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## The assessment of the use of information communication technology in the teaching and learning in selected Rwandan secondary schools: A case study of Nyagatare district

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### Abstract

This research is about the assessment of the state-of-the-art use of ICT in teaching and learning in selected Rwandan secondary schools, a case study of Nyagatare district. The research design was a cross-sectional survey where both qualitative and quantitative methods were used. Questionnaire, interviews and documentation were used to collect data. The sample size was 95 respondents. The study found that there were ICT tools used in teaching and learning in all the schools but inadequately used. Some Teachers who were not using ICT Tools revealed that school authorities don't allow them to use them. The study revealed that purchasing ICT tools is also expensive for both school authorities and teachers. The study recommends that school administrators organize themselves and find funds for buying and equipping all missed ICT tools. The government of Rwanda ought to allocate ICT equipment equally in all schools and generate funds specifically to promote ICT use at the secondary school level and enhance education.

**Keywords:** information communication and technologies, assessment, teaching and learning, Rwanda, secondary schools.

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## Introduction

In the 21st century, the integration of ICT in education has emerged as a transformative force, shaping the landscape of teaching and learning (Hafni et al., 2020). Globally, the integration of Information Communication Technology (ICT) in education has transformed traditional teaching and learning paradigms (Al-Rahmi, 2020). Research affirms that the effective use of ICT promises to enhance educational outcomes and foster a more dynamic and engaging learning environment. Indeed, the role of technology in education has become integral to preparing students for the demands of a rapidly changing global landscape (Ghavifekr & Rosdy, 2015). The Rwandan government has undertaken major investments in ICT infrastructure and quality-improvement programs, with a focus on secondary schools. One of the areas where these initiatives have been put into practice is the Nyagatare district in Rwanda's Eastern Province. Nevertheless, despite these initiatives, an assessment of the state-of-the-art ICT utilization in Nyagatare district teaching and learning is still necessary. For the purpose of identifying strengths, shortcomings, obstacles, and chances for additional development, an evaluation of this kind is essential. This study attempts to close this gap by thoroughly examining ICT use in a chosen secondary. The Rwandan government (GoR) is concentrating on a knowledge-based economy as it moves toward the nation's Vision 2050. In this regard, science and technology education is considered crucial to this ambition (Farley, et al., 2013). The GoR has made significant strides in the education sector, with a commitment to enhancing the quality and accessibility of education through the use of ICT at all levels (Rubagiza, et al., 2011). Recognizing the potential of Information and Communication Technology (ICT) in fostering educational advancements, the GoR has undertaken initiatives to integrate technology into secondary schools (Twagilimana & Mannikko-Barbutiu, 2018). These digital tools cover a wide range of resources, including virtual labs, online textbooks, interactive simulations, instructional apps, and more where internet is also regarded as an enabler for using those digital tools (Iyamuremye, et al., 2022).

The integration of ICT in education in Rwandan secondary schools aligns with the framework of implementing the Competence-Based Curriculum (CBC), which fosters active learning methods to assist students in developing their own knowledge and competencies (Ndiokubwayo, 2019). Related research (e.g., (Salas-Rueda, 2021; Wieman, et al., 2008; Ouahi, et al., 2022) claim that the use of ICT tools support teachers in getting pupils interested in their classes. According to Gilbert (2021), active approaches help learners to get involved in their lessons. The authors further argued that using active teaching strategies that include ICT tools enhances students' engagement, interaction, and communication throughout the process of teaching and learning. According to a study by (Beena, 2021), teaching science and mathematics to students using a variety of innovative teaching techniques keeps them interested in the subject and can also serve as evidence of successful instruction. To create engaging learning environments and raise student achievement, most teachers nowadays employ cutting-edge techniques (Byukusenge, et al., 2022; Byusa, et al., 2021; Iyamuremye, et al., 2022).

The assessment of the state-of-the-art use of information communication technology in the teaching and learning process in selected Rwandan secondary schools, particularly in Nyagatare district, is

essential to evaluate the effectiveness of current ICT initiatives and identify areas for improvement. Despite the government's efforts to promote ICT integration in education, there is a lack of comprehensive studies that specifically focus on the use of ICT in secondary schools in Nyagatare district. Therefore, his paper aims to assess the state-of-the-art utilization of ICT in the context of selected Rwandan secondary schools. The evaluation encompasses the current infrastructure, the relationship between the use of ICT tools and the quality of education, and face challenges while integrating technology into education.

### 3. General Objective

The overall objective of our study was to assess the state-of-the-art use of ICT in teaching and learning in selected Rwandan secondary schools, a case study of Nyagatare district.

#### Specific Objectives

Specific objectives of our study were:

- i. To identify different ICT tools used in teaching and learning in selected secondary schools in Nyagatare District.
- ii. To examine the relationship between the use of ICT tools and the quality of education in selected secondary schools in Nyagatare District.
- iii. To determine the challenges of using ICT in teaching and learning in selected secondary schools in Nyagatare District.

## Methodology

### 1. Research approach and design

The adopted approach for this study was mixed, while the cross-sectional survey design was adopted. The researchers collected qualitative data and quantitative data to investigate the causal-comparative relationship between technology and the quality of education.

### 2. Population, sampling procedures and sample size

The study population was composed of 1667 participants (teachers, students, administrators) from one school selected conveniently from Nyagatare. The main reason was that our study was exploratory research, the primary goal of which was to gain insights and generate hypotheses for further investigation. Additionally, limited time available for data collection as well as the budget were among criteria for school selection. The sample including three administrators (Head Teacher, Dean of Studies, and one subject leader for ICT), 25 teachers and 67 students.

To select sample size, the researchers used Slovin's formula  $n = \frac{N}{1+NE^2}$

Where: n = sample size, N = population size and E = margin of error

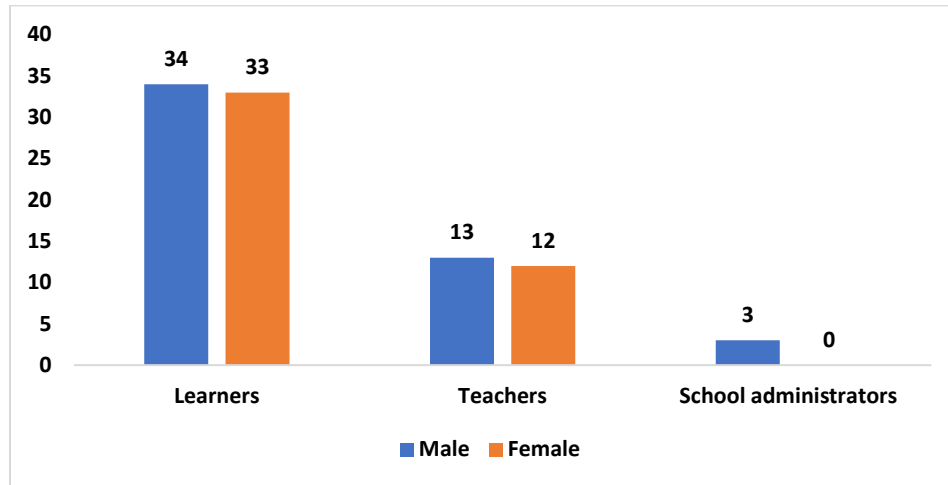
From the above formula, by using the marginal error of 0.12 i.e. 88% confident; we calculated the sample size of 1624 learners and 40 teachers.

$$\text{Sample size of learners } n = \frac{1624}{1+1624(0.12)^2} = 66.5 = 67 \text{ learners.}$$

$$\text{Sample size of teachers } n = \frac{40}{1+40(0.12)^2} = 25.3 = 25 \text{ teachers}$$

The researchers used purposive sampling techniques for school administrators (Head Teacher, Dean of Studies, and one Subject Leader for ICT). This means that the sample size of school administrators

was three (3). Therefore, the total sample used in our research is 95 respondents. **Figure 1** shows the distribution of participants in terms of gender.



**Figure 1.** distribution of participants in terms of gender

### 3. Research instrument and data collection procedures

Data collection was done by using a questionnaire and interview. In fact, the questionnaires with close-ended questions were distributed among students, while interviews with open-ended questions were used to gather information from teachers and school administrators.

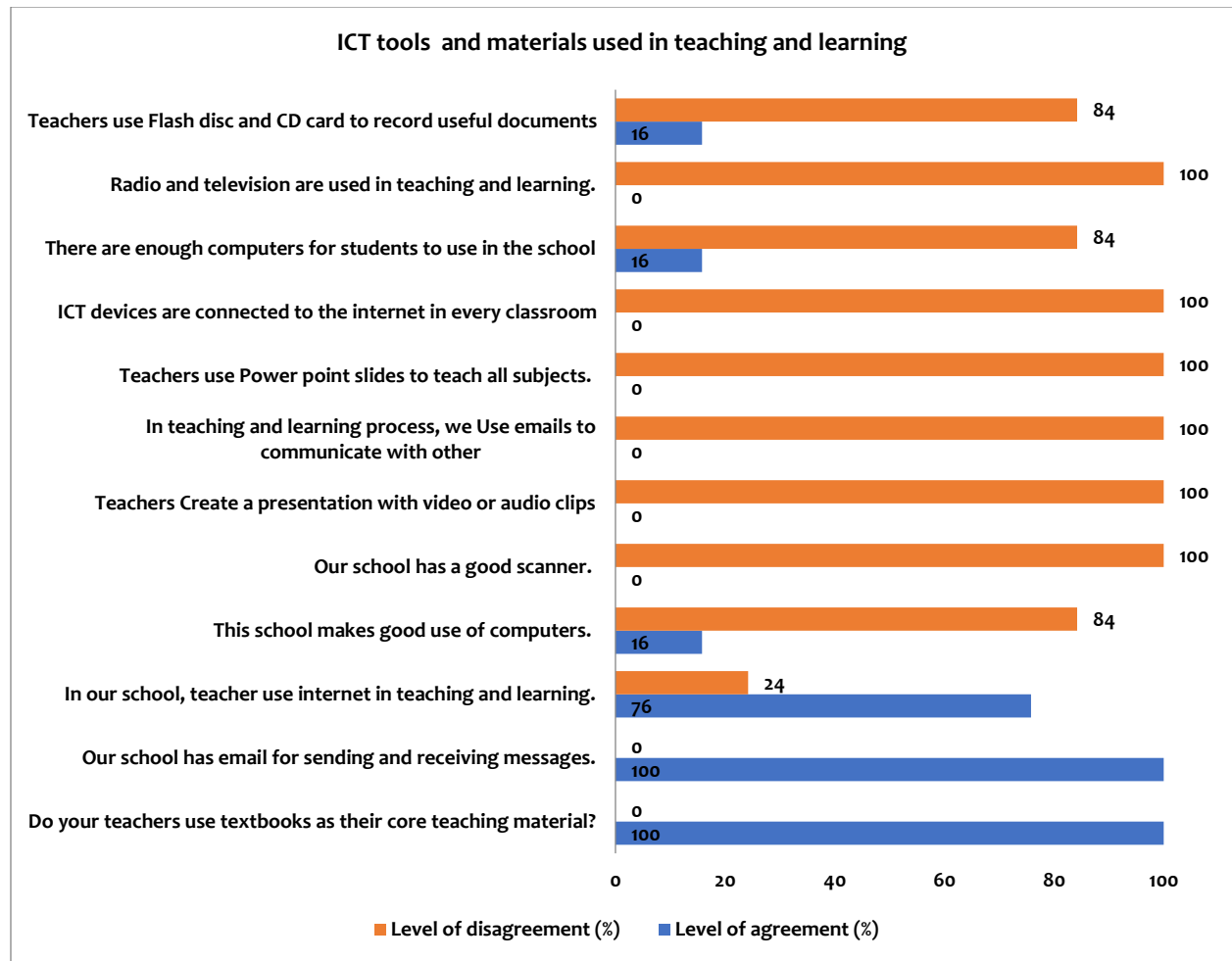
### 4. Data analysis

Data analysis procedure consisted of editing, coding. After data editing and coding, data were summarized in presented in the form of histograms. The analysis was done using Microsoft Office Excel. While editing, the researchers checked the data's completeness, accuracy, uniformity and comprehensibility. The collected data from the interview were coded into meaningful categories to bring out their essential patterns, which are easy to understand

## Results

### 1. ICT tools used in teaching and learning

A critical component of effective ICT integration is the existing technological infrastructure within the selected Rwandan secondary schools. This section assesses the availability and adequacy of hardware, software, internet connectivity, and other technological resources essential for the successful implementation of ICT in education. The findings aim to provide insights into the readiness of schools to harness the full potential of technology in the teaching and learning process.



**Figure 2. ICT tools used in teaching and learning**

Figure 2 shows that all respondents 100% agreed that in teaching and learning, teachers use textbooks as their core teaching material, the school has good electronic bulletin board services, mailing lists, etc and their school has email for sending and receiving messages. These results show that the use of traditional teaching materials such as textbooks is widespread and that the school has well-established electronic communication systems in place, which are universally acknowledged and accepted by the respondents. It was also revealed at 84% of teachers use internet in teaching and learning. However, all participants did not accept (100%) that there is a good scanner; teachers create presentations with video or audio clips or use emails while communicating with others. All participants also refused at the same rate of 100% that ICT devices are connected to the internet in every classroom and that Powerpoint slides are used to teach all subjects. All participants denied that Radio and television are used in teaching and learning and that teachers use Flash disc and CD card to record useful documents. 85% reported that there are not enough computers for students to use in the school, teachers do not use Flash disc and CD card to record useful documents, and the school does not make good use of computers.

These study results indicate a significant lack of key ICT resources and practices in the school, highlighting several challenges in integrating technology into teaching and learning. None of the participants acknowledged the presence of a good scanner or the use of emails for communication,

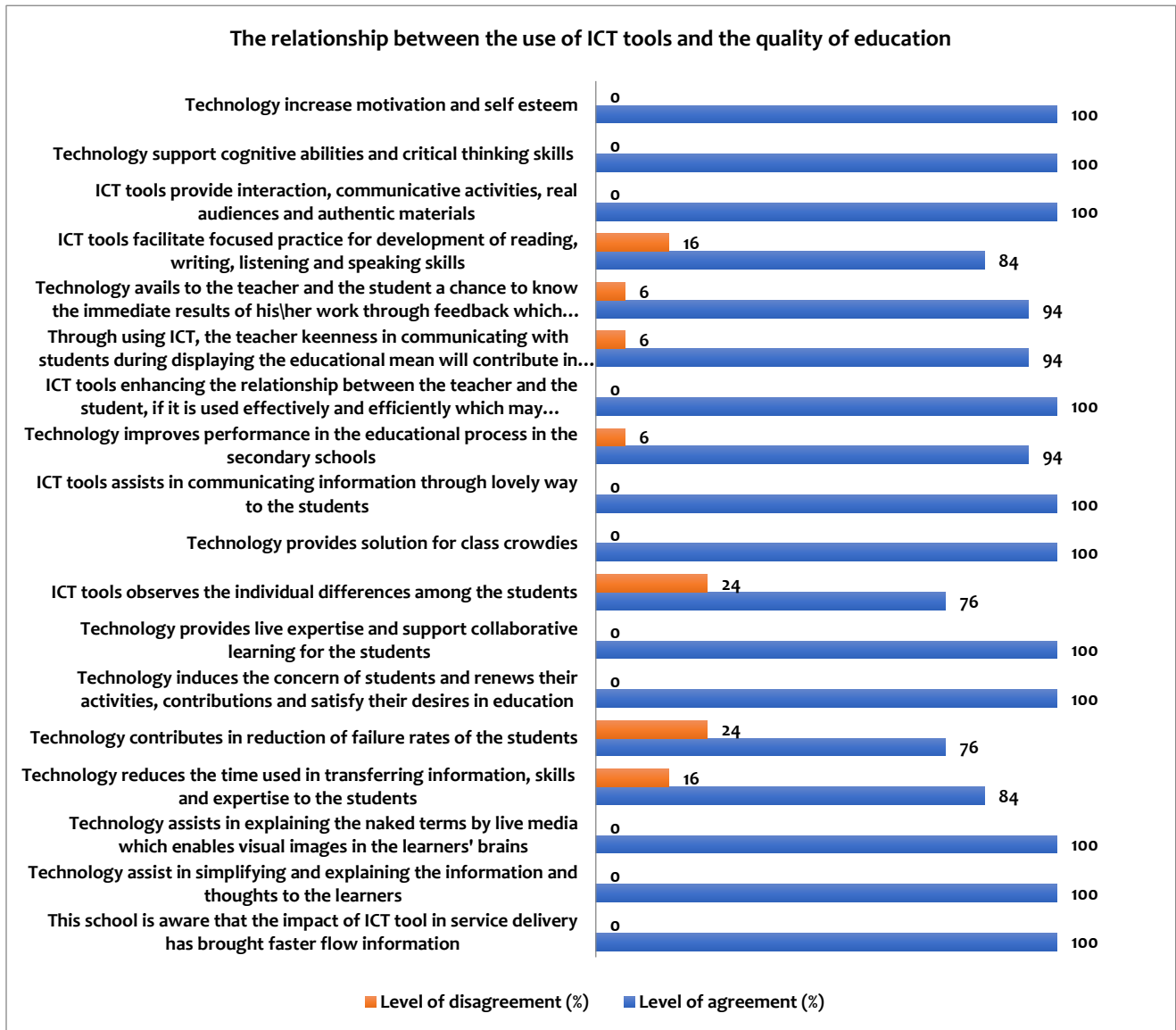
suggesting a gap in essential communication and digitization tools. Additionally, the complete rejection of ICT devices connected to the internet in every classroom and PowerPoint slides used for all subjects indicates a substantial deficiency in technology infrastructure and integration. The denial of the use of radio, television, and external storage devices like Flash discs and CD cards further underscores the limited use of multimedia and alternative resources in teaching. Moreover, most participants report insufficient computers for students, lack of use of external storage devices by teachers, and a perception of the school not effectively utilizing computers indicate a broader issue with ICT resource availability and utilization. Addressing these issues would require significant improvements in ICT infrastructure, teacher training, and resource allocation to enhance technology integration into teaching and learning processes.

From the interviews, all respondents said they use computers, CD Cards, flash disk projectors and telephone in their classroom. When asked how often participants use technology in their teaching activities, all reported that they use ICT sometime when they need to record marks, to search notes and to prepare a summary of learners. They also use them for some topics, which have a relationship with ICT tools. Interviewees said that they use the internet when they want to download learners' notes and research some topics. Participants highlighted the way their students' responses to the technology. They said that whenever ICT is integrated in the teaching, learners are responsive, interested, active and co-operative in the classroom.

All interviewed participants said that they sometimes use technology in teaching and learning. Teachers specified that the use of multimedia in the classroom is an awesome support for learners as they can have direct encounters through live presentations of the topic, which are useful in the teaching and learning processes. Most participants specified that ICT tools helped them develop great correspondence with students, and the learning outcome was remarkable.

Despite all strategies of the Rwanda Education Board to use educational technology, most ICT tools are not used in teaching and learning activities as they must be. This indicates that although in this selected school, there is inadequate and misuse of ICT tools, there are ICT tools used in teaching and learning that can enhance the quality of education.

## 2. The relationship between the use of ICT tools and the quality of education



**Figure 3. The relationship between the use of ICT tools and the quality of education**

**Figure 3** above shows that all respondents 100% agreed that the school is aware that the impact of ICT tools in service delivery has brought a faster flow of information. Inspiring the utilization of technology in the secondary school classroom has more extensive implications.

The results revealed that most of the participants acknowledged the importance of ICT and its impact on the quality of education. For all 18 items testing this dimension, all participants agreed with the 12 items with the rate of 100%. These research findings indicate a high level of consensus among participants regarding the perceived benefits of ICT tools in education. The strong agreement that their schools are aware of the positive impact of ICT tools in service delivery, particularly in facilitating a faster flow of information, suggests that participants believe in the effectiveness of technology in improving communication and information dissemination within the educational context. Similarly, the unanimous agreement that technology assists in simplifying and explaining

information to learners highlights the perceived value of ICT in enhancing the clarity and comprehensibility of educational content, potentially improving learning outcomes.

Furthermore, the finding that all participants believe technology provides live expertise and supports collaborative learning for students indicates a strong belief in the interactive and engaging nature of ICT tools. This suggests that participants view technology as a means to enhance learning experiences by providing access to real-time expertise and facilitating collaborative learning environments, which can promote active engagement and knowledge sharing among students. Additionally, the unanimous agreement that technology provides a solution for class crowding reflects a perception among participants that ICT can help address challenges related to large class sizes, potentially improving the quality of instruction and individualized learning opportunities for students. Overall, these findings highlight the positive perceptions of participants regarding the role of ICT in education and suggest a strong consensus on its potential benefits for teaching and learning.

A significant proportion of respondents (84%) agree that ICT tools effectively reduce the time required to transfer information, skills, and expertise to students. Moreover, these tools are perceived as catalysts for student concentration, activity renewal, and fulfillment of educational desires. This indicates that ICT tools are seen as efficient mediums for knowledge dissemination and enablers of enhanced student engagement and satisfaction within the educational context. The agreement among respondents on these aspects highlights the widespread recognition of ICT tools' potential to streamline the teaching and learning process while enriching the overall educational experience.

Furthermore, the research findings indicate that ICT tools play a crucial role in addressing academic challenges, as evidenced by 76% of respondents agreeing on their contribution to reducing student failure rates. These tools are perceived as instrumental in facilitating the observation of individual differences among students and in engagingly delivering educational content. Additionally, respondents acknowledge the ability of ICT tools to communicate information effectively, thus potentially mitigating barriers to learning. This shows that ICT tools are viewed as valuable aids in promoting academic success and addressing diverse learning needs within the secondary education setting. The high level of agreement on these aspects emphasizes the perceived importance of ICT tools in fostering an inclusive and supportive learning environment.

Moreover, the research findings highlight the significant impact of ICT tools on student skill development, motivation, and self-esteem. A substantial majority of respondents, 84%, agreed that these tools facilitate focused practice for the development of essential skills such as reading, writing, listening, and speaking. Additionally, ICT tools are seen as effective motivators, enhancing student engagement and confidence in their learning endeavors. This implies that ICT tools are instrumental in academic achievement, nurturing essential competencies, and fostering positive attitudes towards learning. The consistent agreement among respondents on these aspects stresses the widespread recognition of ICT tools as valuable assets in promoting holistic student development and well-being within the secondary education landscape.

The obtained results also show that most respondents 84% agreed that ICT tools can reduce the time used in transferring information, skills, and expertise to the students and ICT tools can bring about the concentration of students and renew their activities, contributions, and satisfy their desires in education. Most respondents 76% agreed that ICT tools contribute to the reduction of failure rates of the students, ICT tools help to observe the individual differences among the students and ICT tools can assist in communicating information through a lovely way to the students.

The same results also shows that most respondents 94% agreed that ICT tools can improve performance in the educational process in secondary schools. Through using ICT tools, the teacher is keen in communicating with students while displaying the educational means which will contribute to increase their academic learning. ICT tools can give the teacher and the student a chance to know the immediate results of his\her work through feedback, which may contribute to the students' academic learning.

Most respondents 84%agreed that ICT tools facilitate focused practice for development of reading, writing, listening and speaking skills and ICT tools increase motivation and self-esteem. . For all the remaining items, the participants were in agreement at 100%

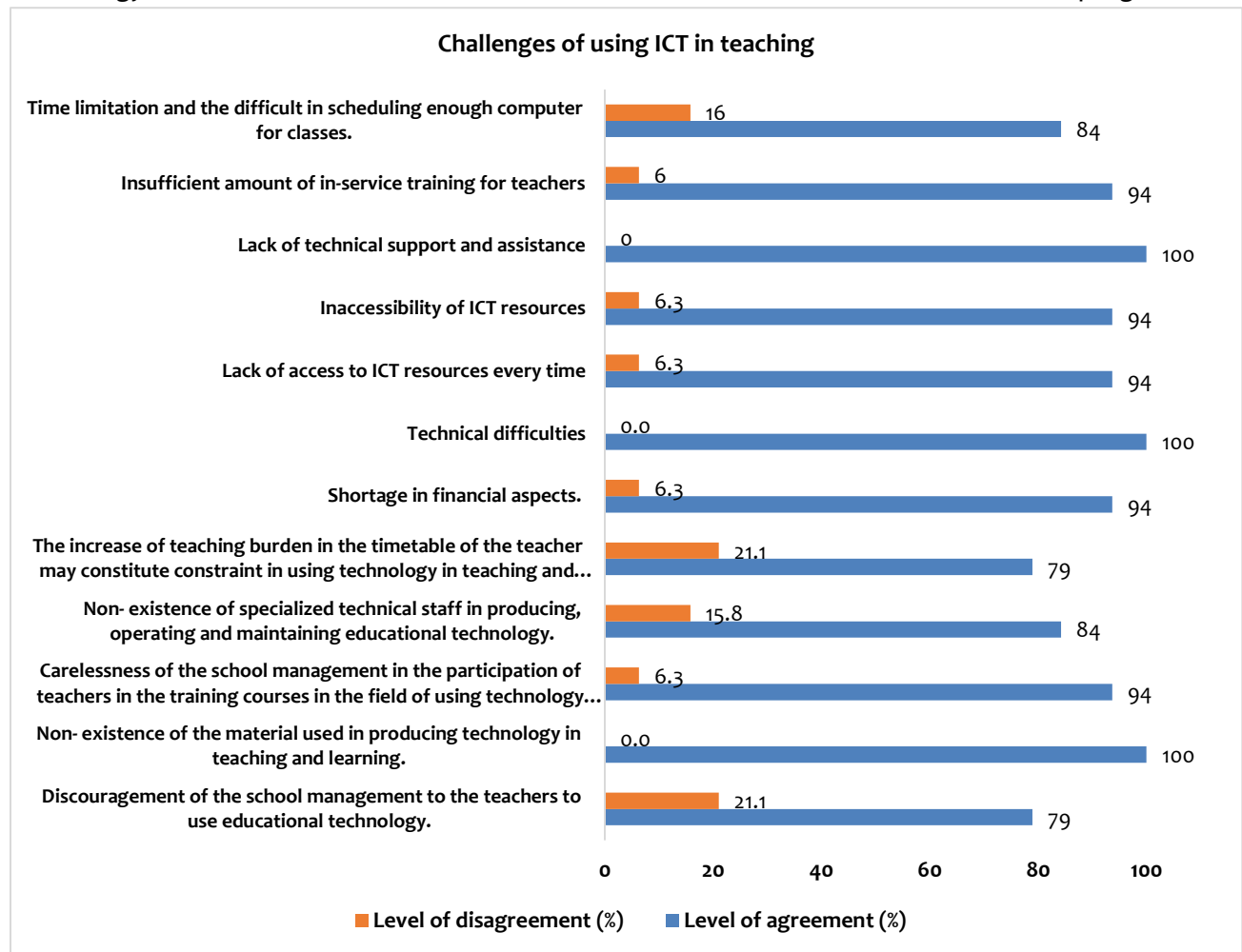
Therefore, there is a clear relationship between using technology and the quality of education. Means that based on research, there is clear evidence indicating that ICT tools can enhance the quality of education. Our results are in good agreement with Tazrin Rahman (2015) as his studies have demonstrated that the utilization of technology and the internet have a positive effect in teaching and learning. It serves to promote interactive activities in the classroom, and the utilization of realia in the classroom makes students active. It likewise gives learners an open learning environment and improves their insight from outside course books. In this study, the researcher found that students are excited to learn through technology. If the government of Bangladesh helped to use the technology and internet for teaching and learning in all schools, students would be motivated to learn it accurately and how to use technology in practical life.

### **3. The challenges of using technology in teaching and learning**

ICT for education has many potential advantages, yet obstacles and hurdles frequently prevent it from being used effectively. This section looks at the challenges secondary schools in Rwanda have when attempting to incorporate technology into their curricula. Typical obstacles could be insufficient training for teachers, a lack of funding, and problems with the long-term viability of

technology-driven

programs.



**Figure 4. The challenges of using technology in teaching and learning**

Figure 4 above shows that 79% respondents agreed that discouragement of the school management to the teachers to use educational technology is among the faced challenges to integrate ICT in the teaching. At the same rate (79%), the increase of teaching burden in the timetable of the teacher may constitute limitations in using educational technology.

The study findings also shows that all respondents 100% agreed that the nonexistence of the material used in producing educational technology, technical difficulties, lack of technical support and assistance, nonexistence of the material used in producing educational technology are challenges of using ICT tools in teaching and learning and no respondent who disagreed with these statements. Most respondents 94% agreed that carelessness of the school management in the participation of teachers in the training courses in the field of using educational technology, shortage in financial aspects, lack of access to resources every time, inaccessibility of ICT resources and insufficient amount of in-service training for teachers are the challenges of using ICT tools in teaching and learning. Time limitation and the difficulty in scheduling enough computers for classes, nonexistence of specialized technical staff in producing, operating and maintaining educational technology are

challenges of using ICT tools in teaching and learning as these were agreed by most respondents (84%).

The results from the interview revealed that a considerable number of participants did not attend any training program on how to use technology in the teaching and learning. Teachers said that two main problems are "infrequent electric connection and slow internet". In addition, most of the time, overhead projectors do not work properly; tablet or laptop charge issues also cause problems in the ICT advanced classroom. Some teachers are not using technology because the authorities of the school are not allowing them to use it. Moreover, purchasing ICT tools is also expensive for the school authorities.

## **Discussion**

The study was restricted to the assessment of the state-of-the-art of using information communication technology in teaching and learning selected Rwandan secondary schools and was limited to a case study of Nyagatare district.

Despite the misuse of ICT tools, it was generally found out that many ICT tools are used in teaching and learning at selected schools but at a very low rate and some are not being used at all. Some of the ICT tools used include cameras, internet, smart board, telephones, computer, projector, radio, television, flash disc, CD Card, Printer and scanners. However, previous research reported that due to its ability to assist even students with hearing and vision impairments in learning chemistry, computers are an effective teaching tool. The same research reported that a computer aids in teaching chemistry principles, allowing teachers to share with students the resources needed for their education. This inspires pupils to investigate novel ideas, generate ideas, and look up pertinent material for both teachers and other students (Nsabayezu, et al., 2022).

ICT tools play a tangible impact in teaching and learning on the quality of education. It can encourage and expand learning in significant ways. ICT tools assist in simplifying and explaining information and thoughts, ICT tools assist in explaining the naked terms through live media, which enables visual images in the learners' brains. They provide interaction, communicative activities, real audiences and authentic material. ICT tools support cognitive abilities and critical thinking skills. They also provide live expertise and support collaborative learning for the students. ICT tools are also a solution for class crowds. ICT tools enhance the relationship between the teacher and the student if they are used effectively and efficiently which may contribute to the increase of academic learning.

ICT tools reduce the time used in transferring information, skills and expertise to the students and ICT tools induce the concern of students and renew their activities, and contributions and satisfy their desires in education and it contributes to the reduction of failure rates of the students. All these results for the quality of education.

## **Conclusion and recommendations**

The assessment of the state-of-the-art of using ICT in teaching and learning in selected Rwandan secondary schools provides a comprehensive overview of the status of used ICT tool in the teaching

and learning, factors, challenges faced when integrating ICT. This assessment serves as a foundation for future recommendations and policy considerations to further enhance the integration of technology in the Rwandan education system, ultimately contributing to the advancement of the nation's educational goals.

Nevertheless, using ICT tools in teaching and learning still has some challenges. Some teachers did not attend any training program on how to use technology in teaching and learning. Nonexistence of the material used in producing educational technology, carelessness of the school management in the participation of teachers in the training courses in the field of using educational technology, shortage in financial aspects lack of access to resources every time, inaccessibility of ICT resources and insufficient amount of in-service training for teacher and shortage in financial aspects lack of access to resources every time, inaccessibility of ICT resources and insufficient amount of in-service training for teachers are the challenges of using ICT tools in teaching and learning.

Based on the findings and conclusions of the study, the researchers recommend that teachers effectively use ICT tools in teaching and learning processes every day. Teachers need to advance their ICT knowledge of computers and other ICT tools related to teaching and learning processes. To be effective, school administrators must be organized to raise funds to buy and equip all missing ICT tools to improve selected secondary school's quality of education. School administrators should set practical arrangements. They should likewise instruct teachers about technology used in teaching. To policymakers and education stakeholders, there is imperative to allocate ICT equipment equally in all schools and generate funds specifically for promoting ICT use at the secondary schools' level.

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