Mathematics Teachers' Perceptions on the Use of Technological Tools in Teaching and Learning Practices in Selected Rwandan Secondary Schools

Martin Bazina[1]
Servilien Bimenyimana[2]
Magnifique Idahemuka[3]

[1]martinbazina84m@gmail.com
[2]servilienb@gmail.com
[3]magnifiqueidahemuka@gmail.com

[1]East African University Rwanda, [2]University of Rwanda-College of Education, [3]Mount Kigali University, Rwanda

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ABSTRACT

This article assessed one objective derived from an unpublished master's thesis with the title "Factors Constraining the Effective Application of Information and Communication Technology (ICT) in Teaching and Learning Mathematics: Case Study of Selected Secondary Schools in Rwanda." The objective of this study was to investigate how mathematics teachers perceive the use of technological tools in teaching and learning mathematics. Gregory's constructivist theory of perception served as the anchor for the research. A case study research design was adopted. The research focused on secondary school mathematics teachers in 10 selected Rwandan schools. Purposive sampling was employed to choose 20 mathematics teachers. Primary data was obtained through open-ended questionnaires along with semi-structured interviews, and thematic analysis was employed for data analysis. Study outcomes indicated that perceptions of mathematics teachers' of embracing technological tools are formed by their familiarity with technology, confidence in adopting it, and the help they get in incorporating it into their teaching procedures. The study concluded that teachers ought to participate in Continuous Professional Development (CPD) programs aimed at technological tools to enhance confidence and boost their integration into teaching. According to research, school leaders should ensure access to the most up-to-date technological resources and offer customized training to facilitate effective technology adoption in mathematics teaching. The study further suggested that Rwanda Basic Education Board (REB) and the National Examination and Schools Inspection Authority (NESA) should enforce extensive training programs, avail more resources in essential technological infrastructure, and boost research and best practices to encourage innovation. Additional research should broaden its context to include different perspectives, evaluate the long-term impact of technological tools on student outcomes, and assess the effectiveness of professional development programs.

Keywords: Technological Tools, Teachers' Perceptions, Teaching Mathematics, Technology Effectiveness

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I. INTRODUCTION

Technological tools describe digital, web, or electronic instruments, software, and applications adopted to enable tasks, work out problems, or facilitate procedures. The education domain employs these tools to enhance teaching and learning. They entail computers, laptops, smartphones, tablets, interactive whiteboards, instructional software, web platforms, and the internet. These tools make learning more interactive, accessible, and effective by providing a wide range of options to access information, involve learners, and oversee class activities (Roblyer et al., 2018). Technology plays a vital function in all spheres of human life, education included. Presently, embracing technology in class settings is paramount to arming students with the skills demanded in the 21st century. It promotes teaching and learning, thus making it necessary for teachers and instructors to utilize their duty as architects of educational settings. By embracing technology, teachers can articulate their lessons in a better, more engaging, and extensive way, which is beneficial to learners at all academic levels (Ratheeswari, 2018).

Technology is vital in the teaching and learning mathematics process. According to Baskoro and Wijaya (2015), it facilitates instruction in mathematics and aids students/learners to learn more effectively. Current technology offers substantial options for teachers to establish a more appealing and informative learning setting. Presently, teachers have a wide choice in regards to learning resources, graphics, videos, and free software to make their lessons more efficient (Pardede, 2020). In Malaysia, Zakaria & Khalid (2016) did a study and indicated that 89.5% of mathematics teachers adopted mainstream technology applications in their lessons. This comprised software, graphics, and online illustrations. Similarly, Umugiraneza et al. (2018) found that nearly 80% of respondents believed that the adoption of technology enhances learners' understanding of mathematics. Mugiraneza (2021) noted that promoting teachers' competencies in employing digital instruments for educational purposes is a core aim of Rwanda's education system, which focuses on boosting equitable and high-standard learning through technological use.

In 2016, Rwanda's education policy embraced technology to improve education standards. The goal was to provide learners with fundamental digital tools (Mugiraneza, 2021). The Ministry of ICT and Innovation (MINICT) in Rwanda stated three key aims for technology in education. The primary goal was to improve education standards while also expanding access to technological tools. The ultimate goal was to accommodate a variety of learning methods. Similarly, in an effort to expand access to computers, Rwanda invested heavily in locally assembled Positivo BGH computers. This resulted in a reduction of the student-to-computer ratio from 23:1 to 8:1 (Ministry of ICT and Innovation, 2015). Through collaboration with the Ministry of Education (MINEDUC), Rwanda has enforced a number of policies to boost the teaching career. It has focused on increasing learning outcomes in both primary and secondary education. In this regard, one policy entails offering rewards to Science, Mathematics, and Technology teachers and students (MINEDUC, 2018). Nonetheless, gaps exist in enforcing these tactics, with technical and vocational institutions lacking necessary digital content. As a result, Rwanda needs improvements in investing in CPD work and increasing the availability of technology and digital content for teaching mathematics (MINEDUC, 2018). Activities in CPD are necessary for improving digital skills and bolstering teachers' career growth. These measures will contribute to Rwanda's intention of attaining a middle-income knowledge-based economy. However, there continues to be a considerable deficiency of teachers trained to utilize technological tools effectively despite these efforts (Mugiraneza, 2021). Simultaneously, several factors influence the effectiveness of using technological platforms in mathematics education. Some of them include psychological elements such as attitude, values, beliefs, and self-esteem (Bazina & Habimana, 2022).

Phiri (2016) performed an investigation in Zambia that assessed the effectiveness of employing technology in teaching and learning mathematics. He used qualitative and quantitative research techniques, utilizing questionnaires and interviews to obtain data from students and teachers. The results showed that teachers' and students' opinions about the adoption of technology in mathematics education posed a significant barrier to its full implementation. However, the research indicated that both groups had a positive view of technology in this context, noting that its implementation enhances teachers' skills, confidence, and motivation. Technology acts as a resourceful instrument for teachers, enabling simpler planning and content preparation. It also offers unrestricted access to current student and school data at any given time (Munyengabe et al., 2017). This research is necessary to assess how mathematics teachers view the integration of technological tools in their instruction and learning. This also involves examining the correlation between these perceptions and the effectiveness of these tools in improving student performance.

1.1 Statement of the Problem

The education sector values technology for its productive role in both teaching and learning mathematics. In addition, technology is crucial in teaching and learning mathematics, enhancing the effectiveness of students' learning (Baskoro & Wijaya, 2015). In his study, Das (2019) found that incorporating technological tools in teaching brings vitality to the classroom environment, enhancing the mathematics teaching and learning process. According to the MINEDUC (2015), using technology to improve education quality across all subjects is recommended. In this line, REB (2015) emphasizes that digital technology should be integrated into every mathematics lesson. Technology also enhances teaching by providing tools for information search, presentation, and application programs, which improve learners' attention and memory (Perienen, 2020).

Despite its benefits, the use of technology in Rwandan secondary schools to teach mathematics remains limited, primarily due to a lack of teachers with ICT training and gaps in digital skills application (Mugiraneza, 2021). In addition, Das (2019) highlights in his research that technology has a significant role in national development and quality education delivery. While governments and stakeholders are addressing some challenges, teachers' perceptions of technology use in teaching mathematics need urgent attention to avoid hindering its implementation in Rwanda's education sector (Mugiraneza, 2021). Ghavifekr et al. (2006) also asserted that technological tools are ineffective if their intended users do not possess or value them. This study is driven by the identified issue of teachers' perceptions regarding the use of technological tools and their effectiveness in teaching mathematics, and the challenges faced by mathematics teachers with whom we share the same career of teaching mathematics.

1.2 Research Objectives

(i) To explore teachers' perceptions of the use of technological tools in teaching mathematics.
(ii) To investigate how technological tools' effectiveness in teaching mathematics relates to teachers' attitudes.

1.3 Research Questions

(i) How do teachers perceive the use of technological tools in teaching mathematics?
(ii) How does the effectiveness of technological tools in teaching mathematics relate to teachers' attitudes?

II. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Gregory's Constructivist Theory of Perception

According to Kombo and Tromp (2006, p. 56), as cited by Phiri (2016), a theoretical framework is a collection of coherent ideas grounded in theories. A theoretical framework comprises reasoned propositions, derived from and supported by data or evidence. The role of theory in educational research and teacher education practice is significant, as it helps in shaping these fields (Phiri, 2016). Additionally, the theory aims to liberate teachers from relying on practices influenced by ideological and political constructs, encouraging them to critically reflect on their classroom practices (Higgs, 2013). Consequently, this current investigation applies Gregory's constructivist theory of perception (1970). This concept suggests that perception is an active process that involves the extraction, assessment, translation, and reconstruction of sensory stimuli. Similarly, it noted that perception stems from the association between external stimuli and the observer's internal hypotheses. Moreover, it encompasses expectations, skills, and knowledge, with motivation and thoughts having an important function (Démuth, 2013). Gregory's theory (1970) also hints that sensory data on its own is inadequate for perception. The concept asserts that perception entails forming inferences and interpretations pursuant to advanced knowledge, expertise, and scope.

2.1.2 Teachers' Perceptions of Using Technological Tools in Teaching Mathematics.

Teachers' beliefs regarding teaching and learning significantly influence their decisions on content delivery (Umugiraneza et al., 2018). Ndayambaje and Ngendahayo (2014) noted that the advancement of technology necessitates the development of relevant skills and confidence in teaching, which can only come from a positive attitude. Furthermore, Brown et al. (2005) discovered disparities in the use of technological tools in schools and mathematics departments, with many teachers lacking confidence in their use.

However, EdQual (2010) reported that even minimal external support can help teachers gain confidence in using technology to create innovative teaching environments. Teachers' attitudes towards use of technology in teaching greatly influence their acceptance and integration of that technology in their classroom (Liaw & Huang, 2011). Schiller (2003), cited by Fu (2013), stated that attitudes toward technological tools are one of the factors that influence technology adoption. Technology provides a variety of tools that improve the interaction and resources between teachers and students. In addition, the rapid technological development and growing student populations necessitate global education reforms and improved teacher education (Pardede, 2020). While teachers are eager to use technology in teaching, their perceptions of its use in mathematics teaching remain underexplored due to limited research on technology use specifically in teaching mathematics (Phiri, 2016).

2.1.3 Technological Tools' Effectiveness Relates to Teachers' Attitudes and Challenges Involved.

Using technological tools in mathematics education significantly influences teachers' attitudes, beliefs, and perceptions regarding their effectiveness and utility. In addition, when teachers are well-equipped with the necessary technological resources and receive adequate training, they are more likely to view these tools positively, believing that they enhance student engagement and understanding (Ertmer & Ottenbreit-Leftwich, 2010). Conversely, a lack of access to technology or insufficient support can lead to negative perceptions, with teachers feeling that the tools are more of a burden than a benefit, potentially hindering their adoption in classroom practices (Niederhauser & Stoddart, 2001). Moreover, teachers' prior experiences with technology and their beliefs about its role in education can either strengthen or diminish their willingness to integrate these tools effectively into their teaching methods (Kim et al., 2013).

The mathematics syllabus for Rwandan secondary schools emphasizes technology and encourages teachers to help students master the subject through technological tools. Moreover, the mathematics teaching methodology outlined in Rwanda's competency-based curriculum requires incorporating technology into the teaching and learning process, making the subject more engaging for learners and teachers (REB, 2015). Regrettably, the primary obstacle to successfully integrating digital technologies into the teaching process lies in the attitudes, values, knowledge, experience, and competencies of teachers. Since digital pedagogy is a relatively new field, not many published works have approached this topic systematically (Bećirović, 2023).

2.2 Empirical Review

The integration of technological tools in teaching mathematics has been extensively studied; revealing both benefits and challenges. Phiri (2016) identified significant disparities in technology access between urban and rural schools, with 70% of urban teachers using technology regularly, compared to just 35% in rural areas. This digital gap hints at the need for equitable sharing of resources, e.g., laptops, projectors, and consistent internet in rural schools. In the same vein, Pardede (2020) observed that technology boosts student-teacher relationships and resource availability.

He noted that 85% of teachers indicated better student engagement in mathematics lessons. Enabling platforms for disseminating best practices, e.g., seminars and online meetings, can aid in forming a supportive society of practice (Pardede, 2020). Research recommendations revealed that technology has a favourable and major effect on the teaching and learning process.

Ndayambaje and Ngendahayo (2014) performed research and revealed that many teachers acknowledge the potential merits of technology in promoting student engagement and comprehension. However, a substantial number lack confidence and essential skills. Of note, 62% of the teachers polled stated that they felt poorly prepared to effectively integrate technology into their teaching profession. They suggest that developing mechanisms to consistently track and evaluate the effect of technology incorporation on teaching and learning outcomes can assist in making data-driven decisions and improvements. Similarly, EdQual (2010) demonstrated that with reduced external aid through seminars, teachers can gain the confidence required to adopt technological instruments in an innovative way. According to research results, 78% of teachers who received training felt more skilled in creating engaging and debateful mathematics lessons. They proposed classifying adequate and intensive training classes to enhance teachers' technological expertise and confidence (EdQual, 2010). This entails first-time training as well as continuous career growth opportunities. Teachers' values and attitudes towards the role of technology in teaching and learning ultimately influence the integration of technology. Prior research revealed that the attitude of a teacher is the most valuable factor in enforcing technology (Kormos & Wisdom, 2021).

III. METHODOLOGY

3.1 Research Design

This study followed a case study research design to explore secondary school mathematics teachers' perceptions of using technological tools in Mathematics teaching and learning practices. This technique was applicable to the research objective of investigating teachers' opinions, beliefs, and attitudes regarding incorporating technology into mathematics instruction. Yin (2014) stated that a case study design assists in comprehending phenomena in actual settings. Karlsson (2016) posits this methodology as a technique for refining the visual image of the case under scrutiny.

3.2 Target Population and Sampling Techniques

The research population consisted of all mathematics teachers from selected secondary schools. Because of time challenges, 20 respondents were selected for this research. Responders filled out open-ended questionnaires, while ten of them took part in semi-structured interviews. This resulted in a sample size of twenty mathematics teachers. Purposive sampling was adopted to choose the responders. Ten schools were picked depending on their technological enforcement and enhancement programs, availability of smart classrooms, electricity accessibility, and Internet connection. Twenty mathematics teachers were chosen from these schools due to their important function and impact in teaching mathematics. The demographic features and academic qualifications of the respondents are depicted below in Table 1.

Table 1

Demographic Features and Academic Qualifications of the Respondents from Chosen Schools.

Number of Schools	Respondents	Gender	Number	Qualifications
Ten Secondary Schools	Mathematics Teachers	Male	11	Bachelor's Degree(A_o):10 Respondents
				Diploma(A_1):1 Respondent
		Female	9	Bachelor's Degree(A_o):7 Respondents
				Diploma(A_1):2 Respondents
	Total		20	

3.3 Data Collection

Qualitative research obtains data in a number of ways. These include in-depth interviews, focus group discussions, open-ended survey questions, social media threads, actual field observations, and document analysis (Patton, 2015). In this current study, data was obtained using open-ended questionnaires and semi-structured interviews. These offered verbatim quotations with sufficient context. Open-ended questionnaires were chosen to gather primary data from respondents, while scheduled semi-structured interviews were used to address limitations of the questionnaires, such as the inability to ask follow-up questions and the challenge of obtaining in-depth meanings from participants' responses. The research instruments were developed based on Gregory's constructivist theory of perception.

3.4 Data Analysis

Primary data collected from respondents using open-ended questionnaires and semi-structured interviews was analyzed using thematic analysis. This was used to prepare and organize codes from the data collected. In addition, themes were designed from created codes. To ensure anonymity, codes given to selected schools and respondents were provided in the table below:

Table 2

Codes for Selected Schools and Respondents.

Codes for Selected Schools	CCR	ESL	ESN	GSB	SPI	ESE	GKM	GSG	GHG	GNY
Codes for Respondents	CCR1	ESL1	ESN1	GSB1	SPI1	ESE1	GKM1	GSG1	GHG1	GNY1
	CCR2	ESL2	ESN2	GSB2	SPI2		GKM2	GSG2	GHG2	GNY2
										GNY3

According to Braun and Clarke (2006), thematic analysis is a method for analyzing qualitative data that entails searching across a data set to identify, analyze, and report repeated patterns. In addition, it is a method for describing data, but it also involves interpretation in the processes of selecting codes and constructing themes. The data collected from open-ended questionnaire responses and semi-structured interview scripts informed the creation of codes, sub-themes, and themes in this study. Table 3 below shows the codes, sub-themes, and themes generated for this research:

Table 3

Codes, Sub-themes, and Theme

Codes	**Sub-themes**	**Theme**
Attitude to the use of technology in teaching mathematics, Cognitive (Belief) on the impact of technology in teaching mathematics, Confidence level when using technology in mathematics teaching practices, Competence in the use of technological tools in teaching mathematics.	Teachers' Perception of the use of technological tools. Effectiveness of Technological tools in teaching mathematics.	Teachers' perceptions and effectiveness of technological tools in teaching mathematics.

3.5 Validity and Reliability

To ensure the validity and reliability of this study, different strategies were used. Validity was ensured through the use of a well-structured questionnaire and interview guide that was developed based on existing literature and expert researcher's feedback, ensuring they accurately capture the constructs of interest. Content validity was further enhanced by piloting the instruments with a small sample of mathematics teachers from selected secondary schools, allowing for adjustments based on their feedback. Reliability was established by conducting a test-retest procedure where the same instruments were administered to the same group of mathematics teachers at two different points in time, and the results were compared for consistency.

IV. FINDINGS & DISCUSSIONS

4.1 Perceptions of Teachers on the Adoption of Technological Tools in Teaching Mathematics

Responders illustrated their experiences and insights through open-ended questionnaires. These were supported by semi-structured interviews. The researcher carefully considered the respondents' comprehension and opinions on the phenomenon under study.

The first objective of this research was to explore perceptions of teachers adopting technological tools in teaching mathematics. It sought to gain insight on how mathematics teachers perceive combining technology in their instructional practices as well as their beliefs about its merits and constraints. Research looked at how comfortable teachers were with embracing technological tools, how they understood their effect on student involvement and learning, and what elements affect these perceptions. In the end, the aim was to comprehend what can assist in enhancing the effective adoption of technology in teaching mathematics by resolving possible blocks and supplementing opportunities.

One respondent, GNY1, indicated that he acknowledges the adoption of technological tools in teaching mathematics. The participant also stated that he appreciates how they contribute to teaching procedures, enhancing both teaching and learning. Likewise, he observed that using a smartphone or computer with an internet connection substantially boosted his mathematics lessons. Further, the respondent views these tools as paramount for promoting his teaching and students' learning of mathematics. The majority of respondents in their answers stressed the benefits of embracing technological tools in their day-to-day teaching and learning practice. They believed that these tools are specifically worthy of teaching and learning mathematics. They also noted that this requires thorough practice and reference resources. They posited that technology simplifies and eliminates the complexity of these tasks. In this setting, Das (2019) argued that technology boosts the learning experience and offers new answers to impediments in teaching and learning practices.

Respondents CCR1 and SPI2 and many others mentioned that their skills in using technological tools are particularly valuable. They allow them to conduct research on the problems that arise before, during, or after a mathematics class and enable them to gather sufficient information to make their lessons more understandable and help them to be confident because they have different ways to respond to any challenges anywhere and anytime, hand in hand with their students. Particularly, CCR1 added that his proficiency and confidence in using technological tools not only aid his teaching but also help him provide additional relevant e-resources to his students. In this context, Ndayambaje and Ngendahayo (2014), in their research, also noted that effective technology integration in teaching requires relevant skills and confidence, which are developed through a positive attitude towards technology.

Regarding the level of confidence in the use of technological tools in teaching mathematics and its effectiveness, Respondent GSG2 acknowledged the importance of using technological tools in teaching mathematics but said that her confidence is still low due to the limited technological resources available at her school. This hindrance blocks her from investing more time to familiarize herself with these tools. She explained that a lack of self-worth in employing technological tools leads to their ineffective adoption in her mathematics lessons. Sabzian et al. (2013) observed that inadequate technological materials in education mostly result in teachers losing authority in combining technology-based work. Conversely, Ertmer and Ottenbreit-Leftwich (2010) argued that when teachers are adequately armed with essential technological materials and acquire enough training, they tend to have a favourable opinion of these tools. They are led to believe that they encourage student engagement and comprehension.

The effect of technological tools on enabling mathematics lessons to be more interactive and enjoyable, GKM2 and ESL1 stressed the advantages of adopting them in their mathematics lesson practices. They concurred that technological tool, when applied during lessons, make the classes more engaging and fun for students. They alluded that easy accessibility to technological inputs aids students to understand better the mathematics content and continue their learning independently after lessons. This outcome aligns with Pardede's (2020) analysis, which noted that technology boosts student-teacher engagement and improves the participation of learners in mathematics lessons.

On the statement about collaboration among mathematics teachers, both GSG1 and GNY3 pointed out technological tools as the most reliable methods of cooperation. This allowed sharing of documents, lesson planning, and sharing instructional experiences. GSG1, GNY3, and others alluded to utilizing these tools, arguing that digital platforms, e.g., Google Classroom and Microsoft Teams, allow them to configure lesson plans and share resources. They further added that interactive software such as GeoGebra assists them in formulating flexible mathematics lessons. Similarly, videoconferencing platforms, e.g., Zoom, support timely collaboration and virtual meetings. Outcomes align with Kouser and Majid's (2021) results positing that technological tools are pivotal in aiding teachers establish, manipulate, adopt, and share information through networks.

On self-directed learning along with student-teacher collaboration, responders GSB2, ESE1, and GHG2 outlined the important function of technological tools in assisting student-student and student-teacher connections. They observed that these tools are specifically beneficial in aiding students prepare their learning and form their own study skills. Similarly, Topping et al. (2022) outlined that a core advantage of digital technology is its ability to promote flexibility of tasks and encourage autonomy of students.

Analysis of outcomes from open-ended questionnaires and interview guides connected to the first objective hints that responders perceive technological tools as highly beneficial for enhancing teaching and learning. They acknowledge the value of these tools in improving lesson delivery, boosting student engagement, and supporting independent learning.

4.2 Technological Tools' Effectiveness in Teaching Mathematics Relates To Teachers' Attitudes.

The last study objective intended to assess how technological tools are effective in teaching mathematics is impacted by attitudes of teachers toward these tools. It aimed to comprehend whether perceptions of teachers', whether positive or negative, values and willingness to adopt technology influence how successfully these tools promote mathematics instruction.

Respondent CCR2 alluded that when his school became adequately equipped with technological tools, e.g., smart classrooms with computers, laptops, projectors, and connected to the internet. Along with these efforts, there is smartphone use, which assisted him to alter his opinion concerning technological use in teaching and learning mathematics. In the words of Ertmer & Ottenbreit-Leftwich (2010), teachers who are armed with the necessary technological materials and acquire adequate training are better placed to have a favourable opinion of these tools. Research outcomes concur with Ertmer and Ottenbreit-Leftwich (2010) findings, which highlighted that combining technological tools in mathematics lessons substantially affects attitudes, values, and perceptions of teachers.

In respect to the effect of insufficient technological tools and the function of CPD, Responders GNY2 and GKM1 depicted that their constrained expertise in adopting technological tools was foremost because of their inaccessibility to these resources. This posed a considerable barrier when they commenced their teaching profession. Similarly, Niederhauser & Stoddart (2001) contend that constrained access to technology can result in negative perceptions. The authors noted that teachers assume these tools are more of a hindrance than a benefit, possibly blocking their utilization in classroom processes.

Pursuant to these outcomes, the effectiveness of technological tools in teaching mathematics is powerfully affected by the attitudes of teachers towards these tools. Teachers who have positive perceptions and are willing to adopt technology are inclined to incorporate it more effectively. This leads to more favourable student learning results. Nonetheless, these attitudes are heavily influenced by resource availability as well as prior experience with technology. Teachers with access to technological tools and the necessary training are better placed to form a positive mentality and gain confidence in embracing these tools. Conversely, constrained access to resources and inadequate support can result in bad attitudes. This may bar the utilization of technology in the classroom. Outcomes of research emphasize the need to arm teachers with essential resources, training, and assistance to boost positive perceptions towards technology. This will foster its effectiveness in teaching mathematics and practice.

V. CONCLUSIONS & RECOMMENDATIONS

5.1 Conclusions

The present study investigated how the adoption of technological tools influences teachers' attitudes, beliefs, and perceptions regarding the effectiveness and utility of these tools in teaching mathematics in selected Rwandan secondary schools. Gregory's constructivist theory of perception suggests that perception entails more than just sensory data, which requires inferences based on advanced knowledge and expertise. Therefore, factors beyond the tools themselves shape the opinions of mathematics teachers about technological tools. Teachers' prior expertise, knowledge, and the teaching settings influence their attitudes and effectiveness in embracing these tools.

Likewise, it was observed that identical to how perception is formed through interpretation and past expertise, perceptions of teachers in utilizing technological tools are impacted by their experience with technology. Other factors include their confidence in using it and the assistance they receive in integrating it into their teaching process. To effectively enhance the adoption of technological tools in mathematics teaching, it is crucial to address these underlying elements. This is according to Gregory's theory, which stresses the benefits of context and experience in forming perception. This understanding can lead to more targeted career growth and support for teachers, ensuring that they have a positive opinion of these tools as worthy assets rather than liabilities. This will ultimately improve their integration into teaching processes.

Outcomes from this study suggest that teachers view technological tools as beneficial for improving teaching and learning. Teachers acknowledge these instruments for improving lesson delivery, fostering student involvement, and aiding independent learning. However, the availability of resources and teachers' confidence in embracing these tools significantly influence the successful integration of technology in mathematics education.

5.2 Recommendations

This research suggested that teachers should embrace continuous professional development programs that support the use of technological tools. This will aid in instilling confidence and fostering their ability to integrate these tools into their teaching. Drawing on past experiences and linking modern technologies with existing systems can boost instructional results. Similarly, collaborating with peers can offer vital insights and encourage innovative techniques. Leaders in school settings must ensure access to new technological resources and offer customized training lessons to aid effective technology adoption in mathematics teaching practices. In the same vein, forming a supportive environment that fosters experimentation with technology is paramount. To foster classroom innovation, the Education Ministry, through the Rwanda Basic Education Board, should enforce extensive training programs and avail resources in the required technological facilities, while boosting research and sharing best practices. Additional research should expand the scope to include varying opinions, assess the long-term effect of technology on student outcomes, and determine the effectiveness of career development programs.

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