

# EFFECT OF INFORMATION COMMUNICATION TECHNOLOGY USE IN TEACHING AND LEARNING MATHEMATICS ON LEARNERS' ACADEMIC PERFORMANCE IN PUBLIC SECONDARY SCHOOLS IN RWANDA. A CASE OF HUYE DISTRICT

<sup>1</sup>UWAMAHORO DONATIEN, <sup>2</sup>DR. MUGIRANEZA FAUSTIN

(Mount Kenya University)

DOI: <https://doi.org/10.5281/zenodo.10025005>

Published Date: 20-October-2023

---

**Abstract:** This study examined the effect of information communication technology (ICT) on the performance of learners in Mathematics at the Secondary school level. The specific objectives were to find out the extent by which information communication Technology (ICT) is used in Secondary Schools of Huye, to access the performance in Mathematics of learners in Secondary Schools of Huye District and to determine the relationship between information communication technology use and performance level in Mathematics of learners in Secondary Schools of Huye District. This study is useful to all stakeholders in the education sector, such as public institutions, decision-makers, district authorities, head teachers, teachers, learners, and scholars. The researcher applied a descriptive correlational study, targeting 400 teachers and 15 head teachers, this study selected respondents and key informants both purposefully and randomly. A study sample of 80 respondents was obtained by using Yamane's formula. Information was analysed using the statistical package for statistical product and service social sciences version 26.0 to generate descriptive statistics in terms of frequency, percentage, mean, and standard deviation. Inferential statistics were produced in terms of correlation and regression coefficients for determining the size of the effect between variables. The extent by which information communication technology (ICT) is used in Secondary Schools of Huye District respondents indicated that 82.5% agreed that the use of Computer in teaching Mathematics is enough. Results shows that the academic performance for learners in Mathematics subject due to use of ICT at school indicate that 45.0% agreed that learners perform in Statistics due to use of ICT ,50% agreed that learners perform well algebra due to use of ICT in teaching. Results on the correlation between Information Communication Technology (ICT) use and learners' performance in mathematics subjects indicated that most measures were positively associated with each other. Since the degree of significance was less than 0.05, it was proposed that all people involved in the education sector in Huye are recommended to work collaboratively in order to enhance the learner's performance among all secondary school students in public and private Secondary schools in both general education and TSS schools in mathematics subjects. MINEDUC, through the Rwanda Education Board, is recommended to avail itself of enough needed materials and requirements in other to facilitate the implementation of Computer based learning. Further studies should be done on the Computer based learning and learners performance.

**Keywords:** Learners academic performance, Mathematical learning ICT use.

---

## 1. INTRODUCTION

### Background of the Study

It is often said that the greatest accomplishment of the 20th century has been the development of ICT for application in all fields of human endeavor. Changes in society have always been brought about by significant technological difficulties. A number of actions around the middle of the 18th century allowed individuals to "mass produce" goods. The planet was previously agrarian but is now industrial. The elite group quickly amassed vast riches by using the structured banking system as a commodity and a way of dominating the newly industrialized society as a result of the considerable advancements in product transportation and communication technologies (Salimov, Ergashe, and Saidov, 2023).

One of the most important accomplishments of the twenty-first century, according to C-H& C-H (2014), is the expansion and development of this society. According to the researcher, this study is especially important for integrating ICT into the teaching and learning of mathematics, which is considered the "queen of all subjects" and is a science-based course. Even when a math instructor lacks the requisite understanding, it is occasionally important to interpret notions that run opposed to what the mathematical theory claims or implies.

But mathematics is one topic in particular that encourages the acquisition of specialized scientific knowledge and skills that explain the commonplace occurrences of daily life. It is something that develops in civilization as the population grows. It first appeared as a challenge the soldiers had to face on a daily basis. It has promoted the development of culture, various academic disciplines, and civilization. Even though mathematics is an abstract subject, it is taught to students in a way that promotes scientific thinking; this way of thinking makes passing exams necessary.

### Problem Statement

Learners frequently use information communication technology (ICT) to complete their educational objectives because it is an efficient way to save, access, retrieve, or collect crucial information. Since the development of information technology, learners have access to knowledge that helps them succeed in both their professional and academic lives. However, it looks like information and communication technology has tarnished learners, particularly secondary schoolaged adolescents who are still developing. For instance, learners are frequently observed spending hours online or watching pornographic content on television, which has the power to sway their judgment and alter their personalities.

Studies have indicated that learners who frequently access the Internet are more corrupt than those who do not (Nandipha *et al.*, 2018). Students that frequently use the internet or watch television engage in sexual promiscuity, cheating on exams, stealing, and other vices or acts of indiscipline that are always practised in the classroom. Recent years have seen an increase in the number of students caught cheating on exams, especially in calculus-based subjects like maths and other science-related ones, in order to link up colleagues and acquaintances in illegal activity. These students had GSM (Global System for Mobile) phones.

It has been seen that both adults and learners utilize GSM phones to spread various sorts of lies and dishonesty in public, and as a result, corruption is firmly entrenched in the society in which we live. It's admirable that television shows are broadcast in more technologically advanced ways, but many of them feature violent and immoral movies, which children watch before acting out in ways that have a detrimental effect on their mental health. The development of information and communication technologies has undoubtedly made students in calculation-based courses like mathematics more sluggish and reliant on calculators. The majority of math learners can no longer perform basic calculations without using a calculator, the internet, etc.(Diebold,2010).

### Specific Objectives

Specific objectives of the study include to:

- i To find out the extent by which information communications technology (ICT) is used in secondary schools of Huye District
- ii. To assess the performance level in mathematics of learners in Secondary schools of Huye District
- iii. To determine the relationship between which information communications technology (ICT) use and performance level in mathematics of learners in Secondary schools of Huye

District

### Research Questions

The following research questions are in this study:

- i. To which extent information communications technology (ICT) is used in secondary schools of Huye District
- ii. How is the performance level of learners in Secondary schools of Huye District
- iii. Is there any significant positive relationship between information communications technology (ICT) and performance level of learners in Secondary schools of Huye District

### Significance of the Study

This study was beneficial to the following:

The study's conclusions and recommendations are beneficial to students because they were able to become more knowledgeable about the information and communication technology used in the classroom. Due to the advantages that may be derived from this study, learners were able to use information and communication technology more actively. They consider this study to be helpful because, as a result of its conclusions and recommendations, teachers would take advantage of the chance to engage in the usage of information and communication technology due to the many advantages it offers. Information communication technology and its purposes are also studied.

The study helps parents since it gives them the knowledge they need to understand the advantages their kids or wards get from using ICT for academics or other activities. Through this study, parents would have the chance to learn the value of information and communication technology, and those who do not currently use it would begin to do so once they realize how useful it is for all aspects of human activity. This study helps the school administration understand more about information and communication technology, particularly how it affects full-time students.

The school authority in Rwanda would be able to broaden its policy on the availability and application of information communication technology if the study's recommendations were followed. This study was beneficial to society because of its advantages in making it more receptive to information and communication technologies. By knowing more about information and communication technology and how it functions in the contemporary context, the society was able to gain something from this research.

## 2. REVIEW OF RELATED LITERATURE

### Theoretical review

The concept and nature of mathematics in schools, the role of gender in math education, and other topics are covered in this section. Identify any connections between ICT use and students' overall academic achievement in classrooms. Evaluation of the socioeconomic position of Learners who frequently utilize information communication technology (ICT) in their educational career, as well as the question of whether Learners' perceptions of ICT differ from those of their teachers (Jones, 2014).

### The Concept Information Communication Technology (ICT)

The ideas behind ICTs and their significance for higher education The World Bank defines information and communication technologies (ICT) as "the set of activities which facilitates by electronic means the processing, transmission and display of information" (Rodriguez and Wilson, 2010). ICT has emerged as a critical tool for facilitating and improving the educational and learning process on a global scale. The university's hub, the library, stands to benefit greatly from the full embrace of ICTs. The new technology supports the library's everyday operations and provides consumers with excellent, efficient, and effective services.

### Integration of ICT in Teaching and Learning

According to Lim (2016), research studies have shown that information communication technology (ICT) coupled with the necessary pedagogical strategies engage students in higher order thinking.

Rangaswamy and Gupta (2010) describes adoption as the decisions that individuals make each time they consider taking up an innovation. Similarly Rodgers (2013) defines adoption as the decision of an individual to make use of an innovation as the best course of action available. Rodgers (2013) argues that the process of adoption starts with the initial hearing about an innovation to final adoption. Rodgers definition of adoption is the most appropriate for the purpose of this study.

### **Factors hindering ICT implementation of ICT in teaching and learning**

There are various obstacles to the success of ICT in education. The following are some of the major barriers to effective ICT implementation in schools.

#### **Lack of ICT resource**

Lack of adequate supportive resources is one of the main factors that hinder ICT implementation in education (Alhawiti, 2013). According to Bingimlas (2019), inaccessibility of resources remains a major obstacle to the incorporation of technology in education in both developed and developing countries.

#### **Lack of ICT policy**

Another major factor that hinders the effective implementation of educational technology into schools is the lack of educational policy and strategy relating to ICT adoption (Oyaid, 2009). In this concept, Wozney et al. (2006), argue that a clear policy framework helps in the creation of a school culture that supports ICT adoption. Balanskat *et al.* (2006), stressed that it is important for policy makers in the education sector to focus on policies that encourage educators to incorporate educational technologies in their instructional practices. This, for instance, includes rewarding teachers who use educational technology.

### **Empirical Literature**

#### **ICT use in teaching and learning**

According to Buabeng-Andoh (2019), many educational institutions and governments globally have taken the integration of ICT into teaching and learning as a major priority and that much premium is placed on its integration and implementation. Teaching and learning process is making great impact in education as a result of the application of ICT. Several millions of dollars have been injected into the education sector to help fully integrate ICT into teaching and learning activities (Grabe & Grabe, 2008; Player-Okoro, 2012). The conventional way of teaching has been emphasizing on content.

#### **Learners' performance in mathematics**

Khrel (2019) had studied entitled, "Mathematics achievement in school leaving certificate examination between public and private school student at Kaski district." The main conclusion of this study was to mean achievement scores and correlation of private school student in compulsory and optional mathematics was greater than public school student in Kaski district in S.L.C. examination. He concluded that the mathematics achievement of private school is better than public school. And also, he concluded the important factors related to student's school achievement in mathematics are classroom behavior (time spend in learning, student attention, method of teaching Teachers background (trained, experience ability) of private & public-school student's characteristics.

#### **ICT and Academic Performance in schools**

The relation between ICT integration and student performance has been the topic of research and discussion for the recent decades. Valasidou *et al.* (2005) believe that ICT improves the performance of students since technology helps to improve teacher-student's interaction. Kulik(2003) in his meta-analysis study pointed out that, in general, students who used computer based learning scored higher than students who learned without computers. ICT integrated learning helps students to grasp the concept better and also retain it for a longer period of time. ICT also help students to develop a positive attitude towards learning since they are engaged in the learning process.

#### **Critical Review and Research Gap identification**

In order to improve teachers' professional development on ICT use with direct effect on learners' performance with specific reference to mathematics subjects, schools are also strongly advised to provide their teachers with workshops or training courses to improve their ICT skills and prepare them to encounter potential challenges while using technology (Educational, 2005). Additionally, in many studies previously reviewed by the researcher, scholars revealed that both learners and teachers

improve their academic productivity when they use ICT proactively with competitive quality ICT equipment and internet with strong connectivity. Numerous studies has been previously conducted regarding the role of ICT in education but few to focus on how ICT affect the performance of students in mathematics. Due to that this study will focus on the use of ICT to effect the learners' performance in mathematics subjects in public schools in Huye District in Southern Province of Rwanda.

### Theoretical Framework

This part is made of different theories about the use of ICT and technology in teaching and learning mathematics

#### Behaviorist Instructional Technologies

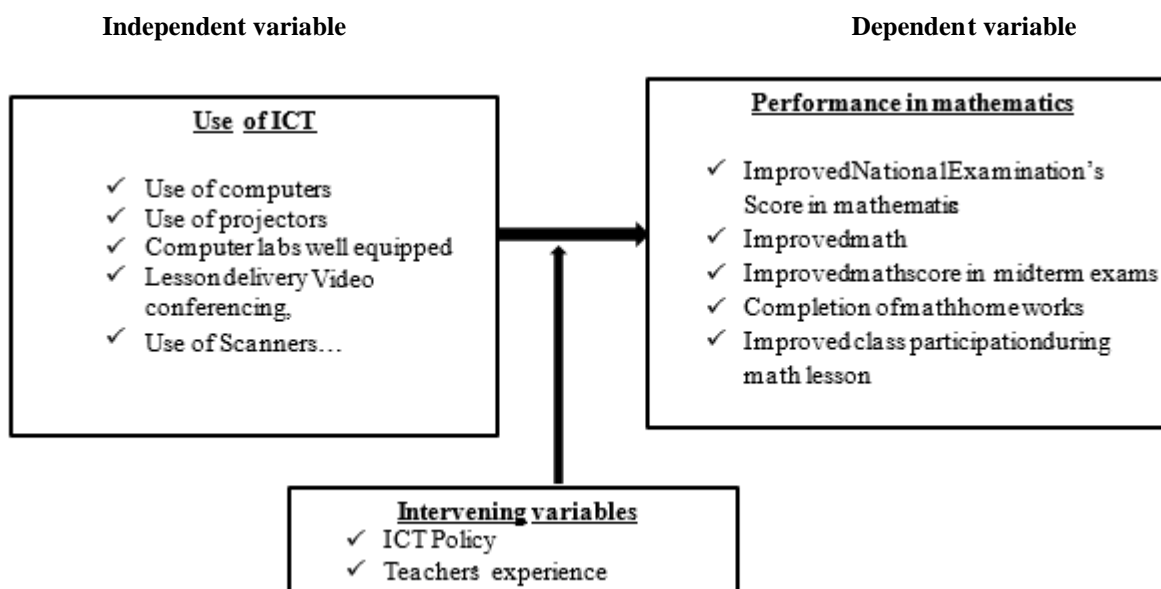
According to Dabbagh, behaviorist theories of learning make the assumption that knowledge is an absolute that reflects fundamental realities (Voogtand,2008). Learning is one of many intentional human acts that are yet controlled by mysterious interior conditions. Learning is produced by relationships between observable, quantifiable learner behaviors (responses) and contextual instructional variables (stimuli). When a correct answer follows the presentation of an educational environmental stimuli, learning has occurred. Immediate consequences are used in instruction to inhibit inappropriate responses to a pedagogical stimulus and promote desired behavior. However, this theory is applicable in this study since the integration of ICT may change the behavior of students toward the way they learn mathematics.

#### Cognitivist Instructional Technologies

Cognitivist theories of learning, as Dabbagh explains, presuppose that reality is objective yet mediated by symbolic mental conceptions. Learners acquire knowledge by understanding the fundamental concepts based on the connections between the information and the skills that already exist. In order to promote the best possible brain processing, instructors organize and arrange these components. The process of acquiring knowledge involves the learner's internal coding and structure. Successful learning depends on the learner's ability to digest this data, storing and retrieving ordered information in memory, in addition to what the teacher or educational tool offers.

### Conceptual Framework

A conceptual framework elaborates a research problem and summarizes the variables and their indicators in relation to the study objectives and reviewed literature. The framework is summarized in a schematic diagram that presents the variables and their hypothesized relationship. It shows the relationship of the variables under study and helps to keep the research work focused on the objectives of the study.



Source: Researcher's Construct (2023)

Figure 2.1 : Conceptual Framework

### 3. RESEARCH METHODOLOGY

#### Research Design

The methods a researcher uses to select a sample, use the equipment, and analyze the results are referred to as research design (Ogula, 2005). The study's research topics was used addressed using a mixed-method approach. In a single study, mixed method research combines qualitative and quantitative procedures, methodologies, approaches, concepts, or language, according to Johnson and Onwegbuzie (2004). In the study, the researcher used phenomenology and cross-sectional questionnaires.

#### Target Population

According to O`Leary (2004) population is the aggregate membership of a distinct class of people, objects, or event. William (2005) also argues that "population is a combined word used to define the total quantity of cases of the type which are subject of your study". In this study, All 15 public secondary schools with their 400 teachers, and all fifteen head teachers will be the study's target population.

#### Sample Size

Grinnell and Williams, (1990) define a sample size as all people selected to take part in the research study and it should be a representative of the whole population. To obtain the sample size of this study, the formula of Taro Yamane will be used after getting the real number of employees to compose the population of this study:

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

Where n= Sample size, N= Population size, e=Sampling of error or level of precision

By applying the above formula, the sample size is the following:

$$n = \frac{400}{1 + (0.1)^2} = 80$$

#### Research Instruments with Category of Respondents

Teacher questionnaires, principals' interview guides, observation guides, and document analysis guidelines were among the study instruments that were used to collect data. To protect the triangulation and complementarity objectives, the instruments will be used to collect both quantitative and qualitative data.

#### Questionnaire

A large amount of information will be collected using questionnaires. They are beneficial due to their ease of use and the ability to preserve respondents' privacy (Kombo & Tromp, 2006). Openended and closed-ended questions were both included in the questionnaires that would be utilized. Open-ended questions, however challenging to analyze, encourage people to think, which means respondents may provide information about their sentiments, interests, and decisions (Mugenda & Mugenda, 2003). In contrast, closed-ended questions are simple to administer and analyze, making them more time and money efficient.

#### Interview Guide

An interview guide will be used to get further information about the administrators' perspectives on the use of ICT in secondary schools. According to Gay, Mills, and Airasian (2009), interviews can be used to filter through participant responses and go further to understand what they are thinking and experiencing. Additionally, it is a versatile instrument for data gathering that enables the use of verbal, nonverbal, spoken, and auditory multisensory channels (Cohen, Manion, and Morrison, 2008). The tool will be used to gather data from the head teachers of the schools chosen for the study.



#### 4. RESEARCH FINDINGS AND DISCUSSIONS

##### 4.1 Extend agreement or disagreement on the availability of the ICT tools in your institution.

**Table 4.1: Pcs, Personal laptop, Projectors, Screen Tv, Printers**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not enough	4	4.9	5.0	5.0
	Fairly enough	7	8.5	8.8	13.8
	Enough	66	80.5	82.5	96.3
	More than enough	3	3.7	3.8	100.0
	Total	80	97.6	100.0	
Missing	System	2	2.4		
Total		82	100.0		

Source: field data

With help of table 4.1, as it shows materials used in teaching mathematics using ICT, 5.0% corresponded with those who responded that materials are not enough, 8.8% is fairly enough, 82.5% is enough, and more than enough is 3%. As it is seen most of respondents confirmed that they are enough materials related to ICT at the rate of 82.5%. This means that they are enough materials used in teaching and learning process of mathematics as way of encouraging learners to be more active instead of being passive.

##### 4.2 The level at which you utilize ICT facilities to fulfill your routine school activities

**Table 4.2: The level at which you utilize ICT facilities to fulfill your routine school activities.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-10 hours a week	56	68.3	70.0	70.0
	11-20 hours a week	16	19.5	20.0	90.0
	21-30 hours a week	5	6.1	6.3	96.3
	31-40 hours a week	3	3.7	3.8	100.0
	Total	80	97.6	100.0	
Missing	System	2	2.4		
Total		82	100.0		

Source : field data

This table 4.2 shows that the level at which ICT facilities are utilized to fulfill school activities. 1-10 hours is used at 70%, 11-20 hours is used at the rate of 20%, 21-30 hours a week at 6.3%, 31-40 at 3.8%. As it is visible most of the time ICT is used in range of 1-10 hours per week. This means that teaching mathematics require practical and demonstrations which do not require ICT always.

##### 4.3 The possible challenges that inhibit the accessibility of ICT facilities with

**Table 4.3: Lack of enough ICT facilities**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	13	15.9	83.8	16.3
	Agree	67	81.7	16.2	100.0
	Total	80	97.6	100.0	
Missing	System	2	2.4		
Total		82	100.0		

Basing on table 4.3, respondents disagree at the rate of 83.8%, while respondents agree at the rate of 16.2%. This means that at different schools there are enough ICT facilities so as to help learners to acquire competences in ICT.

#### 4.3.1 Negative attitude towards computers use in schools

**Table 4.4: Negative attitude towards computers use in school**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	29	35.4	36.3	36.3
	Disagree	42	51.2	52.5	88.8
	Neutral	9	11.0	11.3	100.0
	Total	80	97.6	100.0	
Missing	System	2	2.4		
Total		82	100.0		

By considering table 4.4 as it shows negative attitudes towards computers used in schools. 36.3% of respondents agree strongly, 52.5% disagree with this statement, 11.3% are neutral about this statement. Basing on these perceptions on this statement where majority of respondents disagree with this statement it means that there is no negative attitude towards computers use in schools.

## 5. SUMMARY AND CONCLUSIONS

### Summary of Findings

Findings of the summary were based on the following objectives

- i. To find out the extent by which information communications technology (ICT) is used in secondary schools of Huye District bas
- ii. To assess the performance level in mathematics of learners in Secondary schools of Huye District
- iii. To determine the relationship between which information communications technology (ICT) use and performance level in mathematics of learners in Secondary schools of Huye District.

### The extent by which information communications technology (ICT) is used in secondary schools of Huye District

It shows materials used in teaching mathematics using ICT, 5.0% corresponded with those who responded that materials are not enough, 8.8% is fairly enough, 82.5% is enough, and more than enough is 3%. As it is seen most of respondents confirmed that they are enough materials related to ICT at the rate of 82.5%. This means that they are enough materials used in teaching and learning process of mathematics as way of encouraging learners to be more active instead of being passive.

Also it shows that the level at which ICT facilities are utilized to fulfill school activities. From 1-10 hours is used at 70%, 11-20 hours is used at the rate of 20%, 21-30 hours a week at 6.3%, 31-40 at 3.8%. As it is visible most of the time ICT is used in range of 1-10hours per week. This means that teaching mathematics require practical and demonstrations which do not require ICT always.

### To assess the performance level in mathematics of learners in Secondary schools of Huye District

It shows leaners performance in algebra due to the utilization of ICT at school. Majority of respondents agree that learners perform well algebra due to use of ICT at school in rate of 42.8. This is some contribution acquisition of learners' performance.

Basing on this aforementioned results as it shows leaners performed algebra due to the utilization of ICT at school. Majority of respondents agreed at the rate of 50.0% responded that leaners perform algebra due to utilization.

By considering finding as it shows leaners performance in statistical applications due to ICT utilization at school majority of respondents agreed with this statement at the rate of 45.0%. This is good because it plays a good role in enhancing learners' performance especially in statistics.



### **The relationship between which information communications technology (ICT) use and performance level in mathematics of learners in Secondary schools of Huye District.**

Basing on interview from interviewees the findings established that relationship, ICT has many benefits in teaching and learning process of mathematics because it helps to do research and innovation in mathematical course. ICT in mathematics play a very crucial role to facilitate teaching and learning process of mathematics by allowing learners to do research in different perspectives of mathematics such as algebra, geometry, equations as well as developing competences among learners such as being creative and innovative. Basing on aforementioned benefits there are challenges related to integration of ICT in teaching and learning process of mathematics such as lack of enough computers and poor internet connection. These are above challenges that related to integration of ICT in mathematics.

Perceptions about facilitators to integrating ICT into maths pedagogy, all stakeholders such as teachers, head teachers, educational policies makers, sectoral educational inspectors and district educational inspectors should be involved in facilitators to ICT. Information Communication Technology cannot be integrated without stakeholders hence all should be involved so that competences developed in mathematics due to use of ICT can go smoothly.

In my teaching, ICT impacts teaching process by making my work very easy because it helps to project and communicate to learners in terms of email and other forms of communication that should be occurred in teaching process. Also ICT impacts my teaching by making learners to make research and bringing innovative in the process of teaching and learning process. By integrating ICT in teaching and learning process bring high achievement by involving learners to be more active than teachers as learner centered method

### **Conclusions**

As conclusion for these findings basing on the first objective as it talks about extent by which information communications technology (ICT) is used in secondary schools of Huye District. By using ICT facilities leads to performance of learners in terms of acquired competences. Also basing on the second objective which shows the performance level in mathematics of learners in Secondary schools of Huye District ICT has many benefits in teaching and learning process of mathematics because it helps to do research and innovation in mathematical course. ICT in mathematics play a very crucial role to facilitate teaching and learning process of mathematics by allowing learners to do research in different perspectives of mathematics such as algebra, geometry, equations as well as developing competences among learners such as being creative and innovative. And on the third objective as stated that the relationship between which information communications technology (ICT) use and performance level in mathematics of learners in Secondary schools of huye district. ICT impacts teaching process by making my work very easy because it helps to project and communicate to learners in terms of email and other forms of communication that should be occurred in teaching process. Also ICT impacts my teaching by making learners to make research and bringing innovative in the process of teaching and learning process. By integrating ICT in teaching and learning process bring high achievement by involving learners to be more active than teachers as learner centered method.

### **REFERENCES**

- [1] Abdon, A & Gómez, A. (2018). *Decolonization of fractional calculus rules: Breaking commutativity and associativity to capture more natural phenomena*. The European Physical Journal Plus (133): 166. Springer link, UK.
- [2] John A.D.(2023). *The nature of mathematics: its role and its influence*, Illinois state university.pdf[Accessed on 18 March 2023].
- [3] Kerui,D &, Boqiang, L.(2015). *Understanding the rapid growth of China's energy consumption: A comprehensive decomposition framework*. Elsevier, UK. Available on <https://www.sciencedirect.com/science/article/abs/pii/S0360544215009743>
- [4] Kia, K. (2018). *Can Rwanda leapfrog to the digital economy with ICT enabled development? A case study of a developing country determined to modernize without the traditional model*. Lund University, Sweden. Available on <https://lup.lub.lu.se/luur/download?func=downloadFile&recordId=8958286&fileId=8958287>[29 April 2023].
- [5] Raul, G; Dimitri, K & Sul,K.(2018). *Assessing the nexus of sustainability and information & communications technology*. Elsevier. Technological Forecasting and Social Change Journal (130), Pages 39-44

- [6] Rezka, A.R; Gunarti, D. L& Rivo, N.(2018). *The Social Emotional Development of Homeschooling Children*. Department of Nonformal Education, Faculty of Education, Universitas Negeri Malang, Indonesia. *Journal of Nonformal Education*(4):2. Available at <http://journal.unnes.ac.id/nju/index.php/jne>[29 April 2023].
- [7] Rubagiza, J; Were, E and Sutherland, R. (2011). *Introducing ICT into schools in Rwanda: Educational challenges and opportunities*. International Journal of Educational Development, Vol 31(1), Pge 37-43. Elsevier. UK. <https://doi.org/10.1016/j.ijedudev.2010.06.004>
- [9] Salimov, B.L; Ergashev, Z.M and Saidov, A.( 2023). *The Influence of the Transport and Communication System on Social Relations*. Web of Semantic: Universal Journal on innovation Education(2):2.Tashkent State Transport University,Uzbekistan.
- [10] Shaw, G and Marlow, N. (1999). *The role of student learning styles, gender, attitudes and perceptions on information and communication technology assisted learning*, Elsevier, UK.
- [11] UNESCO.(2020). *Guidance on Open Educational Practices during School Closures: Utilizing OER under COVID-19 Pandemic in line with UNESCO OER Recommendation*. Smart Learning Institute, Beijing Normal University, China