An inquiry into teachers' and students' perspectives on the usefulness of technology in teaching and learning mathematics in teacher training colleges, Rwanda

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ABSTRACT

According to the current study, a major factor in determining how well students at Teacher Training Colleges (TTCs) learn mathematics is technology. The specific objectives were to determine the significance of technology use in mathematics classes and explore the opinions of teachers and learners regarding the value of technology in the teaching and learning of mathematics. Moreover, the study followed a phenomenological research design to investigate tutors' and students' perspectives on the usefulness of technology in the teaching and learning of mathematics in TTCs. Hence, a sample of 13 participants, including mathematics teachers and students of Science Mathematics Education (SME), was selected for this study under the purposive sampling procedure. The research was informed by constructivist theory, which affirms that someone can create his or her own knowledge through different activities. Selected participants provided qualitative data using an open-ended questionnaire, a semi-structured interview, and classroom observation. The data were analysed using a thematic analysis. Furthermore, the literature review and respondents' data provided the basis for developing the study's two themes. The study's findings showed that using digital learning and technology to teach mathematics improves students' accountability. Therefore, the study recommends tutors of mathematics in TTCs make use of technology to improve students' creativity and innovation through digital learning and use of technological tools.

Keywords: Mathematics Teaching and Learning, Students' Perspectives, Teachers' Perspectives, Usefulness of Technology

I. INTRODUCTION

Technology has a major impact on all aspects of modern life as it is a necessary part of the time (Warner et al., 2018). Technology has transformed education by making teaching methods more engaging and effective (Lin, 2008). In addition, the use of technology plays a pivotal role in the teaching and learning of mathematics (Lin, 2008). According to Warner et al. (2018), technology is both mental and physical tools for problem solving in real life. They added that computers, software, computer peripherals, projectors and the internet connection are examples of technology. This means that data access, data management and data display are the three main benefits of using technology. In this regard, the use of technology in the teaching and learning of mathematics has many different aspects (Hegedus et al., 2017). They added that the way new technologies transform student relationships during learning has a major impact on how well they learn, especially mathematics. These include creating an effective mathematics learning environment and encouraging students' aspirations to learn mathematics effectively (Hegedus et al., 2017). However, the competences and experiences required to be a good technology teacher vary.

Therefore, numerous interpretations of mathematics are supported by the availability of digital tools (Hegedus et al., 2017), which also stimulate critical thinking, especially when different interpretations are actively linked. Without technology, the use of available new technologies such as smartphones, computers and the internet cannot be developed well (Hegedus et al., 2017). Because of this, teachers and students develop different attitudes towards the

techniques involved in the teaching and learning of mathematics. Lin (2008) argues that teachers' attitudes are extremely important when using technology to teach and learn mathematics. Since technology can improve the teaching and learning of mathematics, it is very important to change teachers' attitudes towards the use of computers and smartphones in the classroom (Lin, 2008). Yet many students and teachers are unaware of the types of technology available to them (Lin, 2008), like the use of smartphones in the teaching and learning process. In addition, most teachers lack the prerequisite skills to effectively integrate technology into mathematics lessons (Lin, 2008).

Mathematics experts argue that the integration of technology in the teaching and learning of mathematics provides an enabling platform for maximum participation by all students in mathematics lessons (Fidele et al., 2019). They added that this is different from what the students believe. This was proven by the findings from the study conducted by Sim and Theng (2005) which showed that respondents broadly agreed that effective utilization of ICT (Information and Communications Technology) makes teachers more effective in their teaching (75%). In addition, Plomp and Voogt (2009) argue that ICT resources, such as hardware and software, must be readily available and accessible for effective adoption and integration into teaching in schools. The effectiveness of using ICT in teaching and learning mathematics depends on the instructional methods, the subject matter being covered, and the applicability of the ICT tools at hand (Bazina & Habimana, 2022). Therefore, the purpose of this study is to ascertain how teachers and students view the use of technology in the teaching and learning of mathematics at teacher training colleges.

1.1 Problem of the Statement

Technology has enormous potential to improve professional development in teaching and learning (McAleavy et al., 2018) because of its emphasis on practicality. According to McAleavy et al. (2018) one way of making learning more practical is to share affordable movies that demonstrate effective practice in real-world environments. They added that learning with mobile technology or computers is more effective than traditional off-site courses. This helps an intellectual capital-based coordination of creation as students develop critical thinking that helps them in creativity and innovation. To transition to a knowledge-based economy, effective educational procedures should be implemented in schools (Mugiraneza, 2021). The structure of improving and organizing procedures makes up educational processes (Kapur, 2021).

According to Mugiraneza (2021) the 2019 National Teacher continuous professional development (CPD) framework and the 2016 ICT in Education Policy are two examples of the plans and policies the Ministry of Education has created to assist ICT integration in education and raise educational standards. But even with the chances for professional development offered to teachers, there is still a demand for more skills to use technology in teaching and learning especially mathematics (Mugiraneza, 2021). Additionally, teachers are still teaching with sometime chalk and board in class rather than using technology integrated pedagogy in their teaching (Mugiraneza, 2021). With the speed at which technology is developing and pedagogy is developing, it is imperative that pre-service teachers get ongoing training and development in order to assist their growth of digital skills (McAleavy et al., 2018). Enhancing teacher proficiency and motivation is an essential prerequisite to achieving improved student learning (McAleavy et al., 2018).

When it comes to making decisions about how best to teach and learn in schools, the opinions of teachers can be a very useful resource (Mugiraneza, 2021). This encourages students to be motivated in their learning of mathematics (Bimenyimana & Uworwabayeho, 2022) and the use of technology enhances students' motivations, attitude and values towards mathematics. In order to demonstrate the significance of technology in teaching and learning, evidence-based techniques must be used. While it is important to support evidence-based techniques, professional development should also allow instructors to contextualize their unique teaching situations (McAleavy et al., 2018). Even with these benefits of using technology in mathematics, teachers still prefer to use chalk and board over computers when teaching mathematics. The majority of teachers claim that group discussions, chalkboards, and whiteboards enable them to cover planned contents quickly.

This study's motivation therefore arises from insights made during actual teaching practice as well as a number of studies on the use of technology in mathematics instruction. The results of the study will enhance both mathematics teaching skills and expertise of using technology to teach and learn mathematics. As a result, the study revealed how important technology is to the teaching and learning of mathematics.

1.2 Research Objectives

(i) Determine the significance of technology use in mathematics classes.
(ii) Explore the opinions of teachers and learners regarding the value of technology in the teaching and learning of mathematics.

1.3 Research Questions

(i) What is the importance of using computers and smartphones in mathematics lessons?
(ii) What are teachers and students' perspectives on the usefulness of Technology in Teaching and Learning Mathematics?

II. LITERATURE REVIEW

This section covered a theoretical and empirical review, as well as a discussion of conceptual definitions. The importance of concepts found in the study, such as teacher and student perspectives, usefulness of technology, and the teaching and learning of mathematics will be discussed. In addition, it also seeks to discuss further literature and studies on the topic under study.

2.1 Empirical Review

Numerous global researches have demonstrated the importance using technology in teaching and learning mathematics. This was confirmed by a study led by Bright et al. (2024) on a sample 216 students. The study sought to ascertain how students' interest in mathematics acted as a mediating factor in the impact of technology use in mathematics teaching and learning on students' performance in the subject. Findings of their study showed that there is good and major impact on interest in mathematics when technology used.

According to the study entitled: integration of technological devices in mathematics education: A literature review by (Serin, 2023a), students can experience learning and develop a greater comprehension of mathematical ideas in an actual learning environment that is created by technological tools. Furthermore, Serin (2023) showed that by providing interactive and visual representations, technology bridges the gap between abstract concepts and real-world applications, making mathematics more comprehensible and accessible.

2.2 Theoretical Review

2.2.1 Technology in Teaching and Learning Mathematics

Technology is defined as both a physical and cognitive tool for solving problems (Warner et al., 2018). They added that technology in education includes cognitive tools and intellectual processes such as calculus or the scientific method, as well as physical objects such as books, televisions, computers, and communication networks like internet. Warner et al. (2018) defined education as a learning process and technology as problem-solving tools. They added that educational technology in a broader sense consists of tools that facilitate the learning process. Hence, the integration of technology into teaching and learning is not intended to replace traditional methods, but to support schools in improving teaching and learning (Umugiraneza, 2012).

Some technologies include graphing calculators, educational software and spreadsheets. Technology provides learning opportunities by helping learners to find, innovate and share ideas and information (Umugiraneza, 2012). She added that by providing access to different representations that help visualize mathematical objects, certain mathematics software can contribute to a deeper understanding of the concepts. Kahveci (2010) argues that networked internet-connected computers can increase the zeal to learn by combining the media richness and interactivity of other ICTs giving the opportunity to connect with real people and participate in real events.

Kahveci (2010) examined students' perceptions on the use of technology for learning especially mathematics. He found that students who used technology were more motivated to learn. Moreover, comparatively to students who don't use computers, those who do so are more motivated to learn new things (Pihlap, 2017). This indicates that the integration of technology devices increases students' enjoyment in learning (Warner et al., 2018). In addition, the initiative was positively correlated with students' technology literacy and frequency of technology-based activities in the classroom. That is to say, use of technology led to increased use of technology and increased ability to use technology. Technology can significantly improve the quality of student learning experiences (Warner et al., 2018). According to (Khoiriyah et al., 2022) employing Google apps in the teaching and learning helps learners become more skilled. They added that Google Jamboard is one of the Google features that is rarely mentioned by academics. Therefore, Jamboard offers a rich environment for collaboration learning in the virtual classroom.

2.2.2 Teachers' and Students' Perspectives towards Technology in Mathematics

In teaching and learning mathematics, qualities of an effective teacher are an important element in effective teaching and learning of mathematics (Han et al., 2019). They added that some studies have identified good classroom behaviour as being primarily related to student achievement in mathematics. While others have examined teacher quality with a more holistic approach that considers teachers' personalities, their teaching skills, and the contexts of classroom practice (Han et al., 2019), this can be a universal building block for good teaching regardless of the use of technology. In addition, effective teachers should be professional, dedicated and intrinsically motivated working towards outcomes that have both long-term and short-term value (Beishuizen et al., 2001). In addition, it is important to find out what students think about good teachers (Beishuizen et al., 2001). However, misunderstandings about the mutual views of teachers and students can hamper the effectiveness of mathematics teaching and learning. This can be removed by designing exercises that connect the course material to real-world situations (Nizeyimana et al., 2023).

2.2.3 Usefulness of Technology in Teaching and Learning Mathematics

The digital technology in mathematics lessons includes a means of different technologies (Thurm & Barzel, 2022). Mathematical multi-plot tools specifically combine the capabilities of scientific calculators, function plotters, spreadsheets, statistics and geometry packages (Thurm & Barzel, 2022). In this study, unless otherwise specified, the term technology refers to such digital mathematical technologies. It is widely agreed that being able to switch flexibly between different forms of representation such as graphical, algebraic and numerical representation is crucial for understanding mathematical concepts (Thurm & Barzel, 2022). Technology can be useful in helping students to explore, discover, and develop mathematical concepts independently.

According to Kahveci (2010) there is a correlation between the use of computers in classrooms and students' positive attitudes towards learning. The integration of computers into mathematics curricula is beneficial because it is more effective, saves time, interprets data, organizes experimental data more meaningfully, and develops problem-solving skills (Kahveci, 2010).

III. METHODOLOGY

The current study examined teachers' and students' perspectives on the usefulness of technology in teaching and learning of mathematics in Teacher Training Colleges in Rwanda. The qualitative research methods were used. To this end, open-ended questionnaires, semi-structured interviews and observations were carried out. The data were analysed by thematic analysis.

3.1 Research Design

A research design for the study should be chosen based on the nature of that study (Bostley, 2019). By studying experience from an individual's point of view and perspectives while common expectations and modes of perception is the focus of phenomenology. According to Creswell et al. (2007) the accuracy of the study is related to innovative by the phenomenological research design. In order to comprehend the phenomenon that the researcher researching from the viewpoints of respondents, the researcher purposefully acknowledges that everyone has a unique perspective on the world and that there is no one objective reality (Creswell et al., 2007; Feig, 2011). Hence, this study followed phenomenological research design to investigate tutors and students' perspectives on the usefulness of technology in the teaching and learning of mathematics in TTCs.

3.2 Participants and Sampling Techniques

The sample size of this study was selected under purposive sampling using criteria sampling techniques. Thus, Rwanda has sixteen Teacher Training Colleges (TTCs) (MINEDUC, 2018) those train teachers. In the current study, participants were drawn from selected Teacher Training Colleges, where they were technologically efficient and would use technology in their mathematics classes. In this context, the sample of 13 participants consists of three males' mathematics teachers and ten students from Science and Mathematics education option were selected for this study from two TTCs.

3.3 Data Collection

The data of this study were collected using an open ended questionnaire, semi-structured interview and classroom observation.

3.3.1 Procedure of Filling Open-Ended Questionnaires

Open-ended questionnaires were distributed to 10 students and 3 teachers from the selected Teacher Training Colleges. They were asked to participate in filling the questionnaire voluntarily. Moreover, they were interviewed on their feelings about teaching and learning of mathematics using computers and smartphones, their comfortability in using computers and other web-based resources in a mathematics class.

3.3.2 Observation Procedure

Following the completion of filling of open-ended questionnaires and participation in the semi-structured interview, observation was conducted in the classroom over a single period of 40 minutes. This was conducted to monitor the teachers' perspectives on the use of technology and student involvement in mathematics class when using technology. The observation of mathematics lesson conducted in science and mathematics education (SME) class. In that lesson, the teacher used a jamboard when teaching students mathematics' lesson. He assigned feedback to the students' work, and instead of paper copies, the teachers sent them electronic comments via jamboard.

3.4 Data Analysis

After the collection of data from the field, thematic analysis was used to analyse data collected from open-ended questionnaires, semi-structured interviews and classroom observations. This was used to prepare and organize codes from the data collected. In addition, a number of themes were designed from created codes. To ensure anonymity, codes given to respondents were provided from RST1 to RST10 for students and from RT1 to RT3 for teachers.

3.5 Validity and Reliability

The other researchers checked the open-ended questionnaire and the interview guide for approval and remove unnecessary questions. The same research tools were used for all participants under the same conditions. The description of this study thus showed that the research results are transferable to other contexts and situations of mathematics teaching and learning. Therefore, other experts from the literature review provided further information on data collection and analysis.

IV. FINDINGS & DISCUSSION

4.1 Findings

The data collected in this study based on two main themes of related literature review, semi-structured interview, classroom observation and open-ended questions from both teachers and students about the use of technology in the teaching and learning of mathematics. Table 1 shows demographic characteristics of respondents who participated in this study.

The demographic information of respondents including teachers of mathematics and students from Science and mathematics education are presented in the table below.

Table 1

Demographic Characteristics of Respondents

	Gender		Qualifications	Total
	Males	Females		
Teachers	3	0	A0	3
Students	5	5	Student-teachers	10
Total	8	5	N/A	13

Respondents' identity was kept with confidentiality. Furthermore, student responses were coded from RST1 to RST10 while teachers' responses were coded from RT1 to RT3.

Therefore, the two themes, that is, technology in teaching and learning mathematics and digital learning and evidence of effect in mathematics were discussed in this study.

4.1.1 Technology in Teaching and Learning Mathematics

The first objective of this study was to determine the significance of technology use in mathematics classes. In connection with this objective, the first theme of this study focused on how participants feel about using technological resources based on the importance and reason for using computers and smartphones in mathematics class.

Table 2

Importance of Technology in Teaching and Learning Mathematics

Technology resources make learning mathematics easier;
Technology provides various learning opportunities;
Technology increases students' enjoyment of learning mathematics;
Technology improves quality of students' learning experience;
Technology increases students' motivation of learning mathematics.

One of the respondents, RST1, indicated that he was more comfortable with computer in mathematics classes. He added that technological aids such as smartphones helps them getting the application activities provided under the link if prepared beforehand. Furthermore, he added that when smartphones are used in mathematics classes, students feel engaged and motivated to put what they have learned into practice. Additionally, creativity and innovation through the use of technology make learners feel more confident in learning mathematics. According to Bukhatwa et al. (2022), the innovative teaching approach through the creation of videos increases student engagement, understanding and access to learning resources whenever and wherever they need them. In this context, the RST1 respondent said that he enjoys using computers and smartphones to search for mathematics exercises, videos and related activities.

Most respondents emphasized the importance of using computers and smartphones in mathematics lessons. Looking at learning opportunities, student enjoyment, and student motivation to learn mathematics, one respondent, RST2 believes that technology in mathematics teaching and learning increases motivation and research, thus opening an analysis mind. According to (Hegedus et al., 2017), technology increases learners' motivation when they discuss mathematics problems and do research on the internet. Motivation is very important for students in learning mathematics (Han et al., 2019). Additionally, instructional methods and resources might contribute to learners' low motivation to learn mathematics (Bimenyimana & Uworwabayeho, 2022).

In this regards, respondent RST2 said that when we use computers and other web-based resources, we feel happy, confident, accurate, evolved and engaged in the teaching and learning of mathematical concepts, formulas and functions. He added that it is very important to use smartphones in classes as they are easy to carry and contain some mathematical applications. Consistent with this, Han et al.,(2019) argue that the internet and social media enable students to learn more and find materials, self-assess and showcase what they have learnt. Respondent RST2 added that other web-based devices such as tablets are more useful when learning mathematics.

According to respondent RST3, working with computers and smartphones is fun and motivating for students. Therefore, the use of smartphones or computers in the classroom plays a major role when it comes to teaching and learning (Darko-Adjei, 2019) Students can access their teaching materials via smartphones, quickly access information online via learning management systems to meet their information needs, or access e-learning platforms. On the part of teachers, it is important to use smartphones and computers because they can easily give assignments and tests to students and correct them easily. This helps teachers provide feedback to students at the right time (Darko-Adjei, 2019).

According to respondent RST3, the use of technology in teaching and learning mathematics is very important as access to soft online materials becomes easier. In addition, RST4 respondent added that technology saves time and helps all students engage meaningfully in the learning process as they take pride in using computers or other electronic devices. It is in this regard that Bukhatwa et al. (2022) argue that integrating technology into the teaching and learning process is very important as it creates a more active and motivating learning environment.

In addition, respondent RST5 said that the use of computers and smartphones in teaching and learning mathematics is important as computer skills improve. In addition, the use of computers and smartphones in mathematics lessons has developed skills and competences in mathematics and increased motivation to learn mathematics (Bukhatwa et al., 2022).

In addition, the respondent, RST6 said that students are happy when mathematics teachers use computers and smartphones. He added that this is very important as it helps both teachers and students to research so that they get additional information from various sources. When teachers use computers and smartphones, they can teach students who are very far from school, even students who are at home. He added that the use of smartphones and computers makes work easier and improves the quality of mathematics teaching. According to Umugiraneza (2012), technology can be used as a tool that facilitates teaching and learning and promotes learners' academic success.

Respondent RST7 argues that the use of technology such as computers and smartphones helps teachers save time and increases students' motivation to learn mathematics. He added that they encourage students to do research

and encourage teachers to assess students directly. In addition, technology seems to play a crucial role in improving students' skills in the classroom (Han et al., 2019).

On the other side, respondent RT1 said that the use of ICT tools is indeed important because it makes work easier. He added that improved standard handwriting formulas, especially in mathematics, are available to everyone. The use of computers replaces the traditional ways of learning in or under libraries, where books are borrowed from libraries. In addition, according to Thurm and Barzel (2022) the use of computers reduces paper consumption as the exam can be conducted online. In this regard, via e-learning platforms, students can use Jamboard to write and share their work, thereby reducing paperwork in the teaching and learning process. According to Habumuremyi et al. (2023), it is advised that students work harder to use technology in their education as giving students access to ICT resources is essential for their academic success.

Respondent RT2 reported that he had not previously used computers and smartphones, which made him tired of finishing classwork, spending a lot of time correcting homework, and spending more energy in grading quizzes or tests. He added that e-learning platforms are much faster and more reliable as they use both computers and smartphones and deliver content using Google Forms. In this sense, the REB (Rwanda Basic Education Board) e-learning platform helps TTC students and teachers to learn, take quizzes and become more interactive.

According to Umugiraneza (2012) visual illustrations on the computer help students better understand various mathematical concepts. This also reduces the amount of paper that has to be printed out and the content stored cloudy. Respondent RT2 added that using computers and smartphones makes learning easier for students to complete activities, conduct research and improve technology-related skills. According to Darko-Adjei (2019), smartphones make learning easier for students because e-learning allows them to easily access digitalized content.

In addition, respondent RT2 said that technology offers dynamic opportunities for mathematics teaching. This respondent added that through engaging and interactive media, teachers can enhance the learning process and bring mathematics concepts to life. This includes collaborative teaching and learning strategies (Bukhatwa et al., 2022) as the basis of various activities to improve students' motivation, understanding and access to learning resources whenever and wherever they need them.

Respondent RT2 added that visualizing mathematics goes beyond student engagement and technology offers additional opportunities. This allows students to see and interact with mathematics concepts while exploring and making discoveries using simulations and digital tools.

4.1.2 Digital Learning and Evidence of Effect in Mathematics Classroom

The second objective of this study is to explore the opinions of teachers and learners regarding the value of technology in the teaching and learning of mathematics. This relates to digital learning and evidence of effect in mathematics as the second theme of this study. This digital learning is any form of technology-related learning or classroom practice that makes effective use of technology. According to Respondent RT2, the use of computers and smartphones makes learning easier for students, it enables learners to complete activities in time, conduct research, and improve technology-related skills. This respondent used Jamboard in his mathematics class and the students were motivated to learn the lesson. This makes work easier and more organized as work is stored in the cloud and feedback can be easily obtained. Students receive feedback very quickly even if they are still working. According to Darko-Adjei (2019), the use of technology in mathematics has played a notable role among teachers and students. However, the use of technologies such as smartphones and computers in the teaching and learning process can be affected (Darko-Adjei, 2019) by some constraining factors such as unstable internet connection. This also applies to smartphones in which disruptive music during lessons, screen and button sizes, are some of the drawbacks to study compared to laptops. However, technology can help students explore, discover, and develop mathematics concepts independently (Thurm & Barzel, 2022). In addition, technology-based mathematics education can support constructivist aspects by encouraging students to develop mathematical concepts (Bukhatwa et al., 2022).

In addition, during classroom observation, mathematics teachers used Jamboard in teaching and learning with both computers and smartphones. This motivates the students by being active participants in the teaching and learning process. Furthermore, as demonstrated in the figures below, teachers used jamboard on computers to display questions to students. In this line, students used smartphones or computer to offer answers through jamboard, their engagement in mathematics classes increases.

Students are presented with the following questions via Jamboard during mathematics classes

Question 1: Observe the following graph and answer the following questions:

(i) What is the proper name for the vertical lines?

(ii) What is the proper name for the horizontal line?

Evaluate the limit of the function $f(x) = \frac{3x^2 + 2x + 1}{x^2 - 1}$

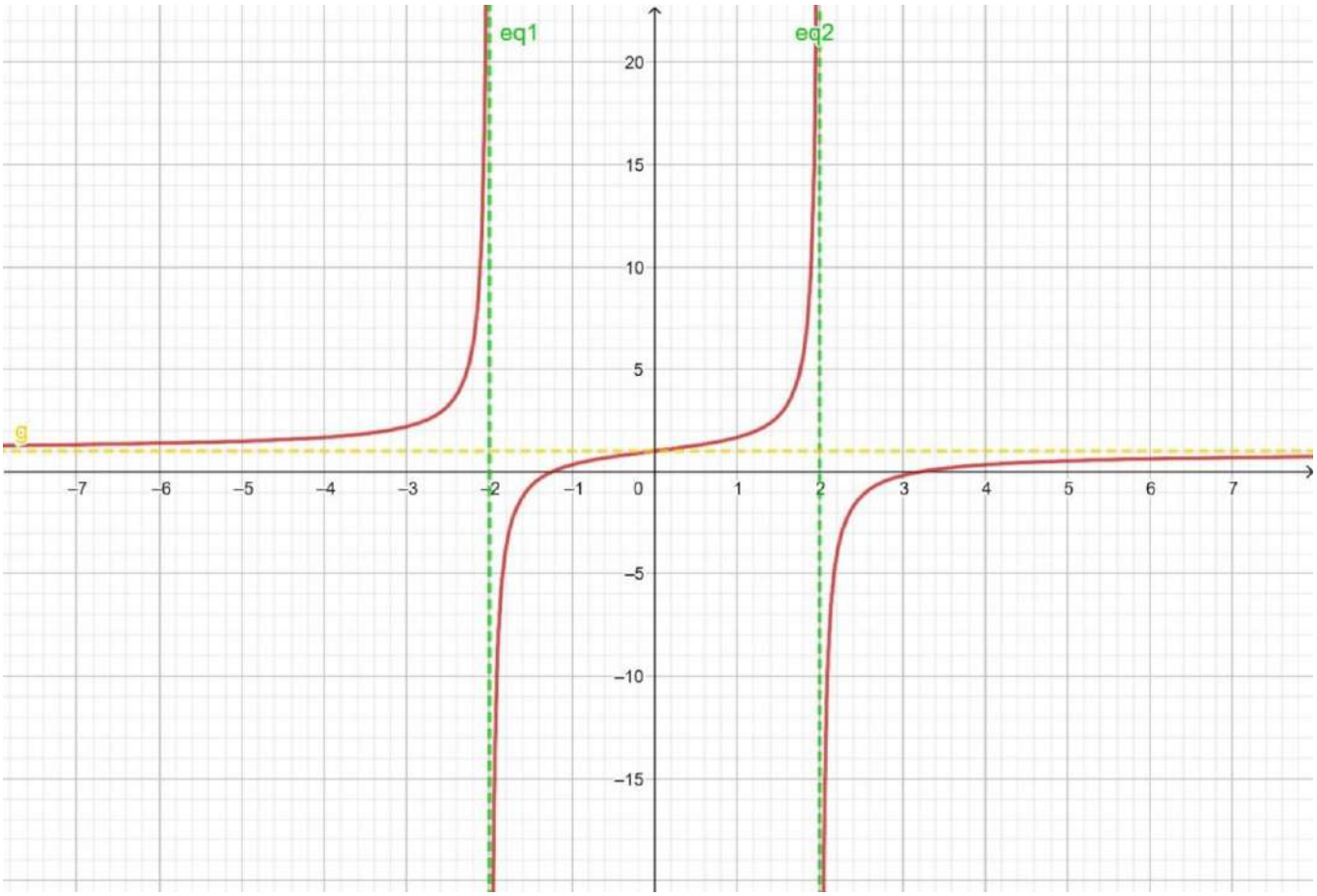

Figure 1
Model Question given to Student in Group Discussions via Jamboard during a Mathematics Lesson

After displaying different questions to different groups, there was a page that also consists of suggested answers by students. Figure 2 and 3 below show the answers given by students in their respective groups. Additionally, *eq1* denotes equation 1 and *eq2* denotes equation 2, and *g* is the provided graph of *f(x)*.

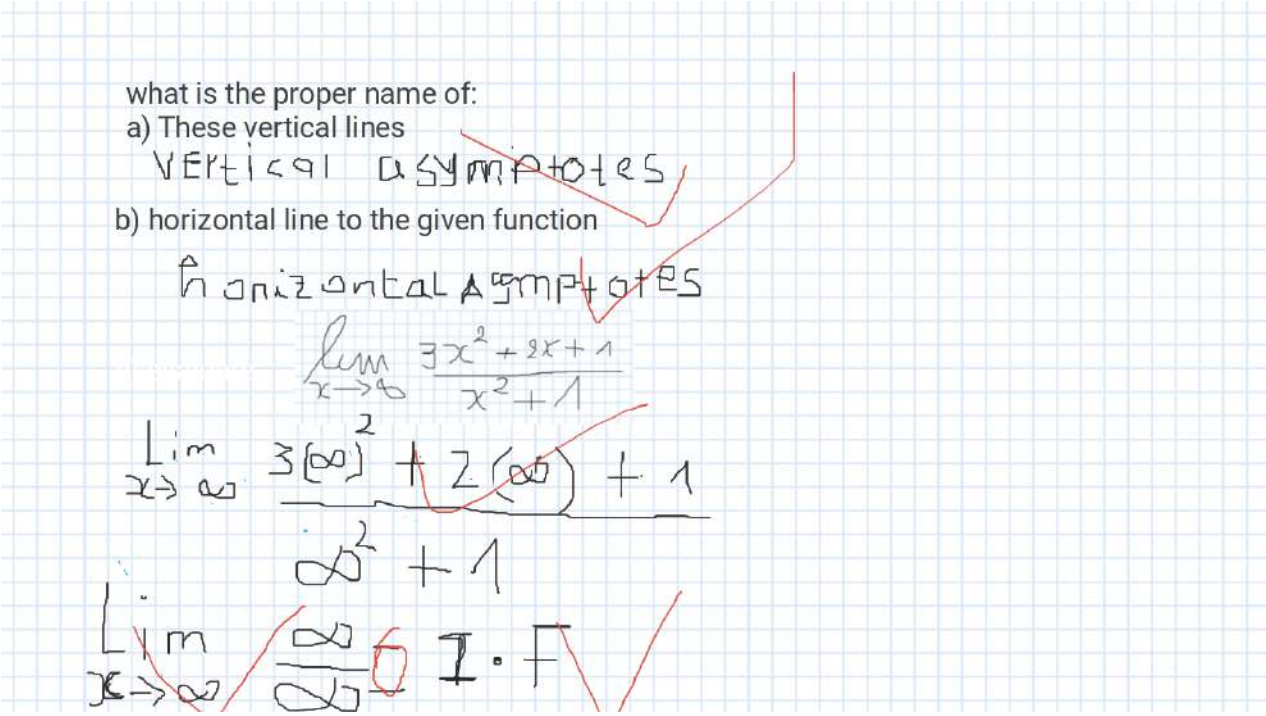

Figure 2
Answers Given by Students Of Group 2 via Jamboard During a Mathematics Lesson

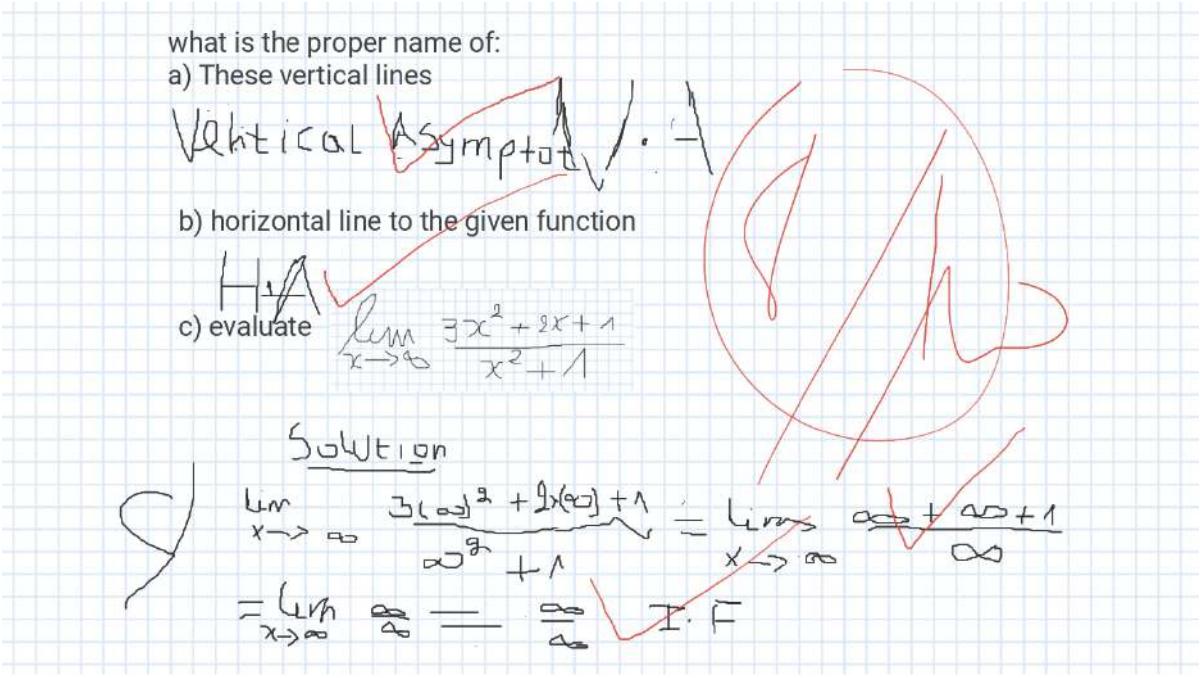

Figure 3
Answers Given by Students of Group 3 via Jamboard during a Mathematics Lesson

As shown above, the students worked in different groups and their answers were saved automatically and the teacher corrected them quickly.

Moreover, Group 4 had different questions from the previous group, the same strategy of using Jamboard in the same lesson was employed. The following question 2 was given to group 4 and they provide their answers on separate page as shown in Figure 5.

Question 2: Observe the graph below and answer the following questions

(i) What is the proper name of oblique line?
(ii) Deduce the function hence evaluate the limit

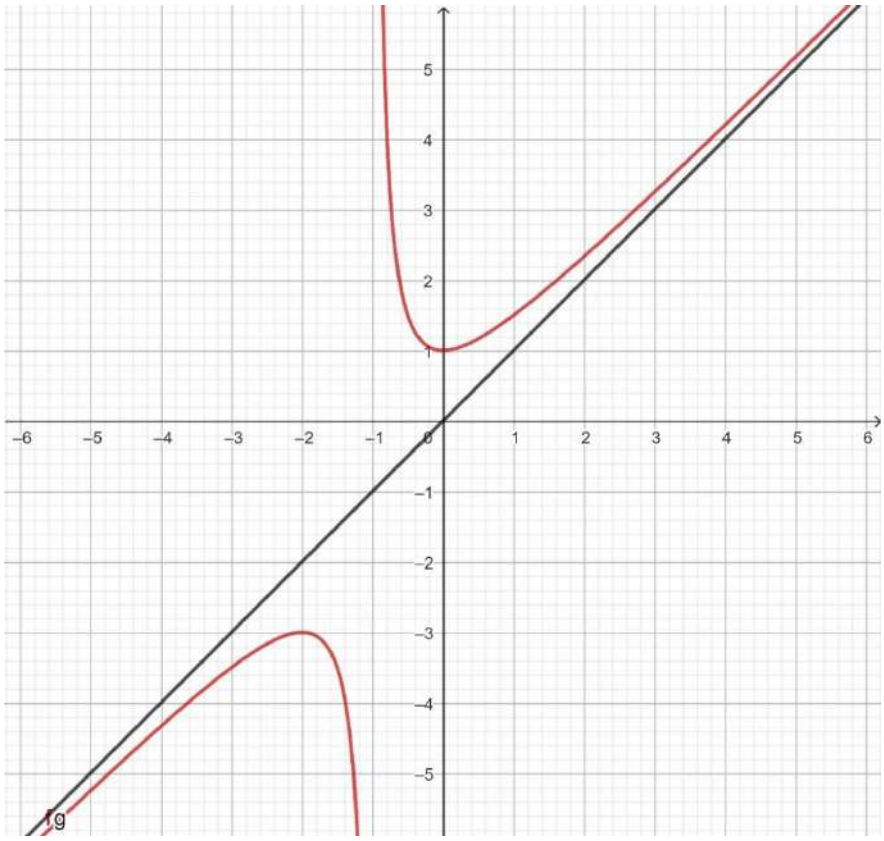

Figure 4
Model Question given to Students in Group Discussion via Jamboard during a Mathematics Lesson

The teacher asked the students about the nature of this sloping line and evaluated the limit of the function. Then, the answers given by the students were displayed as follows:

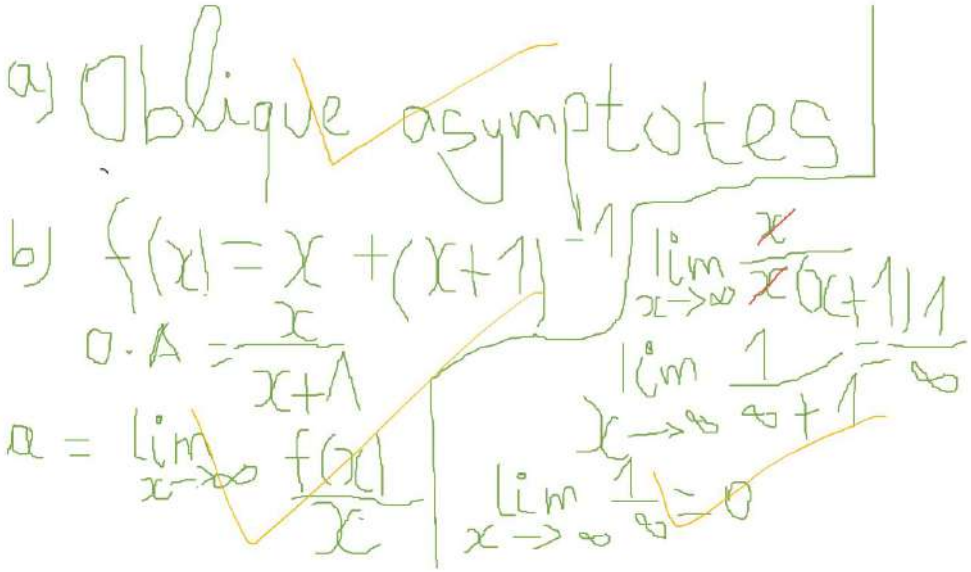

Figure 5
Answers from Students via Jamboard on the Given Question in Group Discussion

As shown above, the students worked in their group discussions and their answers were saved automatically and the teacher corrected them right away. Students were motivated and show interest in learning mathematics using technology as teacher showed their feedback automatically.

Students in mathematics classes are motivated, and teachers have good time management skills, according to open-ended questionnaire results, observations made in the classroom and interviews with mathematics teachers. Additionally, Using Jamboard help students to foster critical thinking, creativity, teamwork, and communication through their group discussions. Moreover, teachers assign easily problem-solving activities to students in the classroom. It is therefore that Jamboard play a great role in motivating students to learn mathematics.

From classroom observation and teaching process, it is found that Jamboard is a helpful tool for remote work since it can be used to increase student participation and make learning more dynamic. Therefore, the use of Jamboard improves class participation by giving students the ability to visualize their learning and thinking. This also helps teachers know their students' understanding in real time. It is more of a collaborative, online, synchronous and asynchronous situation.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

Using mathematics classroom observations, open-ended questionnaire and semi-structured interview results, teachers and students presented their understanding of technology integration and their beliefs about technology. As explained above, the teachers integrated the technologies in a way that made more sense for the students. In addition, teachers argue that technology is essential to learning mathematics. According to Sim & Theng (2005) teachers should have the technological, pedagogical and content knowledge for successful technology usage in the classroom, which was evident in the cases examined in this study.

This study found that teachers viewed the use of technology as a means to improve teaching and learning mathematics, rather than as an end in itself. This belief in technology was certainly embedded in teachers' approaches to lesson design and practice, resulting in a whole integration of technology with pedagogy in a content-specific manner.

The results from interviews and open-ended questionnaire indicated that most students felt confident and comfortable using web-based resources in mathematics classes. In addition, most students felt ready to teach mathematics with technology. Most students indicated that they felt comfortable using computers and smartphones in mathematics lessons. They argue that web-based resources are fun and stimulating in mathematics classes. Referring to how students appreciated the use of Jamboard in mathematics lesson and technology in general, it is advised to teachers to use Jamboard and other technologies in their teaching.

Therefore, the results of this study provided the basis for research concluding that the use of technology in the classroom empowers students to collaborate in mathematics learning, develops their critical thinking and improves student responsibility. The use of technology in the teaching and learning of mathematics supports real-time learning and visual collaboration during mathematics lessons.

5.2 Recommendations

Based on the results, Teacher Training Colleges need to create a supportive environment for the use of technology among students. In addition, technology must be made available at all times to enhance student learning and teacher professional development. It is also recommended that all students must have access to appropriate computers and other technological tools for learning mathematics in their free time.

Finally, we recommend that further studies and research should be carried out in this area of study to refine this crude attempt for the better and obtain much more useful results.

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