**E-learning in Mathematics Education: Examining Teachers' Attitude, Intentions**

**And Barriers**

ABSTRACT

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| **Aim:** This study delve into e-learning in mathematics education, examining teachers’ attitude, intentions, and barriers in their teaching practices, specifically focusing on secondary school teachers in Laoang, Northern Samar.  **Study Design:** This study used a qualitative research approach, utilizing thematic analysis to examine the factors shaping mathematics teachers' attitudes and intentions toward adopting e-learning tools, along with the challenges they faced. By exploring the deeper reasons behind their experiences, the research provided valuable insights into what drives or obstructs the integration of e-learning in mathematics education.  **Place and Duration of Study:** The study was conducted between **February and April 2025** in **Laoang, Northern Samar**, focusing on mathematics teachers from **Laoang National High School** and **Laoang National Technical High School.**  **Methodology:** This study examines seven (7) mathematics teachers were purposively selected based on their experience and willingness to adopt e-learning tools from Laoang National High School and Laoang National Technical High School. Semi-structured interviews and thematic analysis provided an in-depth understanding of their perspectives.  **Results:** finding reveals a complex interplay of enthusiasm and skepticism regarding e-learning integration. While teachers recognize its potential to enhance engagement and provide interactive learning experiences, concerns persist regarding accessibility, digital literacy, and the effectiveness of technology in teaching advanced mathematical concepts. The study identifies critical barriers, including inadequate technological infrastructure, limited digital literacy, misalignment between e-learning tools and curriculum goals, and institutional pressures driving a compliance-oriented approach.  **Conclusion:** Successful e-learning adoption requires a holistic strategy encompassing investments in technology, structured professional development, curriculum revisions to align with digital tools, and targeted initiatives to improve digital literacy among students and educators. Shifting from compliance-driven implementation to a blended learning model will foster more equitable and effective mathematics instructions. |

***Keywords:*** *E-learning, teacher attitudes, intentions, barriers, technological infrastructure, digital literacy, curriculum alignment, blended learning.*

**INTRODUCTION**

The rapid advancement of technology is revolutionizing education, particularly in mathematics, where its interactive potential can transform abstract concepts into engaging learning experiences. In the wake of the pandemic, there has been a drastic shift to electronic learning, bringing limitless advantages to students. Moreover, the Ministry of Electronics and Information Technology identifies online learning as an essential tool for imparting education. This technological progression has significantly expedited access to information, making learning more efficient and effective (Kiong, J. F. 2023). Therefore, e-learning has emerged as a pivotal tool in mathematics education, offering personalized instruction through interactive visuals and immediate feedback that boost student engagement and comprehension (Hillmayr et al., 2020). By catering to diverse learning styles, e-learning makes mathematical concepts more accessible and enjoyable. Thus, this study examines math teachers' intentions and decisions regarding e-learning tool adoption, recognizing that successful implementation depend on their willingness and ability to integrate technology effectively (Kasa et al., 2024).

However, many math teachers face significant challenges in adopting e-learning technologies. Teachers' attitudes towards e-learning vary widely, with some being enthusiastic and others resistant due to discomfort with technology or skepticism about its effectiveness. Additionally, intentions to use e-learning tools are influenced by perceived ease of use, usefulness, and available institutional support. Furthermore, perceived barriers, such as technical challenges, insufficient training, and resource limitations, further hinder adoption. Concerns about equity and access for all students also complicate integration. Understanding these factors—attitudes, intentions, and barriers—is crucial for developing effective strategies to support teachers and improve e-learning implementation in math education. Therefore, addressing these challenges with support and training can enhance e-learning adoption, positively influencing student-learning outcomes.

E-learning adoption in mathematics education is shaped by attitudes, institutional support, and technological factors. Positive perceptions, recognizing its usefulness, encourage adoption, while skepticism and discomfort with technology hinder integration (Ahmad et al., 2023). Intentions to use e-learning depend on perceived ease of use and institutional readiness (Siron et al., 2020), though barriers such as insufficient training and technical challenges persist (Sukendro et al., 2020). The digital divide remains a critical issue, affecting both students and educators (Almaiah et al., 2020). Addressing these challenges through structured support and training can enhance adoption and improve learning outcomes (Kunwar et al., 2023).

The COVID-19 pandemic accelerated the shift to online learning, prompting institutions worldwide to adopt virtual instruction (Rheddy et al., 2023). Studies on e-learning implementation during this period applied the Technology Acceptance Model (TAM) to analyze influencing factors such as teacher experience and computer anxiety (Siron et al., 2020; Sukendro et al., 2020). However, understanding teachers’ attitudes, intentions, and challenges in integrating e-learning in math education remains incomplete (Kunwar et al., 2023). Research suggests aligning technology integration strategies with institutional goals to ensure effectiveness.

Studies on ICT use highlight mixed perceptions. While Zamir et al. (2023) found that prospective teachers favored ICT integration, they also faced challenges such as limited access to math-specific applications. Similarly, Martin et al. (2021) and Martin et al. (2024) emphasize the need for increased ICT resources to improve educational engagement. Jubran et al. (2023) and Khan et al. (2023) explore language and technology-related barriers during online instruction, while Evendi et al. (2022), Ullah et al. (2023), and Das (2021) assess e-learning's effectiveness in critical thinking and satisfaction. Hamad et al. (2022) highlights resistance to change in digital math education, and Khong et al. (2022), Muangmee et al. (2021), and Mailizar et al. (2021) examine teachers’ and students’ acceptance of e-learning, emphasizing the importance of training and system accessibility. Infrastructure gaps and digital literacy remain major obstacles (Qashou et al., 2022; Liu et al., 2021).

Structured professional development is necessary for successful technology adoption (Alenezi, 2023; Minea-Pic, 2020; Dumbuya, 2025). Studies by Chansa et al. (2024) and Jaramillo & Chiappe (2024) argue that digital tools must align with curriculum objectives, particularly in mathematics education. Investments in infrastructure and policy-driven support can bridge the digital divide (Selwyn, 2020; Van Dijk, 2023), while targeted digital literacy programs improve student engagement (Soufghalem, 2024; Puniatmaja et al., 2024). Teacher training is also critical for effective integration (Hamad et al., 2022; Moreno-Guerrero et al., 2020).

E-learning aligns with Sustainable Development Goals (SDGs), contributing to quality education (SDG 4), fostering innovation (SDG 9), reducing inequalities (SDG 10), and enhancing global cooperation (SDG 17). By ensuring inclusive access and personalized instruction, technology supports effective mathematics education, while collaboration among educators, policymakers, and industry experts strengthens its impact.

**Research questions**

This study investigates the factors that influence mathematics teachers' adoption and use of e-learning tools, focusing on teacher attitudes, intentions, and barriers to successful integration.

Specifically, the researchers seek answer for the following questions:

1. What are the teachers’ attitudes towards the use of e-learning in their teaching practices?

2. What factors influence math teachers’ intentions to use e-learning tools in their classroom?

3. What are the perceived barriers to the adoption of e-learning tools among mathematics teachers?

**METHODOLOGY**

**Research Design**

This study employed a qualitative research using thematic analysis approach to explore the factors that influenced mathematics teachers' attitudes and intentions towards adopting e-learning tools, as well as the barriers they encountered. The qualitative methods used in this study were designed to uncover the underlying reasons behind teachers' experiences, making them a perfect fit for this research. By focusing on these factors, the study provided a comprehensive understanding of what drove or hindered the integration of e-learning tools in mathematics education.

**Participants**

This study will focus on mathematics teachers from two secondary schools, Laoang National High School and Laoang National Technical High School. A total of 7 out of 13 participants have been selected based on their relevant experiences and demonstrated interest in adopting e-learning tools while 8 possible participant refused to have an interview.

**Sampling Method**

To understand the challenges and strategies mathematics teachers faced in adopting e-learning tools, this study employed purposive sampling. Researchers specifically selected participants who could provide the most relevant insights, focusing on mathematics teachers with experience or intentions to adopt e-learning tools. This approach allowed for the collection of in-depth information from a specific group with unique experiences, emphasizing teachers' attitudes, intentions, and barriers in e-learning adoption. This method ensured that the study gathered comprehensive insights from those most likely to provide valuable perspectives on the successful integration of e-learning in mathematics education.

**Research Instrument**

This study aimed to investigate the factors that influenced mathematics teachers' intentions to adopt and utilize e-learning tools in their math teaching. The researchers created an interview guide questions, carefully designed to focus on the challenges mathematics teachers faced and the strategies they used to overcome obstacles and integrate e-learning tools. The interview guide was designed to identify factors that influenced mathematics teachers' adoption of e-learning tools. It consisted of expert-validated, open-ended questions focusing on attitudes toward e-learning, factors influencing adoption, and barriers to implementation. Teachers were asked about their perceptions of e-learning’s usefulness, its impact on student learning, and their confidence in using digital tools. The guide question also examined institutional support, access to technology, prior digital learning experience, and external motivators such as professional development opportunities. Additionally, it addressed obstacles like digital literacy gaps, inadequate training, and resistance to change. The responses provided valuable insights that informed recommendations for improving support systems, training programs, and institutional policies to facilitate effective e-learning integration in mathematics education.

**Data collection**

This study aimed to investigate the factors that influenced mathematics teachers' intentions to adopt and utilize e-learning tools in their math education. The researchers began by seeking permission from the professor, principal, and other relevant authorities to conduct the study. To gather information, the researchers employed in-depth interviews. Semi-structured interviews were conducted with individual mathematics teachers using an interview guide, allowing deep and meaningful conversations to capture their unique stories and experiences with e-learning tools. The interviews were audio-recorded and transcribed verbatim for detailed analysis. This approach ensured that the researchers gathered comprehensive insights into teachers' attitudes towards e-learning, the factors influencing their intentions to use e-learning tools, and the perceived barriers to e-learning adoption among mathematics teachers. The insights gathered from these interviews were used to develop better teaching methods and support systems to help teachers effectively integrate e-learning tools into their math education.

**Data analysis**

The collected data was analyzed using thematic analysis, searching for recurring patterns or themes. The process included familiarization, where the researcher read and re-read transcripts while recording initial notes. Data was systematically coded to identify meaningful segments related to the research questions, using both inductive and deductive coding approaches. Codes were grouped into themes based on similarities and relationships, reviewed and refined to accurately represent the data. Themes were organized to reflect key factors influencing mathematics teachers' attitudes, intentions, and perceived barriers in adopting and utilizing e-learning tools. Themes were interpreted in the context of the research questions and existing literature.

To ensure trustworthiness, researchers employed triangulation by comparing data from different sources. Member checking validated interpretations with participants, ensuring accuracy and credibility. This approach helped identify key themes related to challenges and strategies faced by mathematics teachers in adopting e-learning tools. The thematic analysis provided valuable insights to develop better teaching methods and support systems, helping educators integrate e-learning tools into their math education.

**Ethical consideration**

This study placed a strong emphasis on ethical considerations to ensure accuracy, trustworthiness, and respect for participants' rights. Before participating, all participants received full information about the study's purpose, procedures, and their rights, with written informed consent obtained. Confidentiality was assured, and identities were anonymized using pseudonyms. Participants had the option to withdraw at any time without consequences. The research team securely stored all collected data, including recordings and transcripts. Before each interview, the researchers reminded participants of their privacy rights and asked for permission to record. Data was used solely for research purposes and was destroyed after use to protect privacy. By adhering to these ethical considerations, the study maintained the integrity of the research process and respected participants' rights.

**RESULTS AND DISCUSSION**

These themes highlight the opportunities, challenges, and key factors influencing e-learning adoption. By understanding them, educators and policymakers can effectively integrate digital learning tools to maximize their impact. These insights provide a strong foundation for developing strategies that support teachers, refine curricula, and improve educational outcomes in digital learning environments.

**1. Attitudes towards E-Learning**

Based on the data teachers identified several key themes regarding their experiences with e learning adoption in mathematics education. These were categorized into the following themes: mixed feelings, perceived benefits and concerns about effectiveness.

**Themes**

*Cautious Optimism*

*Skepticism Regarding Effectiveness*

*Need for Comprehensive Support*

*Pressure to Comply vs. Pedagogical Choice*

*Hope for Enhanced Engagement and Outcomes*

**1.1 Cautious Optimism**

Many teachers see the potential of e-learning for engaging students and making math more accessible, but they have reservations due to practical challenges like inconsistent internet access, limited time for preparation, and concerns about its effectiveness in teaching complex concepts. E-learning adoption strategies should acknowledge the complexities of teacher attitudes. Instead of pushing for a full-scale shift to e-learning, a gradual and supportive approach that addresses concerns and provides adequate training is recommended. The following are the sample of the transcriptions.

***Participant 1: Great contribution to learning***

***Participant 2: Highly effective***

***Participant 3: Lack of stable internet***

***Participant 5: Limited time for preparation***

Teachers' cautious optimism highlights the need for realistic expectations regarding e-learning integration. This aligns with studies by Hillmayr et al. (2020) who emphasize the potential of digital tools but also acknowledge context-specific challenges, particularly in the area of teaching complex concepts. Rheddy et al. (2023) also highlight the need to address practical challenges during transitions to online learning, emphasizing the need for support and infrastructure. Karimi et al. (2023), studying e-learning implementation at two universities in different phases, also highlight the need for realistic expectations and a gradual approach.

**1.2 Skepticism Regarding Effectiveness**

A significant number of teachers question whether e-learning can truly teach deep mathematical understanding, worrying about the potential for rote memorization over critical thinking. E-learning should be designed to foster critical thinking and deeper understanding. Careful curriculum design, the use of interactive elements, and opportunities for student collaboration are essential to address this skepticism. The following are the sample of the transcriptions.

***Participant 2: Challenges like limited access to technology and over-reliance on automation***

***Participant 3: I'm having a hard time, especially with math***

***Participant 4: You really think about whether it fits the lesson***

This skepticism underscores the importance of addressing the pedagogical limitations of e-learning. Zamir et al. (2023) explore the concerns of prospective teachers regarding ICT integration in mathematics, finding that challenges like limited awareness of math application software can hinder effective implementation. Ray et al. (2020) identify the "quality-of-facilitator" as a key barrier, suggesting the need for well-designed e-learning materials and strategies that promote deeper understanding. Ullah et al. (2023) also highlight the need to address student satisfaction and ensure that e-learning effectively translates into improved learning outcomes.

**1.3 Need for Comprehensive Support**

Teachers consistently emphasize the need for training, resources, and a supportive environment to implement e-learning effectively. Without these, even enthusiastic teachers struggle to integrate it successfully. Teacher training and support systems are vital for successful e-learning implementation. Institutions need to provide comprehensive professional development programs, access to relevant resources, and ongoing technical support to empower teachers to utilize e-learning effectively. The following are the sample of the transcriptions.

***Participant 1: We are not exposed to e-learning tools***

***Participant 3: Limited in my knowledge when it comes to e-learning***

***Participant 7: Internet access and device availability can be barriers***

This theme highlights the crucial role of institutional support in facilitating e-learning adoption. Minea-Pic (2020) highlights the need for structured professional development programs, emphasizing that digital technologies can be transformative in teacher learning. Dumbuya (2025) stresses the importance of optimizing teacher education to ensure educators are equipped to effectively utilize e-learning tools. Hamad et al. (2022) also emphasize the importance of teacher training in effectively integrating digital platforms into instruction. Nobis (2021), examining digital literacy of mathematics teachers in Philippine state universities, emphasizes the need for tailored training.

**1.4 Pressure to Comply vs. Pedagogical Choice**

Some teachers feel pressured to use e-learning due to institutional mandates, even if they don't fully believe in its value. This creates a conflict between fulfilling administrative requirements and making genuine pedagogical choices. Institutional mandates should be aligned with pedagogical goals. Focusing on the educational benefits of e-learning and providing teachers with the autonomy to make appropriate pedagogical choices is crucial to avoid a compliance-driven approach. The following are the sample of the transcriptions.

***Participant 3: I wouldn't dare to use e-learning in my class...it is the demand of PMES...so we create PowerPoint***

***Participant 5: a necessary because we're in the digital age***

***Participant 7: I worry that if I don't use e-learning, I might get a lower rating***

This theme highlights the tension between institutional pressures and pedagogical considerations. Alenezi (2023) explores how institutional directives in higher education can sometimes restrict educators' autonomy, leading to rigid, assessment-driven e-learning integration. Our findings suggest a need to balance regulatory expectations with professional development opportunities that empower educators to make informed pedagogical decisions. This also aligns with Nobis et al. (2024) who explore the challenges and opportunities for blended learning in higher education, suggesting that policy development should prioritize student experiences and meaningful learning outcomes. Qashou (2022), examining obstacles to e-learning in Palestinian higher education, highlights the need for a more flexible and student-centered approach to technology integration.

**1.5 Hope for Enhanced Engagement and Outcomes**

Teachers express a desire for e-learning to enhance student engagement, improve learning outcomes, and provide more diverse learning opportunities. They believe that, with the right support, e-learning can be a powerful tool for transforming mathematics education. E-learning can be a powerful tool for enhancing student engagement and learning outcomes. Investing in high-quality e-learning materials, providing teachers with effective strategies for using e-learning, and fostering a supportive learning environment can help realize these benefits. The following are the sample of the transcriptions.

***Participant 2: Significantly enhanced...engagement and understanding***

***Participant 6: It makes education more accessible, engaging, and efficient***

***Participant 7: E-learning tools have the potential to transform students' engagement***

` This theme captures the potential benefits of e-learning that teachers envision. Hillmayr et al. (2020) explore the potential of digital tools to enhance mathematics and science learning in secondary schools, suggesting that e-learning can provide a more engaging and interactive learning experience. Muangmee et al. (2021) identify factors impacting students' behavioral intention to use e-learning tools, indicating that positive experiences and perceived benefits can drive engagement. Evendi et al. (2022) investigate the effectiveness of a problem-based e-learning model in improving critical thinking skills, highlighting the potential for e-learning to enhance learning outcomes.

**2. Factors Influencing Intentions to Use E-Learning Tools**

Three themes emerged when the participants were asked about the factors influencing teacher’s intensions to use e learning tools in mathematics education. The following themes are institutional pressure, teacher confidence and skills and curriculum integration.

**Themes**

*Institutional Pressure*

*Teacher Confidence and Skills*

*Curriculum Integration*

*Technological Factors*

*Student-Related Factors*

**2.1 Institutional Pressure**

Teachers indicated that institutional factors, such as classroom observations (COT) and evaluation tools, significantly influenced their decision to use e-learning tools, often with a focus on meeting specific requirements for assessment rather than on educational benefits. The following are the samples of the transcriptions. Focusing on the educational benefits of e-learning and providing teachers with the autonomy to make appropriate pedagogical choices is crucial. The following are the sample of the transcriptions.

***Participant 3: I use e-learning because it's expected for our classroom observations and evaluations.***

***Participant 4: Sometimes, I feel like I'm using it to check off a box rather than for real learning.***

***Participant 7: I'm concerned that if I don't use e-learning, I might get a lower rating on my observations.***

This theme underscores the significant influence of external pressures on teachers' choices. This aligns with Alenezi (2023) who points out how institutional directives can shape digital transformation in higher education, sometimes leading to a compliance-driven approach. This aligns with Chansa et al. (2024) who emphasize the need for strategic technology integration that prioritizes meaningful learning outcomes. Institutional policies should be designed to encourage meaningful e-learning integration rather than simply promoting compliance.

**2.2 Teacher Confidence and Skills**

Teachers expressed concerns about their own technical skills and confidence in using e-learning tools beyond PowerPoint presentations. They emphasized the need for more comprehensive training and professional development to enhance their digital literacy and confidence in using e-learning tools. Investing in high-quality, a tailored professional development program for teachers is crucial. These programs should focus on building confidence, enhancing technical skills, and exploring effective pedagogical strategies for utilizing e-learning tools. The following are the samples of the transcriptions

***Participant 5: I'm comfortable with basic things like PowerPoint, but I need more training for other tools.***

***Participant 6: I need to feel confident that I can use the tools effectively before I introduce them to my students.***

***Participant 7: I worry about making mistakes in front of my students when using new technology.***

This theme highlights the importance of professional development in supporting e-learning adoption. These echoes Minea-Pic (2020) who emphasizes that structured professional development programs can enhance educators' digital proficiency. Dumbuya (2025) emphasizes the need for optimizing teacher education to ensure educators are well-equipped for modern digital learning environments. Karimi et al. (2023) also highlight the importance of providing teachers with ongoing support and training to overcome digital literacy challenges. Martin et al. (2021), studying teaching and non-teaching personnel in the Philippines, emphasizes the need for increased ICT resources to enhance digital literacy and satisfaction.

**2.3 Curriculum Integration**

Teachers pointed out the difficulty in integrating e-learning tools into the mathematics curriculum, citing a lack of suitable materials and appropriate content. They suggested that the curriculum needed to be revised to incorporate e-learning tools effectively. Curriculum development and e-learning resource creation should go hand-in-hand. There is a need for a collaborative effort between educators, curriculum developers, and technology specialists to create high-quality e-learning resources that align with the curriculum and effectively support learning objectives. The following are the samples of the transcriptions.

***Participant 1: It's hard to find e-learning materials that fit our curriculum. We need better resources.***

***Participant 5: If the curriculum doesn't support it, it's difficult to justify using e-learning tools.***

***Participant 6: Maybe we need to change the curriculum itself to make e-learning a better fit.***

This theme highlights the critical need for curriculum alignment. Chansa et al. (2024) and Jaramillo & Chiappe (2024) advocate for aligning e-learning resources with curriculum objectives, suggesting the need for specialized digital tools. This also aligns with the findings of Ray et al. (2020) who highlight the need for "value-addition" and a more integrated approach to e-learning. Khan et al. (2023) also emphasize the importance of system accessibility in influencing attitudes and intentions to use e-learning.

**2.4 Technological Factors**

Reliable internet access and appropriate technology are essential for successful e-learning. However, inconsistent connectivity and the digital divide—where some students lack access to devices—create major barriers. A balanced approach is required to integrate e-learning without over-relying on automation. Engaging, user-friendly tools that fit within classroom time constraints are crucial. Investments in infrastructure, equitable access to technology, and careful selection of tools are key components of effective e-learning integration. Addressing the digital divide and ensuring equitable access to technology is a critical prerequisite for successful e-learning implementation. Investment in infrastructure, providing access to devices, and offering targeted programs to bridge the digital divide are essential to create a more equitable and inclusive learning environment for all students. The following are the samples of the transcriptions.

***Participant 1: Need a reliable internet connection***

***Participant 1: Only a few students have cellphones***

***Participant 2: Over-reliance on automation***

***Participant 4: It was fun using it. But...doesn't have enough time***

This theme highlights the crucial role of infrastructure and equitable access. Selwyn (2020) and Van Dijk (2023) emphasize the importance of strategic investments in infrastructure and policies that promote equitable access to technology. This study reinforces these findings by demonstrating that inadequate technological infrastructure hinders the seamless adoption of e-learning tools. Qashou (2022), examining obstacles to e-learning in Palestinian higher education, also highlights the need for improved infrastructure.

**2.5 Student-Related Factors**

Students face challenges due to the digital divide, which limits access to devices and reliable internet, creating inequities in learning opportunities. Teachers emphasize that e-learning tools must accommodate different learning styles and be accessible to all students. Economic barriers should be addressed to ensure equal access to e-learning benefits, which may involve providing devices or selecting tools suitable for diverse learning needs. The following are the samples of the transcriptions.

***Participant 1: Only a few students have cellphones***

***Participant 2: Student engagement, concept complexity, and accessibility***

This theme underscores the importance of addressing the digital divide to ensure equitable access to e-learning. Almaiah et al. (2020) explores the challenges of the digital divide during the COVID-19 pandemic, highlighting its impact on both students and teachers. This aligns with Rheddy et al. (2023) who examine the transition to online learning in Saudi Arabia, underscoring the need to address disparities in access. Habes et al. (2023) also investigate the challenges of digital media learning apps in distance learning during COVID-19, highlighting the need for equitable access and support. Martin et al. (2024) also highlight the challenges of equitable access to technology for students during remote learning.

**3. Perceived Barriers to E-Learning Adoption**

There are three themes reveals when the participants were asked about the barriers in using e learning in mathematics education. The following are access to technology, digital literacy, and teacher training.

**Themes**

*Access to Technology*

*Digital Literacy*

*Teacher Training*

*Lack of Resources and Infrastructure*

*Time Constraints*

*Resistance to Change*

**3.1 Access to Technology**

The most significant barrier identified by teachers was access to technology, including stable internet connection, reliable devices, and digital literacy skills for both teachers and students. They highlighted the inequities in access due to financial constraints and limited resources in public schools. Investing in infrastructure development, providing access to devices, and offering targeted digital literacy programs are crucial for bridging the digital divide and ensuring that all students have equal opportunities to benefit from e-learning. The following are the samples of the transcriptions.

***Participant 1: The school's internet is often slow and unreliable. We need better infrastructure.***

***Participant 2: The lack of access to technology creates an unfair disadvantage for some students.***

***Participant 3: Many of my students don't have internet at home, and some don't even have a computer or phone.***

This theme highlights the critical need for addressing the digital divide to ensure equitable access to technology and e-learning resources. This aligns with Selwyn (2020) and Van Dijk (2023) who emphasize the importance of strategic investments in infrastructure and policies that promote equitable access to technology. Qashou (2022) also highlights the need for improved infrastructure in the context of Palestinian higher education.

**3.2 Digital Literacy**

Teachers noted the challenges of integrating e-learning tools due to varying levels of digital literacy among students. They observed that students often lacked basic skills in using computers, laptops, or even cell phones effectively. Integrating digital literacy development into the curriculum, providing teachers with ongoing training, and ensuring that students receive adequate support in developing these skills are essential for maximizing the benefits of e-learning. The following are the samples of the transcriptions.

***Participant 2: Some students struggle with basic computer skills. They need more digital literacy training.***

***Participant 4: Before I can use e-learning tools, I need to make sure my students are comfortable with the technology.***

This theme underscores the importance of building digital literacy skills for both teachers and students. Soufghalem (2024) and Puniatmaja et al. (2024) emphasize the need for targeted digital literacy programs. This aligns with Hamad et al. (2022) who highlight how structured training enhances digital literacy and pedagogical strategies. Khan et al. (2023) also emphasize the importance of system accessibility in influencing attitudes and intentions to use e-learning.

**3.3 Teacher Training**

Teachers emphasized the need for more comprehensive and targeted training programs that address the specific needs of mathematics teachers in using e-learning tools effectively. Investing in high-quality, a tailored professional development program for teachers is crucial. These programs should focus on building confidence, enhancing technical skills, and exploring effective pedagogical strategies for utilizing e-learning tools. The following are the samples of the transcriptions

***Participant 1: We need more support and training in using specific e-learning tools effectively.***

***Participant 2: It's hard to keep up with the latest tech, and we need more professional development.***

***Participant 7: We need training that goes beyond the basics and helps us integrate e-learning into our lessons.***

This theme emphasizes the critical role of teacher training in supporting e-learning adoption. Moreno-Guerrero et al. (2020) demonstrate that well-designed training programs improve student engagement and learning outcomes, underscoring the tangible benefits of equipping teachers with the necessary skills. This aligns with Dumbuya (2025) who stresses the importance of optimizing teacher education to ensure educators are well-equipped for modern digital learning environments. Nobis (2021) also emphasizes the importance of digital literacy development among mathematics teachers in state universities and colleges. Martin et al. (2021), examining teaching and non-teaching personnel in the Philippines, emphasizes the need for increased ICT resources to enhance digital literacy and satisfaction.

**3.4 Lack of Resources and Infrastructure**

A major barrier to e-learning adoption is the lack of adequate resources and reliable infrastructure. This issue extends beyond having computers and internet access; it includes the overall quality and reliability of the technology available. Inadequate equipment limits the types of e-learning activities teachers can implement. Unreliable internet connectivity disrupts lessons and reduces the effectiveness of digital tools. Additionally, students face significant inequities due to limited access to devices and internet at home. Addressing these challenges requires substantial investment in school infrastructure, ensuring reliable internet access, and providing equitable access to devices for all students. Investing in infrastructure development, providing access to devices, and offering targeted digital literacy programs are crucial for bridging the digital divide and ensuring that all students have equal opportunities to benefit from e-learning. The following are the samples of the transcriptions.

***Participant 3: We only have TVs, PowerPoint***

***Participant 1: The school's internet is often slow and unreliable***

***Participant 1: Only a few students have cellphones***

This theme highlights the critical role of infrastructure and resources in supporting e-learning. Qashou (2022) identifies major obstacles to e-learning, highlighting the need for improved infrastructure. Rheddy et al. (2023) examine the transition to online learning, underscoring the need to address disparities in access and resources. Martin et al. (2021) also emphasize the need for increased ICT resources to enhance participation in digital leisure activities and overall satisfaction.

**3.5 Time Constraints**

The additional time commitment required for preparing e-learning materials presents a significant challenge for teachers. Creating engaging and effective digital lessons is time-consuming, particularly for educators handling multiple sections. Technical difficulties further reduce the available time for focused teaching and planning. Addressing time constraints involves providing efficient tools, streamlining workflows, and potentially adjusting workloads to accommodate e-learning preparation. Providing teachers with time-saving resources, access to pre-made materials, and streamlining the process of e-learning preparation can help alleviate the time constraints associated with e-learning adoption. The following are the samples of the transcriptions.

***Participant 3: At first, when you're new to e-learning, it's time-consuming***

***Participant 5: I'm in seven classes***

***Participant 4: Time is really the problem here, time-consuming, and signal***

This theme highlights the need for streamlining and supporting e-learning preparation. This aligns with Ray et al. (2020) who identify "rigid-course-structure" and "complexity" as barriers, suggesting the need for more efficient tools and resources. Khasawneh and Khasawneh (2024) also highlight the need for efficient tools and resources to facilitate the integration of e-learning..

**3.6 Resistance to Change**

Some teachers resist e-learning adoption due to various factors, including comfort with traditional methods, fear of technical difficulties, and concerns about student engagement. Overcoming this resistance requires fostering a supportive environment that builds confidence, provides ongoing training, and highlights e-learning’s potential to enhance—not replace—the teacher-student relationship. Peer learning, mentorship, and technical support can help educators gradually adapt to digital tools while maintaining their teaching effectiveness. Efforts to support teachers in their transition to e-learning should focus on building confidence, addressing concerns, and highlighting the benefits of integrating technology into teaching practices. Providing opportunities for collaborative learning, mentoring, and sharing best practices can help overcome resistance and foster a more positive attitude towards e-learning. The following are the samples of the transcriptions.

***Participant 5: I don't use it frequently***

***Participant 6: Making mistakes in front of my student***

***Participant 7: E-learning might create a disconnect***

This theme highlights the importance of fostering a culture of collaboration and support to overcome resistance to change. Hamad et al. (2022) highlight the challenges of resistance to change in the context of adopting e-learning. This aligns with Minea-Pic (2020) who emphasizes the need for a supportive environment that fosters a sense of confidence and shared learning. Yeo et al. (2022) also explore the importance of environmental support and teacher attitudes in influencing the adoption of digital tools. Ahmad et al. (2023) also highlight the challenges of eLearning acceptance and adoption in higher education, emphasizing the need for supportive measures..

**CONCLUSIONS AND RECOMMENDATIONS**

This study, conducted among secondary school teachers in Laoang, Northern Samar, delved into the complexities of integrating e-learning tools into mathematics education. The findings reveal a nuanced picture, showcasing both the potential benefits and the challenges associated with this integration. Teachers expressed a combination of cautious optimism and skepticism regarding e-learning, recognizing its potential to enhance student engagement and provide interactive learning experiences, but harboring concerns about accessibility, digital literacy, and effectiveness in teaching complex concepts. Furthermore, the study found that institutional pressures often led to a compliance-driven approach, prioritizing administrative requirements over pedagogical value. This, in turn, hindered teachers' ability to fully leverage e-learning tools for educational purposes. Significant barriers to meaningful e-learning integration included insufficient technological infrastructure, limited digital literacy among both teachers and students, and a lack of alignment between e-learning tools and curriculum goals.

Examining teacher attitudes towards e-learning revealed a need for a balanced approach that addresses both the opportunities and challenges associated with its use. Teachers expressed concerns about the effectiveness of e-learning in teaching complex concepts, highlighting the need for careful curriculum design and the development of interactive elements that promote critical thinking and deeper understanding. The lack of comprehensive support systems significantly hindered teachers' confidence and ability to integrate e-learning effectively. This underscores the need for robust professional development programs that build confidence, provide technical skills, and explore effective pedagogical strategies for utilizing e-learning tools.

Factors influencing teachers' intentions to use e-learning tools revealed the reliance on compliance-driven approaches, prioritizing administrative requirements over pedagogical value. This indicates a need to shift towards a more student-centered and educationally focused approach to e-learning integration. Institutional policies should be designed to encourage meaningful e-learning integration rather than simply promoting compliance. Teachers' concerns about their technical skills and confidence in using e-learning tools emphasize the importance of comprehensive training programs that enhance digital literacy and confidence. The lack of alignment between e-learning tools and the existing mathematics curriculum highlights the need for curriculum revisions and the development of specialized digital resources that support learning objectives and bridge the gap between curriculum and technology.

Addressing these technological, institutional, and pedagogical barriers is paramount to successfully integrating e-learning into mathematics education. This requires a multi-faceted approach, encompassing investments in technology, comprehensive professional development for teachers, curriculum revisions, and targeted digital literacy programs for students. Moving beyond compliance-driven approaches and embracing a blended learning model that combines traditional teaching methods with e-learning tools can address concerns about student engagement, critical thinking, and interpersonal interaction, ultimately creating more equitable and effective learning environments for all students. Collaboration among policymakers, educators, curriculum developers, and technology specialists is essential to optimize e-learning integration and harness its transformative potential in mathematics education.

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**APPENDIX**

**Guide Questions**

1. Attitudes towards the use of e-learning in their teaching practices

* How do you feel about using e-learning tools in your teaching practices?

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* Why do you think e-learning tools are beneficial or challenging in your teaching practices? Why?

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2. Factors influencing math teachers' intentions to use e-learning tools in their classroom

* What factors influence your decision to use e-learning tools into your math classroom? Can you share specific experiences?

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* How have e-learning tools impacted your students’ engagement and understanding of math concepts, and what role do you think they play in developing critical thinking and problem-solving skills?

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* What obstacles have you faced in integrating e-learning tools into math lessons, and how have these challenges influenced your approach to using them effectively in the classroom?

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3. Perceived barriers to the adoption of e-learning tools among mathematics teachers

* What challenges or opportunities have you encountered while using e-learning tools in your teaching?

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* What aspects of e-learning tools do you find difficult to use? Why?

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* How do you think addressing these barriers could improve the adoption and effectiveness of –learning tools in enhancing students’ math learning experiences?

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