Pre-Service Mathematics Teachers' Preparedness in Incorporating Digital Math Tools

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Abstract

The integration of technology in mathematics education has become essential in preparing future teachers to foster higher-order thinking skills. However, little is known about the readiness of pre- service mathematics teachers to effectively employ digital tools in classroom practice. This study examined the preparedness of pre- service teachers to integrate three types of digital mathematics tools: open math tasks, rich math tasks, and simulation tools. Using a descriptive–correlational design, data were collected from 88 respondents at Batangas State University through a validated researcher-designed questionnaire. Findings revealed that participants were moderately prepared overall, with the highest preparedness in rich math tasks and the lowest in simulation tools. Preparedness significantly varied by year level and socioeconomic status, while sex showed no significant association. These results underscore the need for targeted training on simulation- based instruction and equitable access to digital resources. The study contributes to the literature on digital readiness in Philippine teacher education and offers evidence-based insights to inform curriculum design and policy initiatives aimed at strengthening technology integration in mathematics teaching.

Keywords: Pre-service teachers, Digital math tools, Open-math task, Rich math task, Simulation tools

Introduction

Classroom settings nowadays are increasingly shaped by technology, yet some teachers who are still manage to teach using traditional setups. In this era, students tend to be more engaged when they learn through conventional and modern approaches. Technology can influence students' academic performance, success, and motivation to attend school. Increased teacher professional development and student exposure to technology help refine recently learned teaching techniques. For school districts to support higher levels of student achievement, technology may serve as the trigger they need (Sancho-Gil, 2020). It is crucial that instructors do not feel threatened by these innovations, but it is equally important that technology be introduced into classrooms carefully. Technology should be utilized to help students develop the abilities required for success in today's world, not simply because it is cutting-edge, entertaining, or popular.

Effective digital learning tools must be incorporated into mathematics curricula in order for schools to adequately prepare students for a successful future in a global society. A teacher's ability to engage students is enhanced by a range of learning technologies and tools because they facilitate students' access to a wealth of information and stimulating activities (LSU Online, 2020). Digital math tools can also be used in classrooms to help students learn mathematics more effectively (Mathletics, n.d.). Such tools are engaging resources that support the dynamics of teaching and learning mathematics (Azevedo et al., 2021). Wong et al. (2023) further point out that computer-enhanced math lessons are beneficial for challenging learners. However, a thorough exploration of how these digital tools affect student learning in mathematics classrooms is required. Moreover, selecting the right digital tools to satisfy instructional objectives is crucial, as the success of any technology depends largely on its implementation.

It is reasonable to assume that different interactive digital tool types are likely to have different effects on student learning because they offer distinct instructional design elements. Therefore, research on how well digital tools are used in teaching and learning should focus more on different types of tools. This study adopts Minero's (2020) three-category classification of digital math tools. Open math tasks require students to approach the subject from multiple angles and apply various mathematical concepts and skills to solve problems. This approach emphasizes that remembering facts and algorithms is not the sole way to evaluate mathematical comprehension; understanding must extend beyond recall (Haryani, 2020). Rich math tasks, meanwhile, integrate procedural fluency, problem-solving, and conceptual knowledge while encouraging collaboration, multiple perspectives, and the construction of representations (SFUSD Mathematics Department, n.d.). Simulation tools, on the other hand, allow students to visualize mathematical concepts through interactive representations, such as rotations, lengths, and light. These tools are found to support academic performance and foster collaborative learning environments.

It is widely accepted that utilizing digital tools in learning and teaching offers many advantages and significantly advances education. Each category of digital tools is designed with education in mind, making them accessible and beneficial to both teachers and students. These resources foster collaboration, communication, and efficient task completion while strengthening teacher-student relationships and enhancing classroom management.

In light of these perspectives, this study aims to determine pre-service mathematics teachers' preparedness in integrating digital math tools and its relationship to selected personal factors. Examining preparedness in this context offers valuable insights into how teacher education programs can better equip future mathematics educators to integrate digital tools in ways that promote critical thinking, digital skills, and 21st-century competencies.

Objectives

This study determined how prepared are pre-service mathematics teachers in incorporating digital math tools and its correlation on their profile. Specifically, the study achieved the followings objectives:

1. Determine the pre-service mathematics teachers' profile in terms of:
   1.1. Sex;
   1.2. Year level; and
   1.3. Socio-economic status.
2. Ascertain the pre-service mathematics teacher's preparedness in incorporating digital math tools relative to:
   2.1 Open Math Task;
   2.2 Rich Math Task; and
   2.3 Simulation Tools.
3. Determine the significant relationship between the pre-service mathematics teachers' profile and preparedness in incorporating digital math tools.
4. Suggest activities to enhance respondents' preparedness in incorporating digital math tools.

Theoretical Framework

The researchers used the Instrumentation Theory of John Dewey as the basis for this study. It was a theory that talked about the interplay between tools and understanding. Learning tools were an important aspect of learning to improve students' understanding and skills. They served as an intermediary between a student's cognition and the phenomenon being studied or between the learning context and the student's learning activity. The way learning tools shaped learning activities and pre-service teachers' perceptions was explained in a theory called instrumentation theory. This theory described the interaction between the cognitive user schema and the tools used to develop the schema. The central assertion of this theory was that tool limitations shaped a user's cognitive schema, while a user's pre-existing cognitive schema influenced how the tool was used. In this study, the instrumentation theory referred to the concept of an instrumental approach. It described the interaction between tool use and the user's cognitive development in a learning context or based on their academic performance. The interaction could generally be expressed by arguing that the user's knowledge shaped the use of the tool and that the limitations and possibilities within the tool simultaneously reshaped the user's cognitive development. As such, intentionally designed tools could lead to the cognitive development of their intended users.

Methodology

Research Design

A descriptive-correlational design was used in the study as it was appropriate for addressing the research objectives and questions. Numerous research techniques could be employed in a descriptive research design to examine one or more variables. On the other hand, correlation studies were quantitative, non-experimental designs that looked at two variables in an effort to find a statistically meaningful relationship between them. The goal of correlational research was to identify variables that were related to one another to the degree that a change in one led to a change in the other (Saini, 2013).

The descriptive-correlational design was used in the study to provide a static picture of the situation and establish relationships between the pre-service mathematics teachers profile and their preparedness in incorporating digital math tools.

Respondents

The population of this study consisted of 113 pre-service mathematics teachers at Batangas State University, The National Engineering University JPLPC Malvar. The Raosoft sample size calculator, a widely used tool in survey research for determining adequate and representative samples (Raosoft, 2004), was used to identify the required number of respondents. With a 95% confidence level and a 5% margin of error, the calculator recommended 88 participants, which became the study sample.

A stratified random sampling technique was applied to ensure fair representation (Nguyen et al., 2021). The population was divided into subgroups based on their major specialization, and participants were randomly selected from each group. This method ensured balanced representation of the different specializations within the 88 respondents.

Data Gathering Tool

The researcher designed a questionnaire that was used in the study to collect the data required to determine how prepared participants were to incorporate digital math tools. The information from the various pieces of reviewed literature served as the foundation for the instrument's content.

The research questionnaire had two parts, the first part revealed the respondents' profile that includes sex, year level, and socioeconomic profile. The second component assessed how prepared pre-service students were to include three different types of digital math tools: open math tasks, rich math tasks, and simulation tools.

The researcher made instrument was validated by experts who are mathematics education faculty members. A pilot test on 30 pre-service teachers gave a Cronbach's alpha of 0.87, indicating internal consistency to be good.

The following mean ranges and their corresponding interpretations were used to calculate the mean and standard deviation in order to assess the respondent's level of preparedness for incorporating digital math tools.

Scale	Mean Ranges	Verbal Interpretation
4	3.51 - 4.00	Highly Prepared
3	2.51 - 3.50	Moderately Prepared
2	1.51- 2.50	Slightly Prepared
1	1.00 -1.50	Least Prepared

Data Collection Procedure and Treatment

After the research paper was approved, the researchers compiled pertinent data that enabled them to clearly express their own opinions about the study. The process of data gathering started with the development of a questionnaire, followed by adjusting instruments to ensure that the questions were appropriate for the topic at hand and that the questions' order was accurate.

The Dean of the College of Teacher Education received a letter requesting authorization to conduct and deliver a survey created by the researcher to the intended respondents.

After the approval, the researchers used email or messenger to send the respondents a Google Form-based questionnaire. The responders provided responses to all of the questions. The respondents filled out the Google Form and then submitted their response to allow the researchers to obtain the data.

The study's findings and suggestions were derived from data collected from completed questionnaires that were verified, processed, and tabulated.

Results

The collected data were analyzed to create and demonstrate the tables below. These are intended to point out and clarify the findings in accordance with the study's objectives. They provide the findings in an organized and easily comprehensible manner.

1. Respondents' Profile

1.1 Sex

Table 1 shows that the majority of responses were female. This difference in numbers may be attributed to the low presence of men in the profession, which is from preconceived notions and cultural perceptions of the loving and caring profession of teaching

According to a study conducted by Gjøvik et al. (2023), which identifies differences in gender in the teaching profession, indicates that there are more female math teachers than male math teachers. There are a number of social, cultural, and historical factors that contribute to this gender gap. It looked at how the distribution of male and female teachers is influenced by professional expectations, educational orientations, and social norms.

Table 1 Distribution of the Respondents' Profile in Terms of Sex

Sex	Frequency	Percentage
Male	13	15
Female	75	85
Total	**88**	**100**

1.2 Year Level

The year levels in which most of the respondents were from the first, second, and third years can be seen in Table 2. It shows that in the three years since the pandemic started, a large number of new students have indicated an interest in becoming teachers despite the difficulties that education is currently facing. It could be that they understood the significance of educators in this pandemic and the anticipated rise in demand for math instructors in the coming years.

The data also revealed that there were differences in the reasons why students chose to pursue teaching, depending on the year level. Fourth-year students were more likely to pursue teaching because they were passionate about it, whereas first- and third-year students were more likely to do so due to their interest in math.

Table 2 Distribution of the Respondents' Profile in Terms of Year Level

Year Level	Frequency	Percentage
First Year	28	32
Second Year	21	24
Third Year	28	32
Fourth Year	11	13
Total	**88**	**100**

1.3 Socioeconomic status

Table 3 shows socioeconomic status based on their monthly income classified as middle class, lower middle class, and lower class wherein most of the respondents are mostly in their lower class. This outcome ascertains that the respondents' families are still having a hard time sufficiently responding to their daily needs after 3 years of the start of the pandemic.

According to Fallesen (2021), The COVID-19 had a major effect on rural livelihoods. For people who depended on these sectors, lockdowns, travel restrictions, and decreased economic activity resulted in layoffs and decreased incomes, thus many families experienced financial difficulties.

Table 3 Distribution of the Respondents' Profile in Terms of Socioeconomic Status

Socioeconomic Status	Frequency	Percentage
Middle Class	19	21
Lower Middle Class	36	41
Lower Class	33	38
Total	**88**	**100**

2. Preparedness of Pre-service Mathematics Teachers in Incorporating Digital Math Tools

This part of the study assessed how prepared the respondents are in incorporating digital math tools in terms of Open Math Task, Rich Math Task and Simulation Tools. These are found on the succeeding tables.

2.1 Open-Math Task

This part of the study determined how prepared the respondents are in incorporating digital math tools in terms of Open Math Task. It shows the calculated standard deviation and mean for every indicator along with an interpretation for each.

Table 4 Preparedness of Pre-Service Teacher in Incorporating Digital Math Tools in terms of Open Math Task

	Indicators	Mean	Standard Deviation	Descriptive Interpretation
1.	Explaining ideas in several ways using equations and graphs	3.30	0.63	Moderately Prepared
2.	Incorporating online learning activities which help to solve problems in different ways	3.36	0.57	Moderately Prepared
3.	Utilizing different methods or approaches to solve challenges and find solutions.	3.47	0.64	Moderately Prepared
4.	Creating open-ended questions online that helps students to use a deeper level of math thinking.	3.30	0.63	Moderately Prepared
5.	Providing sufficient quality answers to various problems.	3.36	0.61	Moderately Prepared
	Overall	**3.36**	**0.62**	**Moderately Prepared**

In Table 4, respondents' preparedness to use digital math tools for open math tasks is shown. The average score of 3.47 with a standard deviation of 0.64 indicates that respondents consistently utilize these tools effectively, particularly for solving problems with multiple solutions or requiring diverse approaches. This aligns with findings from Aggarwal (2020), highlighting the usefulness of ICT in enhancing higher-order thinking skills and student interest in learning Mathematics, making problem recognition and analysis easier.

However, when it comes to explaining concepts through equations and graphs and creating open-ended questions, respondents scored lower, with means of 3.30 and standard deviations 0.61. This suggests that respondents may face challenges in formulating open-ended tasks and interpreting various graphical and mathematical representations, which resonates with Wolff's (2021) observation that open-ended problems can be more challenging to evaluate consistently.

Overall, respondents' preparedness for integrating digital math tools into open math tasks yielded an average score of 3.36. This indicates that pre-service math teachers may still be in the process of developing their growth mindset and higher-order thinking abilities, as suggested by Wang et al., (2018) study, which found that employing computer-based methods for problem-solving improved prospective teachers' higher-order thinking skills and motivation, albeit with modest enhancements in communication and problem-solving capacities.

2.2 Rich Math Task

This part of the study determined how prepared the respondents are in incorporating digital math tools in terms of the Rich Math Task. It reveals the computed mean and standard deviation for each indicator with its corresponding interpretation.

Table 5 Preparedness of Pre-Service Teacher in Incorporating Digital Math Tools in terms of Rich Math Task

Indicators	Mean	Standard Deviation	Descriptive Interpretation
1. Creating online interactive learning activities that give students the chance to communicate with one another, to the instructor, and to the course content.	3.49	0.61	Moderately Prepared
2. Preparing exercises that will encourage cooperation between students.	3.58	0.60	Highly Prepared
3. Giving interactive learning activities where students can collaborate by group.	3.51	0.66	Highly Prepared
4. Improving the imagination and interest of the students in math concepts through group collaboration	3.48	0.64	Moderately Prepared
5. Making complex problems where students proactively exchange information with other group members.	3.43	0.60	Moderately Prepared
Overall	**3.50**	**0.62**	**Moderately Prepared**

Table 5 reveals how ready the respondents are to use digital math tools for Rich math tasks. They scored the highest mean of 3.58 with a standard deviation of 0.60, showing their consistent readiness to assign exercises that promote teamwork among students. This indicates that respondents actively prepare exercises that encourage participation and collaboration in the classroom. Sanmas et al. (2023) asserts that the use of digital tools can improve teamwork and alter the relationship between learners and teachers. These technologies foster critical thinking, creativity, and communication while also fostering digital responsibility, entrepreneurship, and problem-solving abilities.

With an average score of 3.50 and a standard deviation of 0.62, the respondents' overall level of preparedness shows that pre-service math teachers have the capability of integrating digital math tools into their lessons, especially for rich math assignments. This implies that if they are prepared, they can create a more engaging and cooperative learning environment during talks.

According to Oyedeji (2017), technological tools have a positive impact on motivational factors influencing mathematics studies, while Zhong (2021) emphasized that classroom collaboration leads to greater autonomous learning, improved understanding of mathematical concepts, increased assistance among peers, more exercises and problem-solving, and an overall enjoyable learning experience.

2.3 Simulation Tools

This part of the study determined how prepared the respondents are in incorporating digital math tools in terms of Simulation Tools. It reveals the computed mean and standard deviation for each indicator with its corresponding interpretation.

Table 6 shows the preparedness of respondents in using digital math tools in terms of Simulation Tools. With a mean of 3.56 and standard deviations of 0.60, the respondents show that the students are prepared applying mathematics problems into real world representation. It signifies that the preservice teachers prefer applying and integrating mathematics activity using digital math tools, specifically simulation tools in real life scenarios.

Table 6 Preparedness of Pre-Service Teacher in Incorporating Digital Math Tools in terms of Simulation Tools

Indicators	Mean	Standard Deviation	Descriptive Interpretation
1. Familiarizing with at least one digital math tool that uses visual representations.	3.48	0.61	Moderately Prepared
2. Applying mathematics problems into real world representation.	3.56	0.60	Highly Prepared
3. Creating graphs in online tools using different formulas.	3.15	0.74	Moderately Prepared
4. Making visualizations of different topics using digital tools.	3.42	0.69	Moderately Prepared
5. Criticizing correct and incorrect visual representations present in online tools	3.33	0.62	Moderately Prepared
Overall	**3.39**	**0.65**	**Moderately Prepared**

Arthur et al. (2018) argue that relating mathematical ideas to real-world situations will improve students' understanding of the subject. Students' interest in mathematics will be ignited by their understanding of the close connection between theory and practice, which will also lay the groundwork for their future application of mathematics in practical settings. Also, Scharaldi (2020) states that one of the factors that helps students connect math concepts in the real world is technology that can be utilized by educators to demonstrate to students the practical applications of concepts they are learning in math and STEM classes.

Statement number 3 received the lowest mean scores, 3.15, with a 0.74 standard deviation. Respondents frequently struggle in utilizing digital math tools to create graphs in online tools. Although it may have the lowest mean, that doesn't change the fact that the students can still handle it.

According to the study of Leong & Parrot (2017), students who use graphing calculators have a better attitude toward solving mathematical problems. Bahtaji, (2020). states that even students' understanding of graphs can increase after a targeted intervention, students did not improve in transferring this skill to various task contexts.

With an average score of 3.39 and a standard deviation of 0.65, the respondents' overall level of preparedness indicates that pre-service math teachers have received sufficient training to use digital math tools in their classrooms, especially simulation tools. They could promote the creation of fresh digital tools that will facilitate the production of figures and graphs.

3. Relationship between the Respondents' Profile and their preparedness in Incorporating Digital Math tools

Table 7 displays the decision along with the corresponding interpretations, as well as a comparison between the calculated Chi-Square values and their P values.

Table 7 Relationship between Profile and Preparedness in Incorporating Digital Math Tools

Variables	Computed X^2	*P* Value	Decision (H_o)	Interpretation
Sex and Preparedness in Incorporating Digital Math Tools	1.931	0.381	Fail to Reject	Not Significant
Year Level and Preparedness in Incorporating Digital Math Tools	36.297	0.000	Reject	Significant
Socioeconomic Status and Preparedness in Incorporating Digital Math Tools	27.482	0.000	Reject	Significant

The table shows that the profile of the respondents in terms of sex was correlated to their preparedness in incorporating digital math tools with the computed Chi-Square value of 1.931 which is meaningful at the level of $p>0.05$. This implies that the null hypothesis is failed to reject, confirming that there is no significant relationship that exists between the respondents' sex and their Preparedness in Incorporating Digital Math Tools.

This finding shows that the male and female pre-service mathematics teachers who participated in the study showed comparable degrees of preparation or ability when it came to integrating digital math resources into their teaching methods. It suggests that other elements

or variables may have a greater impact on a person's preparation or talents in this particular area than their gender and may determine their capacity to effectively use digital math tools. In other words, it doesn't seem that a person's ability to use these tools for mathematics teaching depends on whether they are male or female.

The second variable, correlation of year level to their Preparedness in Incorporating Digital Math Tools. The computed Chi-square is 36.297 at the level of $p<0.05$. This results in the rejection of the null hypothesis, therefore, there is a significant relationship between the respondents' year level and their Preparedness in Incorporating Digital Math Tools.

According to Staddon's (2020) research, older students use technology less regularly and less frequently than younger students, but they have been using it for a long time. Perry et al. (2018) stated that grade expectation shows where pupils have been and where they are headed. They aid teachers in maintaining their focus so that they don't suffer from choice fatigue due to the pupils' increasing access to tech tools and apps.

The last variable correlated with Preparedness in Incorporating Digital Math Tools is the Socio-economic Status of the respondents. The computed value of Chi-square is 27.482 at the level of $p<.05$. This confirms the rejection of null hypothesis. Implying that there is a significant relationship exists between the Socio-economic Status of the respondents and their Preparedness in Incorporating Digital Math Tools.

Based on the research findings of Katz (2019), there is a digital gap between some segments of society that does not seem to shrink in the era of technological advancements. Children who were raised in a family with low social status are more likely to have a lower level of digital literacy. At the same time, an increase in the annual family income does not significantly increase the odds that children will become more interested in the feasible use of ICT.

4. Suggested activities to enhance respondents' preparedness in incorporating digital math tools.

This includes the suggested activities that the researchers believe can help pre-service teachers in integrating digital math tools into their lessons. The proposed activities were also based on the collected data and the results of the survey.

Table 8 Suggested Activities to Enhance Respondents' Preparedness in Incorporating Digital Math Tools

Activity: Think-Connect-Share
Purpose: This activity will enhance students' critical thinking, engagement, and participation in class collaboration by using a particular digital math tool. It makes traditional math instruction more interactive and focused on working in groups.
Description: 1. The class will be divided into small groups to begin the activity. A set of collaborative math problems will be given to each group. 2. Students will access the digital math tool in their groups and begin working on the given problems. They can communicate ideas by texting, drawing, or chatting on the digital tool. 3. After the groups have solved the problems, instruct them on how to use the digital tool for a critical thinking discussion. 4. Gather again the class and request that each group present one interesting idea or conclusion from their critical thinking exercise. 5. Students may be asked to reflect on how the group project has improved their problem-solving skills and what they have learned from other students.

Activity: You Think

Purpose: This activity will guarantee that each student is given assignments that are suitable for their level of ability and fosters peer cooperation and knowledge exchange. Using digital math tools makes for a more effective and engaging mathematical learning experience.

Description:

1. Teachers will create a problem bank with various math topics and difficulty levels. They will assist in selecting appropriate topics, tracking progress and providing support.
2. Teachers will evaluate students' math proficiency individually. Students are guaranteed to be working on assignments that align with their current skill level and learning requirements through this individualized approach.
3. Once students receive their assignments, they will work through problems step-by-step, applying pertinent ideas to provide precise answers.
4. Teachers will promote peer-to-peer collaboration through online resources to exchange knowledge and techniques. Collaborative learning improves comprehension and develops a sense of teamwork in students.
5. Students must present their solutions once they have solved the problems that have been assigned to them. Students are better able to express their ideas and effectively communicate their mathematical reasoning when they present their solutions.

Discussions

Most of the respondents were first- and third-year students, the majority of which were female and from lower socioeconomic classes. This implies that the mathematical community has a substantial gender gap. There were differences in the motivations behind students' decisions to become teachers based on the year level. It also showed that the respondents' families were still having difficulty meeting their basic needs three years after the pandemic started.

Additionally, the respondents' assessment of their level of preparation for utilizing Rich Math Tasks, Open Math Tasks, and Simulation Tools in the teaching and learning process showed that they are all only moderately prepared, indicating that they are competent with basic technologies. This underscores the overall positive trend in incorporating digital math tools among the evaluated pre-service mathematics teachers.

Importantly, when it came to using digital math tools, there was a significant correlation between the preservice math teachers' socioeconomic status and year level. This relationship can be explained by their age, degree of digital literacy, familiarity with technology, and interest in practical applications of technology, all of which influence how prepared they are to use it to teach and learn mathematics. However, since both sexes were equally adept at incorporating digital math tools into their teaching methods, there was no significant relationship between the respondents' sex and their preparedness in integrating digital math tools.

The study, taken as a whole, highlights how ready pre-service math teachers are to use technology in the classroom. By providing different activities, institutions can enhance the preparedness of pre-service mathematics teachers in incorporating digital math tools in their teaching, leading to a more successful learning environment.

Conclusion and suggestions

In conclusion, the results of this research demonstrate that most of the respondents are female, first to third year students and belong to low class income. Also, Open math tools and simulation tools are used by pre-service math teachers with varying levels of preparation, whereas Rich math tools are used by them with the greatest level of preparation. On the other hand, the respondents' first variable, sex, is not substantially connected to their preparedness to use digital math tools, but the other two factors, year level and socioeconomic position, are significantly associated with the respondents' preparedness to use digital math resources.

In line with the findings mentioned above the researcher recommends the following: Pre-service teachers have the capability to facilitate group and collaborative activities using tools such as "E-Linear," "CanProveIt," "Raise to Top," and "Board Zone." These activities have the potential to significantly augment the knowledge and skills of their future students through collaborative learning experiences with their peers and classmates.

As the world of educational technology is always changing and developing, pre-service teachers need to stay up to date with the newest digital math tools and technologies. Keeping up to current with these developments is essential for success in the teaching profession.

Since technology is advancing in the twenty-first century and can help pre-service teachers enhance learning, prevent learning loss, and create opportunities for the teaching and learning process, the department may decide to establish a policy integrating digital tools into the classroom.

This work broadens the researchers collective knowledge, and future researchers might use it as a springboard for their own investigations. Your contributions may be essential to extending our understanding even farther. especially when they integrate digital math resources into a pertinent and related subject.

New knowledge and the effects on society and communities

The results of a recent study provide insight into how prepared educators are to integrate technology into the process of teaching and learning. According to the study, pre-service teachers have a moderate level of proficiency when it comes to using websites and applications that provide real-world math situations with multiple approaches, solutions, and representations. These situations are presented to students in the form of word problems. Additionally, they have a moderate level of preparation for assignments that encourage rigor, teamwork, and conceptual thinking as well as for applications that let students observe how a simulation behaves without actually controlling it.

The society will be greatly impacted by these findings, particularly in the fields of education and self-improvement. Acknowledging pre-service teachers' readiness can lead to the creation of programs to solve issues that may arise when using digital math tools in the classroom. This study functioned as a link to improve student instruction, which benefited society and administration.

Furthermore, it provided information about the early attitudes of respondents towards integrating technology in mathematics instruction. Technology was incorporated into math classes to support students' independent and meaningful learning of mathematical concepts. The study was also important and proved to be very helpful in the math classroom since it let teachers know what kinds of learning tools were required to improve the pre-service teachers' academic performance. Future educators gained from the study as it helped them design effective collaborative learning experiences that encouraged problem-solving and flexible thinking. This served as a gateway for continuing to shape students' futures with a top-notch education.

References

Aggarwal, M. (2020). Tools of ICT for learning and teaching mathematics. *Journal of Mechanics of Continua and Mathematical Sciences, 15*(4), 1–10. https://doi.org/10.26782/jmcms.2020.04.00001

Arthur, Y. D., Owusu, E. K., Asiedu-Addo, S., & Arhin, A. K. (2018). Connecting mathematics to real life problems: A teaching quality that improves students' mathematics interest. *IOSR Journal of Research & Method in Education, 8*(4), 65-71. https://www.iosrjournals.org/iosr-jrme/papers/Vol-8%20Issue-4/Version-2/J0804026571.pdf

Azevedo, B. F., Pereira, A. I., Fernandes, F. P., & Pacheco, M. F. (2021). Mathematics learning and assessment using MathE platform: A case study. *Education and Information Technologies, 27*(2), 1747–1769. https://doi.org/10.1007/s10639-021-10669-y

Bahtaji, M. A. A. (2020). Improving students graphing skills and conceptual understanding using explicit Graphical Physics Instructions. *Kıbrıslı Eğitim Bilimleri Dergisi, 15*(4), 843-853. Retrieved from https://www.ceeol.com/search/article-detail?id=966899

Fallesen, D. (2021). *How COVID-19 impacted vulnerable communities in the Philippines.* World Bank Blogs. https://blogs.worldbank.org/eastasiapacific/how-covid-19-impacted-vulnerable-communities-philippines

Gjøvik, Ø., Kaspersen, E., & Farsani, D. (2023). Stereotypical images of male and female mathematics teachers. *Research in mathematics education, 25*(2), 178-193. https://doi.org/10.1080/14794802.2022.2041471

Haryani, F. (2020). *Flexibility In Mathematics: Case Of Open-Ended Graphing Task In College Algebra.* https://tinyurl.com/yxw7bynw

Katz, Y. (2019). Technology, society and the digital gap. Advances in Applied Sociology, 9(01), 60. https://doi.org/10.4236/aasoci.2019.91005

Leong, K. E., & Parrot, M. A. S. (2017). Impact of using graphing calculator in problem solving. *International Electronic Journal of Mathematics Education, 13*(3), 139–151. https://doi.org/10.12973/iejme/2704

Louisiana State University (LSU) Online. (2020). *The future of education: Integrating technology in the classroom*. https://online.lsu.edu/newsroom/articles/future-education-integrating-technology-classroom/

Minero, E. (2020). *10 Teacher-recommended math apps and online tools*. George Lucas Educational Foundation. https://www.edutopia.org/article/11-teacher-recommended-math-apps-and-online-tools/

Nguyen, T. D., Shih, M. H., Srivastava, D., Tirthapura, S., & Xu, B. (2021). Stratified random sampling from streaming and stored data. *Distributed and Parallel Databases, 39*(3), 665-710. https://link.springer.com/article/10.1007/s10619-020-07315-w

Oyedeji, S. O. (2017). The Effects of Students' Motivational Factors on Their Attitudes toward Mathematics. *International Journal of Evaluation and Research in Education, 6*(4), 277-287. https://eric.ed.gov/?id=EJ1166882

Perry, T., Davies, P., & Qiu, T. (2018). Great grade expectations? The role of pupil expectations in target setting. *International journal of educational research, 89*, 139-152. https://www.sciencedirect.com/science/article/abs/pii/S0883035516312320

Raosoft. (2004). *Raosoft Sample Size Calculator*. Raosoft, Inc., Seattle. http://www.raosoft.com/samplesize.html

Sancho-Gil, J. M. (2020). Digital technology as a trigger for learning: promises and realities. *Digital Education Review, 37,* 195-207. https://doi.org/10.1344/der.2020.37.195-207

Sanmas, M., Qadir, A., Nahria, N., & Laili, I. (2023). *The role of interpersonal communication in enhancing teamwork effectiveness in the digital era*. https://doi.org/10.37010/lit.v5i2.1503

Scharaldi, K. (2020). *What are the benefits of teaching math using technology? Texthelp.* https://www.texthelp.com/resources/blog/what-are-the-benefits-of-using-technology-for-math

Staddon, R. V. (2020). Bringing technology to the mature classroom: Age differences in use and attitudes. *International Journal of Educational Technology in Higher Education, 17*(1). https://doi.org/10.1186/s41239-020-00184-4

Wang, M., Kirschner, P. A., Spector, J. M., & Ge, X. (2018). Computer-based learning environments for deeper learning in problem-solving contexts. *Computers in Human Behavior, 87,* 403-405. https://doi.org/10.1016/j.chb.2018.06.026

Wong, B. T. M., Li, K. C., & Chan, T. H. T. (2023). A survey of smart learning practices: contexts, benefits, and challenges. *International Journal of Innovation and Learning, 34*(2), 122-142. https://doi.org/10.1504/IJIL.2023.132755

Wolff, R. (2021). *Advantages and disadvantages of open-ended and close-ended questions.* MonkeyLearn Blog. https://monkeylearn.com/blog/advantages-of-open-ended-questions/

Zhong, Q. M. (2021). Fostering group autonomy through collaborative learning in an online environment. *Studies in Self-Access Learning Journal, 12*(1), 79-91. https://doi.org/10.37237/120106