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Influence of Teachers' Experience in Information Communication Technology and Students' Academic Performance in Mathematics in Public Secondary Schools of Rwanda: A Case of Kayonza District

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ABSTRACT:
The study evaluated the impact of teachers' ICT experience on students' math performance in public secondary schools in Kayonza District, Rwanda. Involving 259 participants (223 teachers and 36 head teachers), data were gathered through questionnaires, interviews, and observations, and analyzed using SPSS Version 20.0. Findings revealed that 83.5% of respondents strongly agreed that teachers skilled in MS Excel, 85.9% in PowerPoint, and 83.9% in preparing teaching materials with ICT tools positively influenced students' performance. Additionally, 82.3% noted that teachers trained in exam preparation with ICT tools demonstrated their ICT experience. Improved student outcomes were reported, with 79.4% noting better numeracy, 80.2% improved grades, and 78.3% enhanced skills in experimenting with MS Excel. A significant positive correlation was found between teachers' ICT expertise and students' math performance. The study suggests that proficiency in ICT tools enhances students' academic performance. The Ministry of Education should support ICT integration to boost academic achievement, with superintendents and head teachers optimizing ICT training and lab usage. Teachers should share ICT skills to improve instruction and student outcomes. Future research should investigate the broader effects of ICT in education on academic achievement in mathematics.

Keywords: Teachers' Experience, ICT, Students' Academic Performance, Mathematics, Rwanda.

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Introduction

The advent of information and communication technology (ICT) stands as the pinnacle achievement of the 20th century, permeating all facets of human endeavors. Throughout history, societal shifts have been catalyzed by formidable technological challenges(Tufail & Malik, 2023). In the mid-18th century, pivotal advancements enabled mass production, propelling the world from an agrarian society to an industrial powerhouse. This transformation spurred rapid wealth accumulation among the elite, facilitated by advancements in transportation and communication systems, as well as the strategic utilization of the burgeoning banking infrastructure(Mishra, 2019)

In Tufail 's research (2014), socialization is defined as the process of preparing children to meet the needs of the society they live in. He suggests that information and communication technology (ICT) can help learners develop social skills, independence, and academic success. Furthermore, it can assist individuals in upholding societal values and standards, as well as achieving professional success(Tufail & Malik, 2023). Tufail also highlights the impact of ICT on academic excellence, particularly in subjects related to science and mathematics. The research project on the influence of information and communication technology (ICT) in Rwanda's education system aims to address the need for competitive education. The study will be conducted in the Kayonza District, Eastern Province of Rwanda, a region where the past, present, and future are equally relevant. In this section of the study, the researcher discusses the challenges associated with the global and local use of information and communication technology in teaching mathematics in public secondary schools(School of Education, Beijing Institute of Technology, Beijing, China et al., 2018).
According to UNESCO (2019), information is defined as a "set of data recorded in a methodical manner," encompassing any knowledge that can assist in the operation of a system, as well as any numerical or alpha-numeric quantity processed by a machine(UNESCO, 2019). The data and results of a problem constitute the total amount of information. Information technology is the application of scientific knowledge(Scherer et al., 2019). The gathering, manipulation, transmission, and storage of verbal, visual, textual, and numerical information through a micro-based network of processing and communication is referred to as information communication technology (ICT). ICT has been shown to enhance students' math performance in Rwandan secondary and postsecondary institutions. For example, scientific students, particularly those studying math, find that using information and communication technology is beneficial for retaining data and performing quick calculations, which in turn improves their academic achievement(Josias Nteziryimana,Japhet Niyobuhungiro, 2023; L. Adamson, 2011).

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Literature Review

Teachers' Experience Affects the Use of ICT in Teaching Mathematics in Public Secondary Schools

In the past two decades, the integration of computers in American schools has increased dramatically, with current ratios of one computer for every two students(Wenglinsky, 2018). However, educators and professionals hold conflicting views on this trend. Some see technology as essential for educational reform, while others view it as a distraction. Proponents argue that technology can transform classrooms through various applications: administration, communication, support for individual and group learning, and instructional management. Computers can tutor students, provide resources, facilitate expert communication, assist with computations, and simulate concepts. They also promote group communication, presentations, collaboration, and instructional management, including managing portfolios and creating individualized plans. Communication applications enhance interactions among students, teachers, and parents and connect remote areas. Administrative tasks are also streamlined with technology, supporting functions like accountability and attendance(Inan & Lowther, 2017).

In California, some schools have implemented "smart" classrooms where each student has a networked computer, enabling group and individual work. These schools feature advanced facilities like Tech Lab 2000, which includes satellite dishes and computer-aided design software. Critics, however, argue that technology's success depends on teachers' willingness to use it. Despite the availability of computers, many teachers use them minimally, only for required tasks. Critics believe technology is unlikely to improve academic achievement, citing historical resistance to technological advancements and the limited impact of computer-assisted instruction (CAI). They argue that teachers resist technologies that disrupt traditional teaching, using them selectively or not at all. Research shows that while CAI may improve performance, the benefits do not justify the costs. Additionally, cognitive theories suggest that social aspects of learning, diminished by computer use, are crucial for education(Wenglinsky, 2018).

Wenglinsky highlights issues with both sides' arguments. Proponents often fail to differentiate between technology programs or consider their broad applications and rely on unverified achievement measures. They also overlook differences in student populations, making it unclear if observed gains are due to technology or other factors. Critics' arguments are similarly flawed, assuming teacher resistance equates to technological ineffectiveness. The study raises questions about whether students' perceptions of ICT align with those of teachers, suggesting a need for further research on technology's true impact on educational outcomes(Wenglinsky, 2018).

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The Relationship Between Teachers' Experience in ICT Use and Students' Academic Performance in Mathematics in Public Secondary Schools

ICT serves as a potent teaching tool, enriching education through information access, social interaction, and innovative teaching methods. Despite its benefits, the digital divide persists, impacting students' academic outcomes in mathematics based on socio-economic status(Zheng et al., 2020). Defined as electronic processes for information processing, transmission, and display(World Bank, 2020), ICT enhances mathematics education by fostering interactive learning, personalized instruction, and deeper understanding of complex concepts. To effectively integrate ICT in teaching, addressing the digital divide is crucial. This involves ensuring equitable access to technology, providing infrastructure, training educators in ICT use, and implementing supportive policies(Mishra, 2019). By bridging these gaps, ICT can significantly enhance educational experiences and improve academic outcomes across student populations.

The Utilization of Information Communication Technology (ICT) and the Problems Inhibiting Its Implementation

ICT plays a crucial role in modern education, moving beyond a mere supplement to become a cornerstone for innovative teaching and learning practices. It fosters skills such as teamwork, communication, problem-solving, and lifelong learning(Hamidi & Chavoshi, 2018). Over the past two decades, efforts to integrate technology into curricula have aimed at enriching educational experiences(Mitchell, 2014). This integration spans programming, interactive software, online learning platforms, and Internet-based resources, promoting cross-curricular applications(Ince-Muslu & Erduran, 2020).Technology supports educational objectives like information retrieval, collaboration, communication, and problem-solving, preparing students for the knowledge economy(Jachin & Usagawa, 2017). It facilitates learner-centered education and enhances critical thinking and decision-making skills(Tondeur et al., 2017). Challenges include the shortage of trained ICT personnel, particularly in developing countries, highlighting the need for ongoing teacher professional development(Hamidi & Chavoshi, 2018; Tondeur et al., 2017). Effective ICT integration requires comprehensive teacher training to reshape classroom practices and attitudes towards technology(Lai & Bower, 2019) (Johnson & Onwuegbuzie, 2017)(Lai & Bower, 2019; Kew et al., 2019). Access to ICT infrastructure and resources is also critical for successful implementation in schools (Law et al., 2018).

Materials and Methods

Study Design

The research employed a mixed-methods approach combining phenomenology and cross-sectional surveys to explore ICT use in teaching mathematics in Kayonza District's public secondary schools. Cross-sectional surveys gathered data on ICT availability and its impact on academic performance. Phenomenology provided insights

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into teachers' experiences using ICT for administration, aiming to understand their perspectives deeply. This comprehensive approach, utilizing both qualitative and quantitative methods, facilitated a holistic understanding of the research topics, aligning with mixed-methods research principles(Johnson & Onwuegbuzie, 2017) .

Data Collection Techniques and Sources

The study conducted a thorough investigation into how teachers' ICT skills influence students' academic performance in mathematics, employing rigorous data collection and analysis methods. Data was gathered from 259 participants, comprising 223 teachers and 36 head teachers. The research utilized a triangulation approach, incorporating questionnaires, interviews, and observation methods to ensure data robustness. To ensure a diverse and representative sample, the study employed purposive, stratified, and simple random sampling techniques.

Furthermore, the study adopted a mixed-methods approach, integrating quantitative and qualitative methods for a comprehensive analysis. Quantitative data was meticulously analyzed using SPSS, employing descriptive statistics (frequency, percentage, mean, and standard deviation) to summarize data trends, and inferential statistics (correlational and regression analysis) to explore relationships. Qualitative data underwent rigorous content analysis to uncover deeper insights and complement the quantitative findings.

Results

The maturity level of respondents stands as a significant variable, crucial for ensuring the credibility of the data collected in this study. Understanding the age demographics of public secondary school students in Kayonza District was essential for assessing their capacity to engage with the study material effectively.

Table 1 Age Group of Respondents

Age group	Frequency	Percentage
20-25 years	9	3.5
26-30 years	124	48.8
31-35 years	75	29.2
36 and above	47	`18.5
Total	**257**	**100.0**

Source : Primary Data (2023)

The results of the current study indicate that 3.5% of respondents fell within the age bracket of 20 to 25 years, while 48.8% were aged between 26 and 30 years. Additionally, 29.2% of respondents were in the 31 to 35 age range, and 18.5% were

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above 36 years old. This distribution underscores the presence of a significant proportion of mature respondents, capable of providing reliable insights crucial to the study's objectives.

Interestingly, these findings align with those of Kumar (2009), who examined the impact of ICT utilization on mathematics performance among students in India. Kumar similarly observed a predominant presence of respondents aged 17 to 20 years(Kumar, 2019). The presence of mature respondents in our study ensures the acquisition of meaningful and valuable information essential for our research objectives.

Level of Study

The researcher through questionnaires has requested respondents to indicate their class in order to investigate whether the respondents' level has influence on responses provided.

Table 2 Level of Study

Level	Frequency	Percentage
Bachelors Degree	254	98.8%
Masters	3	1.2%
PHD	0	0%
Total	**257**	**100.0%**

Source: Primary Data (2023)

Table 2 illustrates that out of the total 257 respondents, 254 held bachelor's degrees, constituting 98.8% of the sample, whereas 3 respondents possessed master's degrees. This diverse educational background enabled the researcher to gather insights not solely reliant on individuals with higher academic qualifications.

The Teachers Experience in Information Communication Technology that affects Students' Performance in Mathematics in Public Secondary Kayonza District Rwanda

The primary aim of this study was to assess the impact of teachers' experience in information communication technology on students' performance in Mathematics within public secondary schools in Kayonza District, Rwanda. To accomplish this goal, respondents were asked to express their views by completing a questionnaire. The opinions of the participants were evaluated using a scale ranging from SD (Strongly Disagree), D (Disagree), Not sure, A (Agree), to SA (Strongly Agree).

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Table 3 Teachers perception on the teachers experience in information communication Technology that affects students' performance in Mathematics

Statements	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	Std
	N	%	N	%	N	%	N	%	N	%		
Experienced teacher in the use of MS excel indicate their experience in ICT	3	1.2	7	2.8	11	4.3	21	8.3	212	83.5	1.362	.971
Skilled teacher in power point presentation indicate their experience in ICT	3	1.2	10	4.2	7	2.8	16	6.3	217	85.9	1.371	.968
Preparation of teaching materials using ICT tools indicate their experience in ICT	4	1.6	11	4.3	19	7.5	4	1.6	213	83.9	1.86	.975
Skilled teachers in preparation of exams and test using ICT tools indicate their experience in ICT	10	3.9	8	3.1	7	2.8	20	7.9	209	82.3	1.385	.988

Source: Primary Data (2022)

Table 3 presents insights into teachers' perceptions of ICT proficiency and its impact on Mathematics performance in public secondary schools in Kayonza District, Rwanda. A significant majority (83.5%) strongly agreed on the importance of proficient use of MS Excel, indicating ICT expertise (mean = 1.362, SD = 0.971). Similarly, 85.9% affirmed the significance of skilled PowerPoint presentations (mean = 1.362, SD = 0.968). Additionally, 83.9% recognized the value of preparing teaching materials with ICT tools (mean = 1.86, SD = 0.975), and 82.3% highlighted the relevance of ICT for exam preparation (mean = 1.385, SD = 0.988). These responses illustrate a perceived link between teachers' ICT competence and its positive influence on students' Mathematics performance.

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Table 4 The Head teacher perception on the teachers experience in information communication Technology that affects students' performance in Mathematics

Statements	Strongly Disgree		Disagree		Neutral		Agree		Strongly Agree		Mean	Std
	N	%	N	%	N	%	N	%	N	%		
Experienced teachers who utilize MS Excel demonstrate their knowledge of ICT.	1	2.8	0	0.0	0	0.0	4	11.1	31	86.1	1.2	.721
Skilled teachers in power point presentations demonstrate their knowledge of ICT.	0	0.0	1	2.8	1	2.8	1	2.8	33	91.7	1.3	.831
Preparation of educational materials using ICT tools demonstrates their knowledge of ICT.	1	2.8	1	2.8	1	2.8	3	8.3	30	83.3	1.31	.894
Skilled teachers who use ICT tools to prepare exams and tests demonstrate their ICT experience.	0	0.0	2	5.6	4	11.1	2	5.6	28	77.8	1.4	.908

Source: Primary Data (2023)

The findings from table 4 indicates responses provided on the teacher's experience in information communication Technology that affects students' performance in Mathematics in public secondary Kayonza District Rwanda. The majority of Head teachers with a total of 86.1% strongly agreed that Experienced teachers who utilize MS Excel demonstrate their knowledge of ICT with a mean of 1.2 and the standard deviation of 0.7, 91.7% respondents agreed that Skilled teachers in power point presentations demonstrate their knowledge of ICT with the mean of 1.3 and the standard deviation of .831, 83.3% of respondents agreed that Preparation of educational materials using ICT tools demonstrates their knowledge of ICT with 1.31 of mean and .894 of standard deviation. Furthermore, 77.8 % of respondents agreed that Skilled teachers who use ICT tools to prepare exams and tests demonstrate their ICT experience with the mean of 1.4 and the standard deviation of .908. ICT is used by students in arithmetic, graphing, and problem solving. In addition, spreadsheets, computer algebra systems, or graphical calculators can be utilized to answer issues via

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testing, improvement, or retrieval techniques. Using a dynamic geometry software to create a visual can assist a learner in understanding and then solving an issue. When students utilize ICT for research or problem solving, their mathematical skills improve significantly(Das, 2019).

Table 5 The Head teacher perception on the teachers experience in information communication Technology that affects students' performance in Mathematics

Statements	Strongly Disgree		Disagree		Neutral		Agree		Strongly Agree		Mean	Std
	N	%	N	%	N	%	N	%	N	%		
Experienced teachers who utilize MS Excel demonstrate their knowledge of ICT.	1	2.8	0	0.0	0	0.0	4	11.1	31	86.1	1.2	.721
Skilled teachers in power point presentations demonstrate their knowledge of ICT.	0	0.0	1	2.8	1	2.8	1	2.8	33	91.7	1.3	.831
Preparation of educational materials using ICT tools demonstrates their knowledge of ICT.	1	2.8	1	2.8	1	2.8	3	8.3	30	83.3	1.31	.894
Skilled teachers who use ICT tools to prepare exams and tests demonstrate their ICT experience.	0	0.0	2	5.6	4	11.1	2	5.6	28	77.8	1.4	.908

Source: Primary Data (2023)

The findings from table 4 indicates responses provided on the teacher's experience in information communication Technology that affects students' performance in Mathematics in public secondary Kayonza District Rwanda. The majority of Head teachers with a total of 86.1% strongly agreed that Experienced teachers who utilize MS Excel demonstrate their knowledge of ICT with a mean of 1.2 and the standard deviation of 0.7, 91.7% respondents agreed that Skilled teachers in power point presentations demonstrate their knowledge of ICT with the mean of 1.3 and the standard deviation of .831, 83.3% of respondents agreed that Preparation of educational materials using ICT tools demonstrates their knowledge of ICT with 1.31 of mean and .894 of standard deviation. Furthermore, 77.8 % of respondents agreed that Skilled teachers who use ICT tools to prepare exams and tests demonstrate their ICT experience with the mean of 1.4 and the standard deviation of .908. ICT is used by

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students in arithmetic, graphing, and problem solving. In addition, spreadsheets, computer algebra systems, or graphical calculators can be utilized to answer issues via testing, improvement, or retrieval techniques. Using a dynamic geometry software to create a visual can assist a learner in understanding and then solving an issue. When students utilize ICT for research or problem solving, their mathematical skills improve significantly (Das, 2019).

The level of students' academic performance in mathematics in the public secondary schools of Kayonza District -Rwanda

The second objective of this research was to assess the level of students' academic performance in mathematics in the public secondary schools of Kayonza District -Rwanda, the researcher asked the respondents to show their views by filling the questionnaire; the researcher also analyzed different documents about public secondary school in Kayonza district. Opinions of respondents are rated using strongly disagree (SD), D (Disagree), Not Sure (NS), A (Agree), SA (Strongly Agree). These rating were given values of 1, 2, 3,4 and 5 respectively.

Table 6 The teacher's perception on the level of students' academic performance in mathematics in the public secondary schools of Kayonza District -Rwanda

Statements	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	Std
	N	%	N	%	N	%	N	%	N	%		
Skilled students in numeracy show the level of students' performance	3	1.2	4	1.6	21	8.3	24	9.5	201	79.4	1.65	1.35
Improved grade indicate the level of students' performance	1	0.4	3	1.2	25	9.9	21	8.3	203	80.2	1.66	1.38
Improved scores indicates the level of students performance	3	0.8	4	1.6	25	9.9	21	8.3	200	79.1	1.61	1.30
Improved skills in experimenting MS excel indicate the level of students performance	2	0.8	7	2.8	26	10.3	20	7.9	198	78.3	1.44	.88
Skilled students in numeracy show the level of students performance	0	0.0	5	2.0	18	7.1	21	8.3	209	82.6	1.93	1.28

Source: Primary Data (2023)

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Table 6 presents findings from a questionnaire assessing students' academic performance in mathematics in Kayonza District's public secondary schools, Rwanda. A significant majority (79.4%) strongly agreed that numeracy skills reflect students' performance (mean = 1.65, SD = 1.358), and 80.2% agreed that improved grades indicate performance levels (mean = 1.66, SD = 1.38). Additionally, 79.1% agreed that improved scores correlate with performance (mean = 1.61, SD = 1.30). Furthermore, 78.3% acknowledged that enhanced MS Excel skills relate to performance (mean = 1.44, SD = 0.88), while 72.6% emphasized the importance of numeracy skills (mean = 1.93, SD = 1.28). Since the 1980s, the evolution of ICT has transformed education, initially focusing on Information Technology (IT) for data storage and retrieval. The term ICT emerged in 1992 with the advent of the World Wide Web, emphasizing communication alongside IT capabilities(Thangam, 2020).

Table 7 The Head Teacher's perception on the level of students' academic performance in mathematics in the public secondary schools of Kayonza District -Rwanda

Statement	Storngly Disagree		Disagree		Neutral		Agree		Strongly Aagree				
	N	%	N	%	N	%	N	%	N	%	Total	Mean	Sdv
Numeracy-skilled kids demonstrate the degree of student achievement.	0	0.0	0	0.0	1	2.8	4	11.1	31	86.1	36	1.8	1.2
An improved grade indicates a student's degree of performance.	0	0.0	1	2.8	1	2.8	1	2.8	33	91.7	36	1.75	1.1
Students' performance levels have improved.	1	2.8	1	2.8	1	2.8	3	8.3	30	83.3	36	1.77	1.2
Improved MS Excel experimentation abilities show the degree of student performance.	0	0.0	2	5.6	2	5.6	4	11.1	28	77.8	36	1.4	.87

Source: Primary Data (2023)

Through the questionnaire, determine the level of students' academic performance in mathematics in the public secondary schools of Kayonza District -Rwanda; The results are presented in the Table 6 which indicates that 86.1% of respondents strongly agreed that Numeracy-skilled kids demonstrate the degree of student achievement with the mean of 1.8 and the standard deviation of 1.2, 91.7% of respondents strongly agreed that An improved grade indicates a student's degree of performance with the mean of 1.75 and the standard deviation of 1.1, 83.3% respondents agreed that Students' performance levels have improved with the mean of 1.77 and the standard deviation of 1.2 , 77.8% respondents agreed that Improved MS Excel experimentation abilities show the degree of student performance. with the mean of 1.4 and the standard deviation of 0.87. The use of ICT in two-dimensional shapes and three-dimensional visualizations

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provided the learners with a more realistic vision. The Internet provides learners with constant access to new material and data(Das, 2019; Karlen et al., 2023). It is feasible to make ICT reliant on real-world applications using various mathematical ideas. Self-Regulated learners are aware of their intellectual strengths and shortcomings, as well as the tactics they employ to meet the on a daily basis challenge of abstract work(Das, 2019; Karlen et al., 2023).

The relationship between teachers' experience in ICT use and students' academic performance in mathematics in public secondary schools of Kayonza District-Rwanda.

The third objective of the current study is to examine the relationship between teachers' experience in ICT use and students' academic performance in mathematics in public secondary schools of Kayonza District-Rwanda.

Table 8 Correlation Analysis between teachers' experience in ICT use and students' academic performance in mathematics

		Experienced teacher in the use of MS excel	Skilled teacher in power point presentation	Preparation of teaching materials using ICT tools	Skilled teachers in preparation of exams and test using ICT tools	Skilled students in numeracy	Improved grade	Improved scores	Improved skills in experimenting MS excel
Experienced teacher in the use of MS excel	Pearson Correlation	1							
	Sig. (2-tailed)								
	N	256							
Skilled teacher in power point presentation	Pearson Correlation	.855**	1						
	Sig. (2-tailed)	.000							
	N	256	256						
Preparation of teaching materials using	Pearson Correlation	.874**	.901**	1					
	Sig. (2-tailed)	.000	.000						

ICT tools	N	256	256	256					
Skilled teachers in preparation of exams and test using ICT tools	Pearson Correlation	.721**	.833**	.773**	1				
	Sig. (2-tailed)	.000	.000	.000					
	N	256	256	256	256				
Skilled students in numeracy	Pearson Correlation	.901**	.833**	.773**	.125*	1			
	Sig. (2-tailed)	.000	.000	.000	.045				
	N	256	256	256	256	256			
Improved grade	Pearson Correlation	.127*	.125*	139*	.130*	.116	1		
	Sig. (2-tailed)	.042	.045	.026	.037	.064			
	N	256	256	256	256	256	256		
Improved scores	Pearson Correlation	.125*	.135*	.995**	.122	.120	.111	1	
	Sig. (2-tailed)	.046	.031	.000	.051	.054	.077		
	N	256	256	256	256	256	256	256	
Improved skills in experimenting MS excel	Pearson Correlation	.855**	.874**	.721**	.025	.127*	.122	-.111	1
	Sig. (2-tailed)	.000	.000	.000	.691	.042	.051	.077	
	N	256	256	256	256	256	256	256	256

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Source: Primary data (2023)

Significant correlations were found between students' numeracy skills and teachers' ICT proficiency in MS Excel (r=.901**, p-value=0.000), PowerPoint presentations (r=.833**, p-value=0.000), and preparation of teaching materials using ICT tools (r=.773**, p-

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value=0.000). These results indicate a strong positive relationship, underscoring how teachers' ICT expertise influences students' numeracy skills. Similarly, improvements in student grades correlated positively with teachers' ICT proficiency in MS Excel (r=.127*, p-value=0.042), PowerPoint presentations (r=.125*, p-value=0.045), and preparation of teaching materials using ICT tools (r=.139*, p-value=0.026). These findings suggest that better student grades are associated with teachers' adept use of ICT tools.

Furthermore, strong associations were observed between improved grades and teachers' ICT proficiency in MS Excel (r=.855**, p-value=0.000), PowerPoint presentations (r=.874**, p-value=0.000), and preparation of teaching materials using ICT tools (r=.721**, p-value=0.000). This highlights the critical role of teachers' ICT proficiency in enhancing students' academic performance, facilitating more engaging and practical learning experiences. Using ICT enables students to apply mathematical concepts in real-world scenarios, promoting self-regulated learning and addressing academic challenges effectively.

Table 9 Regression coefficient between independent variables and Improved grade

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	.099	.050		1.992	.047
	Experienced teacher in the use of MS excel	.225	.068	.219	3.327	.001
	Skilled teacher in power point presentation	.332	.078	.311	4.244	.000
	Preparation of teaching materials using ICT tools	.120	.073	.118	1.638	.103
	Skilled teachers in preparation of exams and test using ICT tools	.243	.081	.231	3.019	.003

a. Dependent Variable: Improved grade

Source: Primary data, 2023

Table 9 presents the results indicating the statistical significance of various factors on Improved grade. Experienced teacher proficiency in MS Excel demonstrated a significant association with Improved grade (B=.219, p-value=.001), as did the proficiency of teachers in PowerPoint presentation skills (B=.311, p-value=.000). However, the preparation of teaching materials using ICT tools did not show statistical significance in affecting Improved grade (B=.118, p-value=.103), while the skill level of teachers in preparing exams and tests using ICT tools was found to be statistically

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significant (B=.244, p-value=.000). These regression analysis results underscore the significant relationship between independent variables and Improved grade.

In light of these findings, it is crucial to address the observed low performance in Mathematics among pupils in the HUYE area, as highlighted in previous studies(Josias Nteziryimana,Japhet Niyobuhungiro, 2023). Therefore, this research aims to investigate the impact of ICT integration in the teaching and learning process on students' performance in mathematics.

Table 10 Regression coefficient between student test and Improved scores

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.069	.041		1.665	.097
	Experienced teacher in the use of MS excel	.229	.056	.234	4.071	.000
	Skilled teacher in power point presentation	.331	.065	.325	5.091	.000
	Preparation of teaching materials using ICT tools	.125	.061	.129	2.063	.040
	Skilled teachers in preparation of exams and test using ICT tools	.245	.067	.244	3.650	.000

a. Dependent Variable: Improved scores

Source: Primary data (2023)

The above table 10 shows that Experienced teacher in the use of MS excel were statistically significant to Improved scores (B=.234, p-value=.000), Skilled teacher in power point presentation were statistically significant Improved scores (B=.325, p-value=.000) and Preparation of teaching materials using ICT tools is significant affecting Improved scores (B=.129, p-value=.040), Skilled teachers in preparation of exams and test using ICT tools were statistically significant Improved scores (B=.244, p-value=.000). The result of regression analysis indicated that there are significant between independent variables with Improved scores. According to the findings, (Mwendwa, 2020) indicate that Rwandan government views ICT as a key tool for economic transformation, with the education sector playing a critical role in producing critical human resources. Since 2000, computers have been made available in classrooms for gradually incorporating ICT into the education curriculum through a variety of creative activities(Rubagiza et al., 2011). The difference in mathematics

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performance of pupils in upper secondary schools persists(Josias Nteziryimana,Japhet Niyobuhungiro, 2023).

Table 11 Regression coefficient between independent variable and Improved skills in experimenting MS excel

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.075	.040		1.873	.062
	Experienced teacher in the use of MS excel	.228	.054	.235	4.196	.000
	Skilled teacher in power point presentation	.331	.063	.329	5.268	.000
	Preparation of teaching materials using ICT tools	.124	.059	.130	2.114	.035
	Skilled teachers in preparation of exams and test using ICT tools	.244	.065	.246	3.771	.000

a. Dependent Variable: Improved skills in experimenting MS excel

Source: Primary data (2023)

Table 11 presents significant findings regarding the impact of teachers' ICT proficiency on improved skills in experimenting with MS Excel. Experienced use of MS Excel (B=.235, p-value=.000), skilled PowerPoint presentations (B=.329, p-value=.000), preparation of teaching materials using ICT tools (B=.130, p-value=.035), and preparation of exams using ICT tools (B=.246, p-value=.000) all showed statistically significant associations with improved MS Excel skills.

According to Mwendwa (2020), ICT plays a crucial role in enhancing educational systems and learning techniques. Effective teacher training in ICT should not only focus on technical skills but also emphasize the strategic use of ICT to transform teaching and learning processes in mathematics education. Integrating ICT into mathematics instruction can enhance student engagement, creativity, and communication skills, offering diverse learning opportunities and making learning more enjoyable and effective.

Discussions

The teachers experience in information communication Technology that affects students' performance in Mathematics

The Result indicated The majority of Respondents with a total of 83.5 % strongly agreed that Experienced teacher in the use of MS excel indicate their experience in ICT with a mean of 1.362 and the standard deviation of .971, 85.9% respondents strongly

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agreed that Skilled teacher in power point presentation indicate their experience in ICT with the mean of 1.362 and the standard deviation of .968 , 83.9 % of respondents strongly agreed that Preparation of teaching materials using ICT tools indicate their experience in ICT with 1.86 of mean and .975 of standard deviation. Furthermore, 82.3 % of respondents strongly agreed that Skilled teachers in preparation of exams and test using ICT tools indicate their experience in ICT with the mean of 1.385 and the standard deviation of 0.988. (Princesse, 2022) looks at the influence of Information, Communication, and Technology (ICT) use on academic achievement in public secondary schools in Rwanda's Nyamasheke area. According to the findings, 58.9% of students never utilize ICT laboratories, while 27.2% use them once a week, resulting in worse academic achievement. Effective ICT usage influenced students' academic achievement by 77.2%, with other variables influencing 22.8%. According to the report, the Ministry of Education should boost ICT literacy and productivity.

The level of students' academic performance in mathematics in the public secondary schools of Kayonza District -Rwanda

The result showed that79.4% of respondents strongly agreed that Skilled students in numeracy show the level of students' performance in kayonza with the mean of 1.65 and the standard deviation of 1.358, 80.2% of respondents strongly agreed that Improved grade indicate the level of students' performance with the mean of 1.66 and the standard deviation of 1.38, 79.1% respondents agreed that Improved scores indicates the level of students' performance in math with the mean of 1.61and the standard deviation of 1.30, 78.3% respondents agreed that Improved skills in experimenting MS excel indicate the level of students performance with the mean of 1.44 and the standard deviation of 0.88 and 72.6% of respondents with the mean of 1.93 and the standard deviation of 1.28 strongly agreed that Skilled students in numeracy show the level of students performance. (Nteziryimana, 2019) looked at the effect of ICT integration on students' Math performance in public upper secondary schools in Rwanda's Huye area. The study included five schools, 392 learners, and eight mathematics teachers, as well as questionnaires for both teachers and students. The findings revealed that pupils who were taught using ICT tools fared better in Mathematics. Tips for improved performance include providing enough ICT tools and better teacher training.

The relationship between teachers' experience in ICT use and students' academic performance in mathematics in public secondary schools of Kayonza District-Rwanda

The study demonstrated a strong positive correlation between students' numeracy skills and teachers' proficiency in MS Excel (r=.901**, p-value=0.000), PowerPoint presentations (r=.833**, p-value=0.000), and preparation of teaching materials using

ICT tools (r=.773**, p-value=0.000). These findings indicate that students' proficiency in numeracy is influenced by teachers' competence in utilizing ICT tools effectively.
In a related study in Tanzania, ICT's impact on secondary school students' math performance in Kosofe Local Government Area, Lagos State, was examined using a survey with 200 participants. The research employed Pearson Product Moment Correlation and independent t-tests to test hypotheses, revealing significant relationships between ICT use, teacher computer literacy, teaching methodologies, and students' academic achievement levels (Maijo S. N., 2019). These findings underscore the pivotal role of ICT in enhancing teaching practices and student outcomes in mathematics education.

Conclusion

Based on the study findings discussed in this chapter and the contrast made with previous empirical studies, the study elucidated the following concluding remarks:
To the first objective and research question, the study concludes that the findings from the present research show that teacher's experiences in information and communication technology affect students' performance in mathematics. "Experienced teacher in the use of MS Excel; skilled teacher in PowerPoint presentations; preparation of teaching materials using ICT tools; and skilled teacher in preparation of exams and tests using ICT tools.
To the second objective of the study, which was to analyze the level of students' academic performance in mathematics in the public secondary schools of Kayonza District (Rwanda), the research indicated that skilled students in numeracy, improved grades, improved scores, and improved skills in experimenting with MS Excel in general indicate teacher experience in ICT.
Finally, to the third objective and research question, The Relationship between Teachers' Experience in ICT Use and Students' Academic Performance in Mathematics in Public Secondary Schools in Kayonza District-Rwanda, the study found a positive correlation between teachers' experience with ICT use and students' academic performance in mathematics in public secondary schools in Kayonza District, Rwanda, with positive significance since the p-value was less than 0.05.

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Conflict of interest statement

The author declares no conflicts of interest.

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