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PUBLIC SCHOOL TEACHERS' ATTITUDE TOWARD TEACHING MATHEMATICS WITH TECHNOLOGY

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Abstract

The 21st century is impossible to imagine without technology. Everyone knows that online learning is not surprising in the current pandemic. However, is the use of these technologies always convenient for the teacher and how effectively can teachers use the technology in their lessons? The article discusses the approach of secondary school teachers to the learning process using digital technologies. The main forms of teaching mathematics using digital technologies are also presented. In particular, I will consider the problems faced by teachers and the benefits of digital learning.

In this article, we used a survey tool, during which we see that many secondary school teachers in Kazakhstan have a positive attitude to digital education and that since the beginning of the pandemic period, teachers have developed professionally in the process of using technology. Analyzing the responses to the survey, it was shown that teachers are highly qualified in the use of technology and actively use technology in their lessons.

Keywords: Digital technologies; Pandemic; Teachers' vision; Teaching mathematics; Mathematics class.

Public School Teachers' Attitude Toward Teaching Mathematics with Technology

The importance of technology in education

Effective teaching of mathematics begins with a fundamental knowledge of mathematics and includes significant knowledge, skills about the processes and curriculum and combines effective practice of teaching mathematics. Well-trained novice teachers are aware of all the difficulties and nuances that are characteristic of this discipline and are ready to apply and expand their established knowledge of pedagogical content. They know specific learning strategies to assess and meet students' learning needs in math. (Shulman, 1986). The use of technology in teaching is an expected part of society. Teachers of our time are aware of the rapid pace of the emergence of technology and try to be aware of new tools, analyzing their benefits when studying mathematics by students. Well-trained teachers know that technology is more than just a computational aid. Therefore, they can apply the technology to the study of shapes, transformations, and sequences. They are particularly willing to use "mathematical action technologies" (see NCTM, 2014, p. xi), useful for high school students, including spreadsheets, dynamic geometry software, function plotting utilities and graphical calculators, computer algebra systems, statistical modeling software, and other applications, and tools that help students better understand mathematical concepts (Association of Mathematics Teacher Educators, 2017). We observe the special importance of technology in our educational society, and this is what influenced the research. I conducted an analysis of dozens of studies that have been published in good magazines and books over the past 10 years and conducted a study on the attitude of Kazakhstan teachers to technology.

This study was aimed at determining the attitude of teachers to the use of technology in teaching mathematics. In particular, this study aimed to determine: (1) teacher attitudes towards

the use of technology in teaching mathematics, before the pandemic, and (2) significant differences in teacher attitudes towards the use of technology in teaching mathematics, during the pandemic.

Research questions:

Public school teachers' confidence in math, confidence in technology, attitudes toward learning math through technology, emotional engagement and behavioral engagement, achievement, gender and grade level of classes where teachers teach, and attitudes toward technology before and during the pandemic.

Theoretical Background

What is meant by teaching mathematics using digital technology?

When computers first appeared in school classrooms in the 1970s, the world wondered how they could be used to improve the quality of learning. Early studies, such as Schoenfeld (1988), show us various ways to implement them, ranging from training and practicing programming, to developing and using developed programs, using modeling and dynamic models. (Kaput, 1987). In recent years, the question of how to improve the learning process has been increasingly raised. Evidence for this can be found in studies such as the Hattie (2003) meta-analysis, which found that of all factors, students are most strongly influenced by the teacher. This was recognized by other researchers, such as Kieran, Criner, and Shaughnessy, "it is the teacher who can most influence the achievement of one of the main goals of the research enterprise, that is, to improve the teaching of mathematics to students" (2013, p. 365). Over the past twenty years, the range of digital technologies has greatly expanded, and the ability and power have increased significantly. In light of these changes, the focus of many studies has shifted from how computers can help in learning to how teachers can help students apply different types of digital technologies in practice, with an emphasis on improving math literacy (Clark-Wilson; Robutti; Thomas, 2020). Looking at this new

focus (Thomas & Chinnappan, 2008), it was recognized that there are many barriers to learning through digital technologies that affect whether and how a teacher can apply technology in the classroom. They include their beliefs and attitudes about technology. For some teachers, the positive use of digital technology requires a significant change in thinking (Thomas, Tyrrell, & Bullock, 1996). Other researchers (e.g. Forgasz, 2006; Goos, 2005; Thomas, 2006) show serious obstacles in the use of digital technologies, such as lack of time and a favorable professional environment, poor technical support and lack of resources.

Public School Teachers' Attitude Toward Teaching with Technology.

Over the past 10 years, digital technologies in classrooms have been actively developing, due to continuous development. Even 10 years ago, we did not use such programs as "Dreambox Learning", "Kahoot!", because they were developed only in 2013.

In the Address of the first President of the Republic of Kazakhstan "Strategy Kazakhstan 2050 ": a new political course of the established state to the people, it is noted: "...Our citizens must be prepared to constantly master the skills of working on the most advanced equipment...".

Nowadays, many math teachers are fluent in technology, and this is a great credit to the pandemic. Up to this point, teachers used interactive whiteboards and Power Point presentations in their classrooms, but now the list of programs used has increased significantly. Teachers began to use not only online classrooms for conducting lessons, but also use various platforms for assessment, such as QUIZIZ, Socrative, and Kahoot!.

Many studies claim that teachers' attitudes towards using technology in their lessons have positively influenced students, completely engrossing students in the learning process. According to Kenneth (1996) and Rosas (2003), there is evidence of a link between computer leisure, positive attitudes towards mathematics, progress in mathematical learning, and student success with using

technology in training. Similarly, Jonanssen (2000) argues that technology can be used to facilitate the deep analytical thinking needed for effective learning. Brandt (1997) also argues that computers can be used as a new technical support for the visualization of abstract concepts using virtual representations created by computers, allowing the creation of conceptual mental models. So, in the mathematics class, the researchers were interested in the attitude of teachers to the use of the computer. The technology acceptance model proposed by Rahman, Ghazali, and Ismail (2003) showed that attitudes towards the use of computer technology have a positive relationship with the purpose and, ultimately, the actual use of computers in the classroom environment. Sa'ari, Luan & Roslan (2005) argued that if teachers have a positive mindset, it can affect the future use of computers in the classroom and help build trust. This also leads to an increase in self-efficiency. According to Usun (2004), computers, considered the most powerful interactive platform and the most powerful individual learning technology, have penetrated educational systems and created new approaches to school systems and learning processes. Monaghan (2004) added that computer technology introduces new mathematical fields and takes with it new ways of thinking about mathematics. The effective use of information technology in mathematics education is the subject of much discussion (Cockcroft, 1982). Additionally, Lopezmartio and Lopez (2007) stated that an e-learning environment focused on interactive recreational math teachers (IIRM) has a positive effect on students' attitudes toward mathematics. Most of the students felt relaxed in the classroom, using multiplayer games combined with the instant messaging method.

Which Technologies Teachers Use

Technological pedagogical knowledge (TPC) is knowledge of existing technologies and the capabilities of various technologies, while at the same time knowing how they can be effectively applied in teaching and learning. Teachers need to understand that there are a number

of tools for a specific task, and therefore the ability to choose based on its suitability, use strategies and knowledge of pedagogical strategies are important here. Technological pedagogical knowledge includes knowledge of tools for keeping records of classes, attendance and grades, as well as such as web queries, discussion boards and chat rooms. (Koehler & Mishra, 2006).

In 2008, the International Society for Technology in Education (ISTE) published a set of progressive standards for teachers that focus on the use of technology to support students' learning and creative thinking. Since those decades, but the topic remains relevant. If at that time, learning through technology meant showing PowerPoint slides or attracting students to a computer lab to conduct Internet research, then in our time everything has changed a lot. As smartphones, tablets, low-cost computers (such as Chromebook), three-dimensional (3D) printers, microcontrollers, virtual reality devices, and other new technologies have entered the market and changed the way people think and learn. Sites and social networks like YouTube and Facebook were just gaining momentum at that time, and now they are visited by millions of people around the world every day. There are a lot of tools that help in the educational field, which we are now talking about.

According to Harrison; Hollebrands; Lee; McCulloch; Mutlu, (2018) we can categorize the technology tools they described into four different categories: mathematical action tools, collaboration tools, assessment tools, and communication tools.

Mathematical action tools. Universal software like PowerPoint and interactive whiteboards can provide valuable support, but still they are not mathematical and do not provide the kind of experience that is needed to learn math using technology in high school. Effective teachers view technology as a vital part of the classroom and note the importance of software such as teacher.desmos.com and interactive platforms, graphical calculators. (Association of Mathematics teacher Educators, 2017). There have been several reviews that look at the positive effects of

learning through technology. Looking specifically at algebra, Raikes, Valentine, Mcgata, and Ronau (2010) note small but significant positive effects in students, as do Graham and Thomas (2000). For Mathematics in General, Li and Ma (2010) a review of the literature, which included 41 studies, led to a similar conclusion. Ellington (2003) conducted a meta-analysis of a study of 54 graphical calculators and found significant improvement in students, while noting that the calculator did not hinder the development of mathematical thinking. Consider two reviews that include higher criteria for the Burrill et al study (2002) and Cheung and Slavin (2011). The first selected only 43 research reports (out of more than 180) that they met the criteria of rigor, evidence-based approach and "scientific" approach. They came to the conclusion that graphical calculators help students in teaching mathematics to understand basic concepts, get higher grades, and improve their skills in solving mathematical problems. Recent researchers have concluded that educational technologies have a modest impact on learning. At the same time, they noted that "technology is not a breakthrough, but a help" (Cheung & Slavin, 2011, p. 20). Assude et al. (2010) states that changes in the use of technology do not occur immediately. In the first stage, there are general characteristics, such as the motivation of students to learn, and only in the second stage there are changes. This is mainly influenced by the relationship between students. Olive and Makara (2010, p. 133), agree with concluding that the interaction between students, teacher, and assignments is very important. When teaching with technology, the focus shifts from the teacher to the students, which contributes to the students' learning. The Mitchelmore study and Kavanagh (2000) considered the mistakes that students make when using graphic calculators and identified four main reasons: a) uncritical perception of graphic images; b) lack of understanding of the concept of scale; c) poor understanding of accuracy and approximation; d) limited understanding of the processes used by the calculator to display graphs.

The most common educational mathematical technologies are the use of portable graphs (GDC) or Computer Algebra System (CAS) calculators.

Mathematical action tools include tools, software, and applets that can "perform mathematical tasks and / or respond to user actions in mathematically defined ways" (for example, virtual manipulators, Desmos, GeoGebra, TinkerPlots).

i. Algebra

Kieran and Drijvers (2006) investigated the understanding of mathematics in students who use CAS calculators. They concluded that the value of CAS directly depends on the nature of the task and on the limits of students' understanding. The main use of portable plotting technology was to plot function graphs. Azarello and Robutti (2010), argue that the symbolic power of a CAS-enabled spreadsheet encourages the development of the meaning of symbols and promotes better understanding about symbolic patterns. Artigue (2005) describes the results of two studies that were conducted at the 10th and 11^{th} grade levels. The first project was devoted to exact and approximate calculations and the equivalence of algebraic expressions. The second stage involved teaching the concept of the derivative. Research results have shown that tools can support mathematical meaning and have a positive impact on learning. Driver (2001) found that students who used CAS achieved a higher level of achievement than expected.

Graphical calculators have many features ranging from creating graphs to calculating descriptive and logical statistics, and you can also use them to work with functions, matrices, vectors, and complex numbers, depending on the variety of calculators. (for example, TI 83, TI 84, TI Nspire, as well as the graphical calculator applications can be downloaded to your phone or computer).

ii. Geometry

Many studies have been conducted on the impact of dynamic geometry systems on the teaching of geometry. Mariotti (2000) notes the importance of the system of dynamic geometry in the social construction of thinking about proof in geometry, about the development of proof skills in geometry (Marrades & Gutierrez, 2000), as well as the mathematical explanation of the geometric situation, beyond the scope of the tool (Jones, 2000). Colmez (2009) proves that using all dynamic geometry software is a challenging task. In a number of cases, it has been observed that 2D software has a greater understanding in students than in use in 3D. Vadcard (2002) shows that the use of technology helps students to better understand the concepts of angle (angle: as a slope). Teachers usually encourage students to build their own shapes on dynamic geometry systems, but Sinclair (2003) notes that teachers' pre-built dynamic geometry shapes have a positive effect on students, helping students notice subtle details, as well as explore and develop reasoning skills.

Teachers need to know not only the subject, but also how they can present it with the help of technology. For example, in geometry, teachers can use the Geometer's Sketchpad as a learning tool. The computer program allows students to play with shapes, making it easier to perceive geometric proofs It gives students more options than when teaching was limited to a chalkboard. (Koehler & Mishra, 2006)

Desmos is one of the most popular free HTML5 graphical calculators (www.desmos.com), which works on different devices (laptops, tablets, phones). This calculator has a wide range of features that teachers and students can take advantage of (www.teacher.desmos.com). When using Desmos activities, teachers can provide students with code that allows the teacher to observe what students are doing, monitor their work, and share and discuss it with the entire class. Desmos is

used to support the development of students ' understanding of mathematics, it is interesting for students, easy to introduce mathematical notation, provides students with feedback.

Another equally popular program is GeoGebra. Teachers note that it is free and can be used by the entire class. And it is also a very good tool to help children discover the basics of stereometry, to help visualize. And the teachers also noted the use of GeoGebra for topics other than geometry, such as plotting.

iii. Statistics

Research has been conducted on the application of the technology in statistics training, but Biehler et al. (2013) notes that there is still a need to explore this topic and integrate technology with learning. In related studies, Forester (2006, 2007) showed that grade 12 students learn descriptive statistics using dynamic Java applets and two-dimensional data using spreadsheets. She came to the conclusion that the computer is superior to the Java applet. And other studies show the value of the dynamic computer approach for constructing representative universality in statistical thinking (Graham, Pfannkuch & Thomas, 2009; Pfannkuch, Budgett & Thomas, 2014).

For teachers who teach statistics, they can use programs like Fathom and TinkerPlots,TuvaLabs (an online tool for plotting data), and applets they find online to illustrate specific statistical ideas.

Collaboration tools. The most important part of learning through technology is the interaction of students with each other, the teacher, and the technology. According to Forster & Taylor (2003), positive learning outcomes are directly influenced by student collaboration and teacher questions. Hoyle et al. (2010) notes that creating a situation for discussion and collaboration, like mathematical modeling, positively affects the learning of both individual and group students. Pratt and Back's research (2009) also focuses on discourse collaborating through

an online discussion board. Collaboration tools have been defined as tools that allow students and faculty to see and discuss each other's interests. Common collaboration tools included Padlet, Google Docs (Slides, documents, sheets, forms), as well as Desmos, Google Classroom collaboration features. All the tools listed above allow you to work in real time simultaneously with the entire class, with the help of which the teacher can control the process. Here we can especially mention Desmos program, where students can exchange solutions, as well as log in anonymously, while the teacher can see all the students' screens. Due to anonymity, timid students can show their skills, even if they make a mistake, no one will know who it did, due to this, teachers noted that students were motivated to learn.

Assessment tools. The main purpose of the assessment is to improve the quality of education: (a) it provides the necessary data for the purposes of teacher accountability; and (b) as an "integral component of the learning process" (Reynolds, Livingston, & Wilson, 2006). The objective of learning assessment is to enable students to understand the purpose of learning and, through effective feedback, to identify the aspects that need to be developed. (Elwood & Klenovsky, 2002, p. 243). It is important to explore assessment methods suitable for online learning to understand the potential of technology tools for monitoring and effective feedback. (Mandinach, 2005). Formative feedback promotes student engagement and improves student performance, thereby increasing motivation. (Crisp & Ward, 2008). Evaluative literacy is a set of teacher skills aimed at developing and implementing tools through which the teacher will monitor the growth and progress of students. (William, Hutchinson & Island, 2008). Evaluative literacy is an integral part of pedagogy, which leads to continuous improvement of teaching and learning. (Wilen, Hutchinson & Ishler, 2008). These assessments guide teachers 'activities to develop lessons using a variety of tools that include both traditional and alternative methods, such as self-

assessment, peer assessment, and tasks that develop students' critical thinking and collaboration. (Herron & Wright, 2006). Stacey and William (2013) considered various evaluation constructs, including automated evaluation of constructed responses. They identified the main principles of evaluation in mathematics:

1) The assessment should be based on mathematics (the principle of mathematics).

2) Promote the teaching of mathematics (learning principle).

3) Support each student and show this learning (the principle of fairness. Teachers should consider evaluation as a multidimensional process and find the most optimal ways to evaluate it. For example, asynchronous online discussions, online tests, and software.

Teachers currently use programs such as: Kahoot!, Socrative, Plickers, Quizlet, MasteryConnect, Grandpoint, Kudo, and others. And they can also use online quizzes like MasteryConnect, Grade Point, and GradeCam. These assessment tools were usually used for a review, a quick assessment at the moment or formative / summative evaluation. The most widely used program among teachers was Kahoot! This game is incredibly attractive for students, at the same time it saves time for the teacher and allows you to monitor the strengths and weaknesses of students and focus on mistakes. No less popular was the Socrative program, since in mathematics it is important to think and solve problems, and this tool makes it possible to answer longer, thereby evaluating not only speed, but also quality. At the same time, both programs give instant results, which helps with quick feedback.

Communication tools. The means of communication are more important than ever before. Since there is a pandemic in the country and everyone is studying remotely. The means of communication can include such programs as Zoom, Microsoft Teams, Webex, Skype, WhatsApp messenger, and so on. Each school determines which of these programs is profitable and

convenient for conducting online classes, based on the capabilities of students and teachers. It is worth noting that all programs can be accessed both from a computer and via a phone or tablet.

For modern teaching with digital technology, there are two main features: multimedia and interactivity. Multimedia is the sharing of several heterogeneous types of data, such as text, sound, image, video, organized as a single environment, a single whole. Interactivity is the presence of a feedback response. Interactive puzzles and anagrams, simulators, moving objects, attract students' attention to the material being studied, create a bright, memorable picture, and motivate them to activate cognitive activity.

Methodology

Research Instrument

In my survey, I have used the scale of Math-Technology Ratio Scale (MTAS) developed by Pearce, Stacy, and Barkatsas (2007) to analyze five affective variables associated with technology-based math learning. Confidence in Math (MC), Confidence in Technology (CT), Attitude to Learning through Technology Math (ALMT), Affective Engagement (AE), and Behavioral Engagement (BE) are five of them. The questions used in the methodology are listed in Appendix.

Study participants

The study participants were 34 teachers of public schools in Kazakhstan. Table 1 shows the participants' profile, grouped according to their profile variables. Table 1 shows that 11 or 32.4% of the participants were male, and 23 or 67.6% were female. The data show that most teachers are female, which means that more women still choose the teaching profession. Marpa and Trinidad (2018) in their study, showed that even today this profession is dominated by women.

Data analysis

From table 2, we can see that teachers have become more confident in using technology during the pandemic than they were before.

The results presented in Table 3 indicate that mathematics teachers have a positive attitude to the use of technology in teaching mathematics (M = 4.08, SD = 0.97). They were familiar with the presented technological tools and actively use them in their classes. Similarly, math teachers were also positive (M = 4.50, SD= 0.76) to the study of mathematics with the help of technology. Here it is worth noting that teachers are moving with the times, taking all aspects of teaching with the help of technology. Teachers are ready to learn and apply new techniques and methods to improve the quality of education. Pedretti and her colleagues (1998) argued that any changes associated with new educational innovations should be taken into account.

Table 4 shows that the ratio of male (M = 4.20 SD = 1) and female (M = 4.02, SD = 0.9) mathematics teachers to the use of technology in teaching mathematics is positive. Similarly, the same results were the results are also obtained by individual consideration of subscales. The attitude of male teachers to the use of technology in their lessons is more positive than that of female teachers. The confidence in the knowledge of mathematics in male teachers is higher (M=4.70) than in female teachers (M=4.66). The same result was obtained in early studies such as Tanveer et al. (2011) in their study on the attitude of mathematics teachers to the use of computer technology in the classroom. Their research has shown that male teachers are more positive about technology than female teachers. Similarly, research by Relich (1996) shows that there is significant evidence that men are more positive in their personal abilities and attitudes to mathematics than women. Because men are thought to be more interested in computer technology (Fallows, 2005; Powell, Hunsinger, & Medlin, 2010; Minton and Schneider 1980; Venkatesh et

al., 2003), it can be concluded that their interest and trust in teaching mathematics is better than that of women.

Table 5 shows that the attitude to the use of technology in teaching mathematics to primary school teachers (M = 3.68, SD = 1.3), middle school teachers (M = 3.97, SD =0.74) and lower secondary school teachers (M = 4.29, SD = 0.84) was positive. Compared to primary school teachers, high-school level teachers showed a more positive response to learning with technology. As well as the teachers of the high school level teachers showed high results in other indicators. They are more confident in their mathematical knowledge and behavioral engagement.

Conclusion

In this article, I explored the complex relationship between public school teachers ' confidence in math, trust in technology, attitudes toward learning math through technology, affective engagement and behavioral engagement, achievement, gender, and grade level of classes where teachers teach, and attitudes toward technology before and during the pandemic. The results show that: Teachers showed a positive attitude towards the use of technology in their math classes. And from the study, we learned that teachers' attitudes to technology during and before the pandemic are different, many teachers noted that they began to feel more confident when teaching using digital technology. Overall, high-achieving men appear to be more confident in math, more confident in using computers, and more positive about learning math using computers than women. I agree with Weglinsky (1998) that computers are not a panacea for the problems facing schools but are an assistant that faithfully serves teachers and students, when used correctly. Nowadays, teachers try to use a wide range of educational tools in teaching and this is very pleasing. Since technology is a good time-saver, it explains mathematical concepts in an accessible way. The main

question for the next study is how much you can influence middle-and low-level students with digital technology.

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Tables

Table 1

Profile of the Participants

Profile Variables	**f**	**%**
Sex		
Male	11	32,4
Female	23	67,6
Total	**34**	**100.0**
Grade level taught		
Primary (5–6)	7	20,6
Intermediate (7–9)	9	26,5
High school (10–11)	18	52,9
Total	**34**	**100.0**

Table 2

Teachers ' confidence in the use of technology before and during the pandemic.

Period/ sub-scale	**Not confident at all**	**Somewhat confident**	**Greatly confident**
Before pandemic	5 (14.7%)	15 (44.1%)	14 (41.2%)
During pandemic	2 (5.9%)	12 (35.3%)	20 (58.8 %)

Table 3

Mathematics Teachers' Attitude towards the Use of Technology in the Teaching of Mathematics

Sub-Scale	**M**	**SD**
Behavioral engagement	4.35	0,87
Confidence with technology	4.65	0,68
Mathematics confidence	4.68	0,52
Affective engagement	4.50	0,76
Attitude to learning mathematics with technology	4.08	0,97
Overall mean	**4.45**	**0,76**

Note. The mean scores are interpreted as follows: 1.00 – 1.80 (Strongly Negative); 1.81 – 2.60 (Negative); 2.61 – 3.40 (Uncertain); 3.41 – 4.20 (Positive); and 4.21 – 5.00 (Strongly Positive)

Table 4

Male and Female Teachers Attitudes toward the Use of Technology in the Teaching Mathematics

Sub-Scale	***Male***		***Female***	
	M	***SD***	***M***	***SD***
Behavioral engagement	4,43	0,99	4,30	0,82
Confidence with technology	4,47	0,94	4,73	0,51
Mathematics confidence	4,70	0,52	4,66	0,53
Affective engagement	4,40	0,74	4,53	0,76
Attitude to learning mathematics with technology	4,20	1	4,02	0,9
Overall mean	**4,45**	***0,84***	**4,45**	0,70

Note. The mean scores are interpreted as follows: 1.00 – 1.80 (Strongly Negative); 1.81 – 2.60 (Negative); 2.61 – 3.40 (Uncertain); 3.41 – 4.20 (Positive); and 4.21 – 5.00 (Strongly Positive)

Table 5

Primary, Intermediate and High School Teachers Attitudes toward the Use of Technology in the Teaching Mathematics

Sub-Scale	**Primary level**		**Intermediate level**		**High school level**	
	M	**SD**	**M**	**SD**	**M**	**SD**
Behavioral engagement	3,68	1,3	4,33	0,53	4,61	0,64
Confidence with technology	4,46	0,79	4,75	0,51	4,67	0,66
Mathematics confidence	4,64	0,56	4,66	0,49	4,70	0,51
Affective engagement	4,07	1,02	4,44	0,73	4,68	0,57
Attitude to learning mathematics with technology	3,68	1,3	3,97	0,74	4,29	0,84
Overall mean	**4,11**	**0,83**	**4,43**	**0,6**	**4,59**	**0,65**

Appendix

Teachers' attitudes on teaching with digital technology

Teachers' attitudes on teaching with digital technology

Questions for survey:

1. Male or Female
2. Grade level taught.
   A) 5-6
   B) 7-9
   C) 10-11
3. How confident do you feel about your ability to adapt and integrate digital technologies effectively in your teaching?
   A) Not confident at all
   B) Somewhat confident
   C) Greatly confident
4. How confident were you in your ability to effectively adapt and integrate digital technologies into teaching before the pandemic?

A) Not confident at all

B) Somewhat confident

C) Greatly confident

Please indicate your level of agreement with the following statements about your online teaching practice:

Not applicable Strongly Disagree Disagree Neither Agree nor Disagree Agree Strongly Agree

Behavioral engagement (BE):

5.In general, I am confident that I can teach effectively

6. I am confident in trying new teaching approaches.

7.Even if something goes wrong in my teaching, I am able to overcome the challenge.

8.I ask for help and support from others in terms of my teaching when needed.

Affective engagement (AE)

9. Teaching mathematics is enjoyable

10 I am interested to learn new things in mathematics.

11. I get a sense of satisfaction when I solve mathematics problems

12. In mathematics you get rewards for your efforts

Mathematics confidence (MC)

13. I can achieve good results in teaching mathematics

14.I know I can handle difficulties in math.

15.I have a mathematical mind.

16. I am confident with mathematics.

Attitude to learning mathematics with technology (MT)

17. Are you familiar with the graphical calculator (GeoGebra, Desmos, etc.) and how often do you use them?

18. Are you familiar with the programs like power point, prezi and collabaration tools (google docs, virtual boards, etc.) and how often do you use them?

19. Are you familiar with assessment tools (Socrative, kahoot!, google forms, etc.) and how often do you use them?

20. Are you familiar with communication tools (zoom, Microsoft teams, skype, webex) and how often do you use them?

Confidence with technology (TC)

21. I feel free to use online technology lessons

22.I am a member of the social network and have free ownership. (Facebook, Instagram, YouTube, Facebook, Telegram, etc.)

23. I use computers, phones, tablets, etc.

24. I feel comfortable when I use the technology I need for any school.