

## Information Communication Technology (ICT) Integration in Teaching and Learning in Selected Rural Secondary School in Burera District, Rwanda

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### ABSTRACT

*Studies conducted on the use of information and communication technology (ICT) in education posit its importance in all life domains, without exception to education. ICT has been a vehicle for aspiration, innovation, and quality academic achievement. This paper aimed to investigate the use of information and communication technology in the teaching and learning process at Ecole Secondaire Kagogo in Burera District, Rwanda. The study had two objectives: (1) to assess the benefits of using ICT in rural secondary schools, and (2) to examine the challenges preventing effective ICT integration in secondary schools. The study is descriptive, adopting a mixed-methods approach. Guided by the Diffusion of Innovations Theory (DOI), the study involved a population of 114 participants with a purposive sample size of 52 respondents. Data were collected through a questionnaire and interviews with teachers and school leaders. Findings revealed that ICT enables teachers to share assessments with students and deliver the lessons; helps learners engage in peer assessments and independent learning; and that school leaders use ICT to share resources. Reports identified inadequate infrastructure and a lack of professional development as barriers to the effective integration of ICT into schools. It was recommended that the required facilities, resources, and ICT gadgets be supplied for rural secondary schools so they would not still lag behind in the use of ICT in teaching and learning.*

**Keywords:** ICT, Integration, Learning, Rural Secondary School, Teaching

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### I. INTRODUCTION

This research was carried out within a secondary school in Rwanda to determine the integration of ICT in teaching and learning. The introduction of technology in delivering lessons is complex and continues to play an essential role in the schooling sector (Underwood, 2014). Winter et al. (2021) reported that technology usage provides more insight into a number of educational activities and new tools that facilitate students while doing homework and assignments. Learners have had access to school ICT Lab for different academic uses such as internet for discussed issues in classroom to have deep and painstaking information, searching for academic information related to assigned academic tasks, and searching for news to harmonize notes and summaries (Kakkar, 2015). Yesilyurt et al. (2014) contended that learners can use household computers and parents' smart phones to do homework and self-guided learning activities. Household computers usage contributes to learners' self-learning and help them share with their parents some homework contents. Public internet cafe accessibility by learners plays a vital role in shaping learners' teaching and learning activities and it improves educational outcomes (Bragdon & Dowler, 2016).

Taking into account access and usage of ICT in secondary schools and in diverse domains, ICT has been a vehicle for aspiration, innovation and quality academic achievement. From both outdoor in the education sector, both within school and from outdoor, ICT has been a fundamental part of the teaching and learning process for secondary school learners (Kumar et al., 2024). For example, in many countries of Europe, ICT has enabled new or more efficient ways of doing things and provides new tools that facilitate learners' structure of learning. Contrariwise, studies show that ICT integration in teaching and learning activities in Europe, particularly by learners, remains limited (European Union, 2013). Hence, developing understanding of how and why ICT is used and not used continues to be of interest.

Among the barriers that hamper effective incorporation and use of ICT in teaching and learning, inadequate ICT infrastructure, take the lead, followed by a lack of professional development coupled with negative learners' attitudes towards the use of ICT in studying (Singh, et al., 2020). However, the government of Rwanda emphasizes the application of technology to achieve the Education mission that is, to change learners into skilled human resources and valuable capital for the socio-economic development of the country by ensuring evenhanded access to quality education, focusing on improving communication, combating illiteracy, upgrade sciences and their application in learning activities to achieve desired academic outcomes (Republic of Rwanda, 2015).

### 1.1 Statement of the Problem

Research conducted on ICT in education found that it is an important tool in all life domains without exception to education (Jain, 2016). Inherently, Rwanda targets enhanced online service delivery by 2050 (Republic of Rwanda, Vision 2050) but poor achievement is still perceived in education as a result of diverse challenges in the use of ICT gadgets (Bazimaziki, 2020). Indeed, inadequate or lack of resources coupled with the big class size issue, high costs of computers and other resources in some Rwandan secondary schools are still a gap that needs to be filled in education (Rudasingwa, 2021). Besides, studies carried out in this area of contention have not investigated the situation in rural areas in Rwanda. Hence, this study sought to bridge this gap by exploring how Information Communication Technology (ICT) is being integrated in rural secondary schools with particular interest in Ecole Secondaire (E.S) Kagogo located in Burera District, Rwanda.

### 1.2 Research Objectives

The overarching aim of the study is to investigate Information Communication Technology (ICT) Integration in Teaching and Learning activities in Selected Rural Secondary Schools. Specifically, the study aimed to:

- (i) Assess the benefits of using ICT in rural area secondary schools
- (ii) Explore the challenges impeding the effective integration of ICT at Ecole Secondaire de Kagogo, in Burera district-Rwanda.

### 1.3. Research Questions

- (i) What are the benefits of using ICT in teaching and learning at E.S Kagogo?
- (ii) What are the barriers that hinder effective integration of ICT in teaching and learning at E.S Kagogo?

## II. LITERATURE REVIEW

### 2.1. Theoretical Framework

This paper hinges on the Diffusion of Innovations Theory (DOI) by Rogers Everett (2003). This theory is applicable to various including education. According to Kaminsi (2011), the standing point of DOI is that it allows the teachers to understand the most effective ways to reach students educational weaknesses which lead to their poor achievements. The theory posits that teachers discover innovative teaching strategies and the best way to win the academically required learners' scores level for promotion. Accordingly, Teachers based on DOI to make innovation in teaching and be able to use improvisation in teaching activities. For trainees to apply the theory and do well in a range of subjects and peer assessments, they need to have acquaintance with ICT skills. Diffusion of Innovations Theory (DOI) supports education experts to ascertain potentials that will make the use of ICT in schools more attractive to students and other academicians. In this vein, the theory was deemed relevant to delve into ICT integration and use in teaching and learning to improve learners' knowledge, retention and attitude towards modern learning strategies to enhance academic outputs.

Ghavifekr and Rosdy (2015) pinpointed that ICT integration and use in teaching and learning activities, along with strategies to address barriers affecting its effective application, are crucial elements for enhancing learners' academic achievement in the modern educational landscape.

### 2.2 Empirical Review

#### 2.2.1 Benefits of using ICT in Teaching and Learning

There are numerous benefits of ICT in teaching and learning. Ngoumandjoka (2012) indicated that academic work is the most important reason students use the ICT internet at school and outside school premises. The researcher further contended that the more the internet is used for scholarly issues, the more it is perceived to exert a positive influence on learners' academic scores. Equally, Torres-Diaz et al. (2016) agreed that ICT usage by learners for recreational purposes rather than academic activities has a positive contribution to their academic grades. They argued that learners who tend to use the ICT internet more for educational materials are less likely to fail their examinations and both summative and formative assignments. Aitokhuehi et al. (2014) noted that information and communication technology (ICT) affects positively learners' learning activities when the educators are digitally literate and have a full skill package to integrate it into the curriculum. Moreso, ICT enables teachers to use diversified ICT logistical tools to transfer, generate, distribute, hoard and arrange information. Kakkar (2015) established significant benefits of integrating ICT in teaching and learning. He revealed that learners who use the internet moderately in their studies perform better than learners who were in the server. It is also found out that a profound group of internet addictions

were found to have a detrimental effect on their academic performance and mental health. Mami and Hatami-Zad, (2014) postulates that ICT can subsidize universal education, quality education, and the delivery of quality learning and teaching activities. Definitely, ICT brings more advantages in a wide range of domains such as educators' professional development and more efficient education management, governance and administration.

Domestically, The Education Sector Strategic Plan (ESSP) calls for 3 strategic goals to be addressed for education to fulfill its potential in the development of Rwanda namely expand access to education at all levels, improve the quality of education and training, and strengthen the relevance of education and training to the labor market including the insertion of 21st century skills (Ministry of Education [MINEDUC], 2016). The integration of ICT in education can speed the achievement of the three mentioned 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. Information Communication Technology can by and large be used to improve the quality of teaching and learning materials through the use of digital learning resources. Multimedia interactive digital content can motivate students; improve understanding of concepts and retention of key topics. ICTs can help simplify the use of regular assessments to keep track of student performance and can finally strengthen teacher professional development, thereby contributing to the improvement of quality of education (Twahirwa, 2017).

### **2.2.2 Barriers to Effective ICT Integration and use in Teaching and Learning Activities**

Many researchers identified barriers to the efficacious integration of ICT in the teaching and learning process. These barriers include but are not limited to poor internet connectivity, poor installation, inadequate professional development, poor support and leadership (Kopcha, 2012; Ertmer, 2019). Other factors are related to teachers' beliefs in terms of deficiency of ICT physical activity and application, insufficient technical support, lack of cooperation and peer technological support, slow connectivity and power disappointment, lack of confidence in applying modern technologies in teaching duties or the like (Papoioannon & Charalambous, 2019). Ertmer (2019) classified these barriers into first and second order categories. First-order barriers relate to hardware and software designs, while second-order barriers relate to internal issues such as learners' motivation as well as the supervision level of learners' activities. There are many barriers centre on accessibility and infrastructure which affect teaching and learning using technologies (Wikan, 2016).

As suggested by United Nations Education Scientific and Cultural Organization (2014), effective ICT in education policies depend on three main pillars, namely access to ICT infrastructure and equipment, teachers' capacities and monitoring. Indeed, satisfactory realisation of these pillars is still facing significant challenges in the context of Rwanda. OECD (2015) pointed out some major challenges that are likely to be encountered in the implementation of the above presented policy including inadequate infrastructure, electricity coverage in public schools, low internet connectivity rate, lack of equipment and high costs, limited access to ICT in the education system (computer to students ratio in secondary schools is 40:1, while 16% of primary schools have access to laptops thanks to the One Laptop Per Child project). Correspondingly, the limited availability of digital learning material, lack of expertise in project management and poor coordination of existing initiatives, technical support were also the barriers in Rwanda (Ministry of Science, Technology and Scientific Research, 2016).

Elsewhere, factors impeding the effectiveness of ICT integration in teaching and learning are related with students' lack of ICT skills. This therefore leads teachers to teach ICT instead of using it in teaching and learning (Chigona et al., 2014), Other studies (Shilongo, 2023, Bazimaziki, 2020) report similar factors inhibiting the effective implementation of ICT- based curriculum such as lack of ICT infrastructure, resources, internet connectivity and electrification, technical support, professional teacher training, and proficiency in ICT-based curriculum.

Despite the above, research findings posit that ICT is playing a significant role in education particularly in the current rapidly growing world (Mohite, 2020; Mushimiyimana et al., 2023). Accordingly, (ICT is an innovative, creative and motivating tool for both teachers and learners (Jain, 2016).

## **III. METHODOLOGY**

### **3.1 Study Design**

This study aimed to explore the integration of Information Communication Technology (ICT) in teaching and learning in rural secondary school in Burera District, Rwanda. To achieve the goal, the study used a descriptive design with mixed method approach.



### 3.2 Study design, Population and Sample Size

This study is a descriptive research adopting a mixed method approach. The target population is 114 individuals including 5 school leaders, 20 teachers and 89 students. Considering different categories of the target population, the researcher used both universal sampling and simple random sampling techniques. For the strata or quotas for key informants (5 school leaders), the researcher selected all respondents in this strata because they are few and they have more information concerning the study subject. Robson (2012) defined complete universal sampling technique as the sample section technique whereby the entire population is included in the sample. To determine the sample, the researcher applied Slovin (2004) formulae as follows:

$$n = \frac{N}{1 + N(e^2)}$$

$$n = \frac{109}{1 + 109(0.1^2)}$$

$$n = 52.1 \approx 52 \text{ respondents}$$

As matter of fact, learners and teachers were systematically drawn from the total population. The researchers managed to use this formula

$$n1 = \frac{n * P1}{N}$$

**Table 1**

*Sample Selection Breakdown*

Category of population	Number	Ratio calculation	Sample ratio	Sample calculation	Sample size
Learners	89	89/109	0.816	0.816 *52	42
Teachers	20	20/109	0.184	0.184*52	10
<b>Total</b>	<b>109</b>				<b>52</b>

The formula of Solvin (2004) was considered to get the sample size as representative of the whole learner population. Therefore, the total sample size of this study was 57 participants including 5 school leaders, 10 teachers and 42 learners.

### 3.3 Research Instruments

The field data was obtained using interviews and questionnaires given administered to the respondents. An interview guide was given to the school leaders while questionnaires were given to students and teacher respondents in E.S Kagogo.

### 3.4. Data Analysis and Presentation

After field survey activities, the researcher did a cross-examination to determine data straightforwardness, competence and identify the wrong items responded to. Quantitative data were presented in tables using statistical Package for Social Sciences (SPSS), frequencies and percentages from tables were descriptively analysed while qualitative data were analysed using themes and content analysis, then presented thematically.

## IV. FINDINGS & DISCUSSIONS

### 4.1. Response Rate

Data were collected from 57 respondents (5 key informants, 10 teachers and 42 learners). The study focused particularly on 10 teachers and 42 learners to respond to questions of questionnaire and 5 school leaders to qualitatively respond to the interview. The study examined a total of 52 respondents, where 52 questionnaires were distributed (10 questionnaires to the teachers and 42 questionnaires to the learners). All distributed 52 questionnaires were well filled and returned back to the researcher for analysis. The response rate was thus 100%. A high response rate indicates that the study is relevant to the participants and that the data collection process is effective. The high level of engagement also indicates that the participants are concerned about ICT Integration in the teaching and learning environment. Additional information about the respondents is as elucidated below.

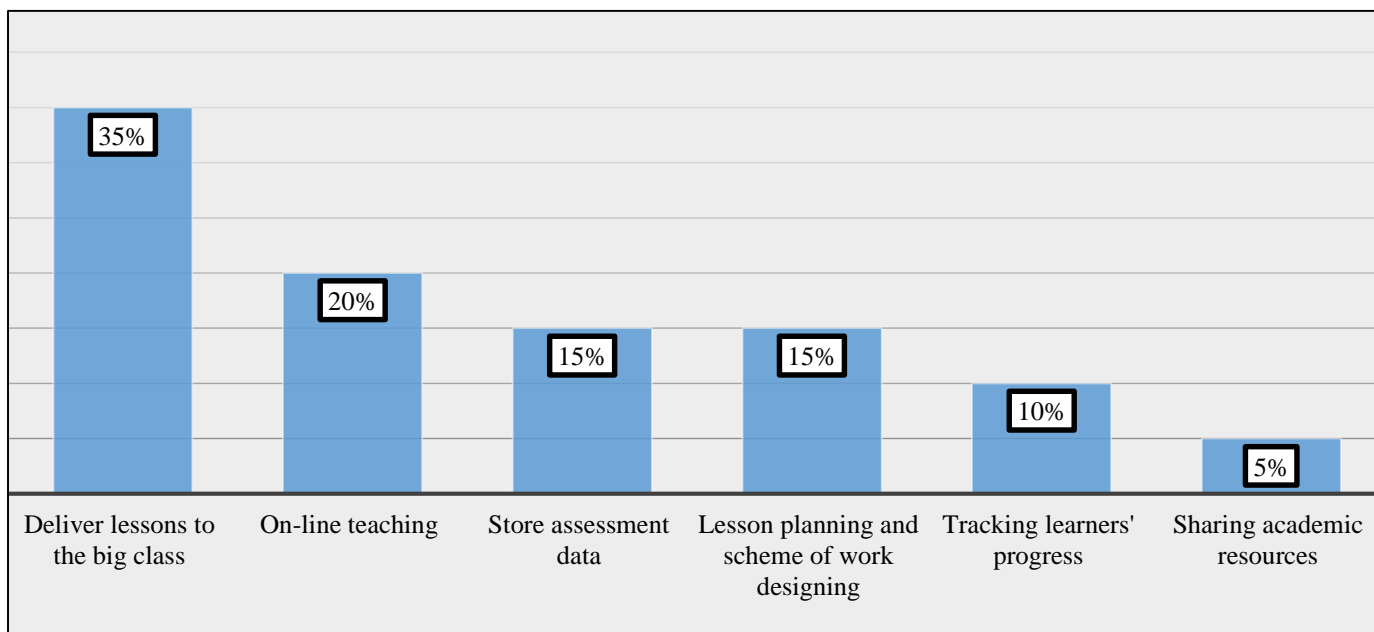
**Table 1**

*Response Rate*

Sampled	Responded	Response Rate
57	57	100%

**4.2 Benefits of Using ICT in Teaching and Learning at E.S Kagogo**

The first research question was, “What are the benefits of using ICT in teaching and learning at E.S Kagogo?” Data was analyzed descriptively and presented in Figure 1 and Table 1.



**Figure 1**

*Teachers’ Responses Related to the Benefits of using ICT in Teaching*

Table 2 shows that ICT helps in delivering the lesson to a big size class, assists in on-line teaching duties, helps in storing assessment data and tracking the learners’ progress as well as ICT assists in sharing academic resources at E.S KAGOGO.

**Table 2**

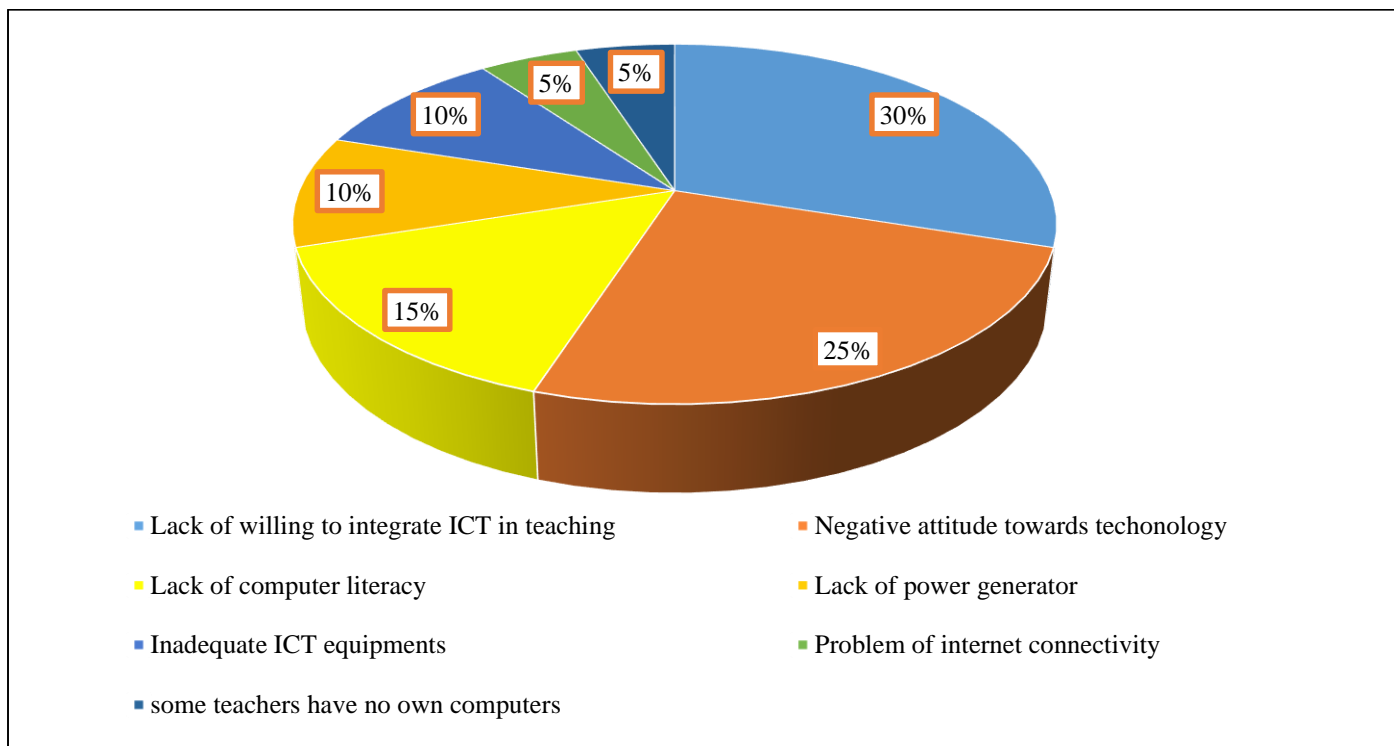
*Learners’ Responses Related to the Benefits of using ICT in Learning*

Benefits of using ICT in learning	Frequency	Percent
ICT facilitates Independent learning	8	33.3
ICT improves discovery and research skills	6	25.0
ICT enables learners to brainstorm what they learned	5	20.9
It develops learners’ ICT literacy and adaptability	2	8.3
It facilitates peer assignments	2	8.3
It promotes learner centered environment	1	4.2
<b>Total</b>	<b>24</b>	<b>100.0</b>

Table 2 and Figure 1 insinuate that ICT integration in teaching and learning benefits both learners and teachers, it helps the teachers to deliver the lessons and it facilitates the learners’ independent learning at E.S Kagogo.

**4.2 Barriers hindering Effective Integration of ICT in Teaching and Learning at E.S Kagogo**

The second research question was, “What are the barriers that hinder effective integration of ICT in teaching and learning at E.S Kagogo?” The findings were presented in Figure 2.



**Figure 2**  
*Teachers’ Responses to the Barriers that Hold Back Effective use of ICT in Teaching*

Figure 2 shows that the majority of respondents were in total agreement that lack of computer literacy and lack of will to integrate ICT in teaching as well as negative attitudes towards technology are the barriers that hinder effective use of ICT by some teachers at E.S Kagogo.

**Table 3**  
*Barriers that Hinder Effective Integration of ICT in Teaching and Learning at E.S Kagogo*

Barriers to effective integration of ICT in learning	Frequency	Percent
Inadequate ICT smart room	6	25.0
Lack of access on ICT outside school	5	20.8
Lack of power supply	5	20.8
Insufficient computers	1	4.2
Limited time in ICT smart room	3	12.5
Slow internet network	4	16.7
<b>Total</b>	<b>24</b>	<b>100.0</b>

Findings in Table 3 and figure two reveal that inadequate ICT smart room and lack of willing to integrate ICT in teaching and learning were the leading factors (barriers) to the ineffective integration of ICT in teaching and learning at E.S Kagogo.

**4.2 Discussion of Findings**

**4.2.1 Benefits of using ICT in Teaching and Learning at E.S Kagogo**

The results presented in table 1 and figure 1 revealed the majority of the respondents, 35% of teachers used ICT to deliver the lessons to the big class, 20% of teachers used ICT in online teaching, 15% of teachers integrated ICT in storing data assessment and planning the lessons & designing scheme of work respectively. To add to this, 10% of teachers tracked learners’ progress using ICT while 5% of teachers integrated ICT in sharing resources into the other hand, the learners acknowledged the benefits of ICT integration in learning, 33.3% of learners argued that ICT facilitated independent learning, 25.0% of respondents replied that ICT improved discovery and research skills, 20.9% of learners

used ICT to brainstorm what they learned, 8.3% of learners developed their ICT literacy and adaptability and peer assignments through, followed by 4.2% of learners felt that it promoted learner centered environment.

Field results were in line with interview results: The head of studies at ES Kagogo revealed that staff use ICT for emailing colleagues and support their planning. While ICT is used by teachers to store data for formative and summative assessment. This was also reinforced by the head teachers through interview responses that teachers used ICT to quite easily track progress of learners. The director of studies continued adding that the learners used ICT in discovery and research skills, teachers used it in preparation, planning and assessment as well as delivering the lessons and sharing information, knowledge and resources with their colleagues. The findings also rhyme well with Liu (2020)' views that ICT enabled independent learning to the learners; it facilitates lesson preparation, planning and assessment for teachers and management of school data and records for school staff. These findings are also consistent with Amponsah et al. (2022) that ICT has been an integral part of the teaching and learning process for high school students.

#### **4.2.2 Barriers that Hinder Effective Integration of ICT in Teaching and Learning at E.S Kagogo**

The result of findings in table 2 and figure two revealed many barriers that obstruct effective integration of ICT in teaching and learning at E.S Kagogo. Potential barriers revealed by teachers are: lack of willing to integrate ICT in teaching (30%), negative attitude towards technology (25%), lack of computer literacy (15%), lack of power generator and inadequate ICT equipment (10%) followed by problem of internet connectivity and lack own computers (5%). findings from learner respondents indicated that the barriers that hinder effective ICT integration in learning are: Inadequate ICT smart room (25%), Lack of access on ICT outside school and Lack of power supply (20.8%), Slow internet network (16.7%) and limited time in ICT smart room (12.5%) as well as insufficient computers (4.2%).

The aforementioned strategies were supported by the findings of interview with the key informants that some teachers are digital emigrants with low willing to integrate ICT in teaching and learning, this is brought about by negative attitude towards technology. The school accountant contends that he faced a challenge of internet connectivity and inconstancy power supply while processing financial records to share with the head teacher. Head of studies in charge of study activities was challenged by network weakness while working in School Data Management System (SDMS) and other academic tasks and duties online.

Primary data tally with evidence from the literature. Kopcha (2012) noted that lack of access to internet, poor software design and installation, lack of shared vision for ICT use, inadequate professional development hinder effectiveness integration and use of ICT in teaching and learning in secondary schools. Correspondingly, there are many barriers that centre on accessibility and infrastructure affect integration of ICT in teaching and learning. Those include poor electric power supply, inadequacy of trained teachers on the use of ICT and High cost of ICT equipment (Wikan, 2016).

## **V. CONCLUSIONS & RECOMMENDATIONS**

### **5.1 Conclusions**

The study carried out at E.S Kagogo in Kagogo sector, Burera District-Rwanda aimed at exploring ICT integration in teaching and learning. The study's specific objectives were to identify the benefits of ICT integration and the barriers that hinder its effective use. Findings reveal that the potential benefits of integrating ICT in teaching and learning were easy delivery the lessons to a large class, sharing teaching resources and information, peer assignment and independent learning for learners. Harmoniously, Rwanda being a country of hills and mountains which does not allow it to accommodate a high internet network due to its landscape (county of hills) and the fact that rural schools are not equipped with relevant and updated ICT teaching materials and energy supply tools as well as a negative attitude towards technology constitute a hindrance to integrating ICT in the learning and teaching process. These barriers can be addressed by below recommendations.

### **5.2. Recommendations**

The study recommended to the learners to remain updated with technology trends and get practical experience to enhance their knowledge, retention capability and attitude by using different information technology tools and weighted the challenges and uplifts their academic achievement. It was recommended that teachers in Burera District change their negative attitude towards technology in the classroom. Teachers are also recommended to regularly use ICT in teaching to provide a more engaged learning environment, connect better with students and boosts collaboration and performance. Parents are recommended to encourage their children to search and make discoveries using ICT at home and give some funds to the learners to enable them visit cyber café internet for more research to boost their research skills and critical thinking. Finally, the study recommended to the Government of Rwanda that it supplies

power in remote areas, avail fast internet connectivity and provision of enough ICT equipment to both teachers and learners to enhance effective teaching and learning.

### Disclosure

The author reports no conflicts of interest in this work.

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