-based technology (Doctoral dissertation)*. Retrieved from Pro Quest Dissertations and Theses database. (UMI No. 9936916)
- Jerome Johnston, (2002), *Assessing the Impact of Technology in Teaching and Learning: Institute for Social Research at the University of Michigan*, Retrieved from, <http://www.dlrn.org/star/sourcebook.html>.
- Joy, E. H., & Garcia, F. E. (2000). Measuring learning effectiveness: A new look at no-significant difference findings. *Journal of Asynchronous Learning Networks*, 4(1), 33-39

- LEWIS, B. R., SNYDER, C. A. & RAINER, K. R. 1995. An empirical assessment of the Information Resources Management construct. *Journal of Management Information Systems*.
- Lockard, J., Abrams, P. & Many, W. (1994). *Microcomputers for the 21st century educators, 3rd ed., New York, Harper Collins*.
- MALHOTRA, N. K. & BIRKS, D. F. 2006. *Marketing Research: An Applied Approach, Harlow, FT /Prentice Hall*.
- MAXWELL, J. A. 1996. Qualitative Research Design: An Interactive Approach London, *Applied Social Research Methods Series*.
- McConnell, T. J., Parker, J. M., Eberhardt, J., Koehler, M. J., & Lundeberg, M. A. (2013). Virtual professional learning communities: Teachers' perceptions of virtual versus face-to-face professional development. *Journal of Science Education and Technology*, 22, 267–277.
- Mendy, A. (2019). *University majors around the world, in public figures*. Retrieved April 20, 2020, from <https://www.vox.com/authors/libby-mendy>
- Ministry of education (2017). Strategy to *integrate ICT in Rwandan Education systems book*. Retrieved August 1, 2019 https://mineduc.gov.rw/fileadmin/user_upload/pdf_files/2017
- Mumtaz, S. (2000). Factors affecting teachers' use of information and communications technology: a review of the literature. *Journal of Information Technology for Teacher Education*, 9(3), 319-342.
- Jackson, D., B. Edwards and C. Berger (2003) The Design of Software Tools for Meaningful Learning by Experience: Flexibility and Feedback. *Journal of Educational Computing Research*, 9 (3), 413-443.
- Ndayambaje, I. (2014). Facing ICTs and elearning environment: An investigation from the graduates registered in the first batch of e-learners under PanAfrican Tele-Education program in Rwanda. *Rwandan Journal of Education*, 2 (1), Available online at <http://www.ajol.info/index.php/rje/article/view/111274/101058>
- NETEMEYER, R. G., BEARDEN, W. O. & SHARMA, S. (2003). *Scaling procedures: Issues and applications, Thousand Oaks*.
- OECD, Organization for Economic Co-operation and Development (2015). Students, Computer and Learning: Making the Connection. *OECD Publishing*, Paris. Retrieved 25 march 2020 from <http://dx.doi.org/10.1787/9789264239555-en>.