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Teachers' Digital Competence, Readiness and Challenges in the 21st Century Education

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Abstract—This study examined the level of teachers' digital competence, readiness, and the challenges they face in delivering 21st-century education. The research was conducted among public elementary school teachers in Zamboanga City and utilized a descriptive-quantitative research design. This approach was employed to gain a deeper understanding of the experiences, perceptions, and challenges encountered by teachers in integrating technology into 21st-century education. Findings revealed that the level of teachers' digital competence is generally rated as "Competent" in terms of device operation, internet navigation, and creating materials or lessons using digital tools. Similarly, the level of teachers' digital readiness was rated as "Agree" in terms of access to technology, although this was influenced by factors such as unreliable internet connectivity. Respondents "Strongly Agreed" in terms of basic digital literacy, and "Agreed" regarding the use of digital tools in teaching. The study also revealed that teachers face challenges in delivering 21st-century education through the use of technology. These challenges are attributed to several factors affecting the quality of instruction, including lack of access to resources, insufficient training, and limited preparation time. Statistical analysis showed a significant difference in the level of teachers' digital competence when grouped according to age, training, and years of teaching experience. Furthermore, teachers' digital readiness also showed a significant difference when grouped by age and years of experience, while no significant difference was observed in terms of training. These findings suggest that while teachers are generally prepared and competent in using digital tools, there remain gaps that must be addressed through sustained professional development, improved infrastructure, and differentiated support systems. The study highlights the importance of continuous investment in teacher training and school technology resources to ensure effective implementation of 21st-century teaching practices.

***Index Terms*—Digital Competence, Digital Readiness, Digital Challenges, 21st Century Education, Digital Tools, Technologies.**

1. Introduction

In today's rapidly changing world of education, using digital technology in the classroom has become more important than ever. As schools move toward more modern and student-centered ways of teaching, teachers are expected to do more than just deliver lessons -- they now use digital tools to connect with students, share content, encourage teamwork, and assess learning in new ways. But having access to technology isn't enough. Teachers also need the skills and confidence to use it effectively, which means being digitally competent and ready to adapt to new teaching approaches.

Teachers' digital competence, readiness, and challenges they face play a vital role in shaping 21st-century education. Digital competence refers to the teacher's ability to use digital tools and technologies to enhance teaching and learning, including skills and basic knowledge in technologies, creating material or lessons, and also integrating multimedia content. Readiness, on the other hand, reflects the psychological, technical, and pedagogical preparedness of teachers to adopt and adapt to innovative teaching approaches in a digital environment. This includes their willingness to engage with technology and their confidence in using the tools and implementing them in their teaching and learning process. Lastly, the challenges encompass various barriers that hinder effective technology integration, such as limited access to infrastructure, insufficient training, lack of institutional support, and resistance to change. Together, these variables significantly influence how well teachers can embrace and implement 21st-century educational practices in their classrooms.

The effective implementation of digital tools in the 21st-century education is reflected on how well teachers can apply innovative teaching methods that promote digital literacy, creativity, problem solving, and communication among students. It also encompasses the transformation of traditional classrooms into dynamic, interactive learning environments aligned with global educational standards. The success of this implementation depends largely on how equipped and prepared teachers are to embrace and adapt to the demands of 21st-century learning.

The correlation between the teachers' digital competence, readiness, and challenges and the implementation of 21st-century education can be understood in terms of how each factor influences the success and effectiveness of modern educational practices in the classroom. Teachers with high digital competence are more likely to integrate technology effectively into their instruction, which enhances student engagement and supports the goals of 21st-century education. Similarly, when teachers demonstrate a high level of readiness, including confidence, motivation, and preparedness to use digital tools, they are more inclined to adopt innovative teaching strategies. On the other hand, the presence of

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significant challenges, such as lack of resources, insufficient training, or institutional constraints, can negatively impact the implementation process, even if teachers are digitally competent or ready.

Therefore, when teachers are confident and skilled in using digital tools and feel truly prepared to bring technology into their classrooms, they're more likely to succeed in applying 21st-century teaching practices. On the other side, when they face too many obstacles, like lack of training or resources, it becomes much harder for them to make those modern approaches work. So, the better equipped and supported teachers are, the smoother and more effective the shift to 21st-century education tends to be.

In the local context, many efforts have been made to bring in digital tools and modern teaching methods. However, not all teachers feel confident or prepared to use them. Some lack training, face technical problems, or don't get enough support. Despite these issues, there are very few studies that look closely at how these factors affect the use of 21st-century education in our local area. Most research focuses on other places or gives a general view, without showing the real situation in our schools. This study aims to fill that gap by looking at how teachers' digital skills, readiness, and challenges influence the way they apply 21st-century teaching in classrooms.

2. Statement of the Problem

1. What is the level of teacher's digital competence in providing 21st Century Education in terms of:
    1. device operation
    2. internet navigation
    3. creating materials/lesson using digital tools
2. What is the level of teacher's digital readiness in providing 21st Century Education in terms of:
    1. access to technology
    2. basic digital literacy
    3. use of digital tools in teaching
3. What are the challenges encountered by the teachers in providing 21st century education?
4. Is there a significant difference in the level of teachers digital competence when variables are grouped according to:
    1. Age
    2. Training
    3. length of service
5. Is there a significant difference in the level of teachers digital readiness when variables are grouped according to:
    1. Age
    2. Training
    3. length of service

3. Scope and Limitation of the Study

This study focuses on assessing the digital competence, readiness, and challenges encountered by teachers in integrating technology into 21st-century education at Mercedes Central School. It aims to determine the level of digital skills among the teachers, evaluate their preparedness to utilize digital tools in teaching, and identify the common barriers they face in adapting to modern educational demands. Specifically, the study seeks to: (1) assess the digital competence of teachers at Mercedes Central School; (2) determine their level of readiness in integrating digital technology into their teaching practices; and (3) identify the challenges they encounter in utilizing digital tools for teaching and learning.

This research will be conducted within the premises of Mercedes Central School which is located along Socorro Street in Barangay Mercedes, Zamboanga City, is a public elementary institution that has played a significant role in the educational development of the region. Established in 1920, the school has been instrumental in providing quality education to the local community for over a century. It is situated 12.9 km from the city proper.

Mercedes Central School has a population of 2,641 learners for this school year, 2024-2025, 7 non-teaching staff, and 73 teachers as the total population of the study. There are also 52 classrooms and 4 facilities, which include the library, the principal and supervisor's offices, feeding facilities, and a covered court.

The respondents are the 73 teachers in Mercedes Central School in which this study will use survey questionnaires as the primary data-gathering tool to obtain teachers' perceptions and experiences regarding digital education for the school year 2024-2025.

4. Methodology

This study utilized a descriptive research design to investigate the level of teachers' digital competence, their readiness to implement technology in the classroom, and the challenges they encounter in the context of 21st-century education. The descriptive approach was deemed appropriate as it allowed the researcher to gather accurate and detailed information about the current conditions and practices of teachers without manipulating any variables. This design enabled the systematic collection and analysis of data related to teachers' experiences, perceptions, and preparedness in using digital tools for teaching and learning. By employing this method, the study aimed to provide a factual and comprehensive picture of how teachers adapt to modern educational demands and to identify areas that require support or intervention. The results derived from this design serve as a foundation for developing evidence-based recommendations to enhance digital integration in basic education.

A. Participation of the Study

The respondents of this study were the 70 teachers currently employed at Mercedes Central School. These respondents are selected to participate due to their involvement in the teaching and learning process, making them well-positioned to provide relevant insights in the digital competence, readiness, and challenges in 21st-century education. The input from these educators are crucial in understanding how digital tools are integrated into teaching practices, the preparedness of teachers in adopting new technologies, and the specific barriers they encounter in doing so.

B. Sampling Procedure

This study employed convenience sampling to select participants from the population of teachers at Mercedes Central School. As of the moment, there are 15 respondents completed the survey. Convenience sampling was chosen due to time constraints and the accessibility of the respondents during the data collection period. This will allow the researcher to gather data from individuals who were readily available and willing to participate. While this method will not guarantee full presentation of the entire population, it provided practical and timely access to relevant data that support the study's objectives on teacher digital competence, readiness, and challenges in 21st-century education.

C. Research Instrument

The primary instrument used in this study was a survey questionnaire designed to collect data on teachers' digital competence, readiness, and the challenges they encounter in integrating technology into teaching in the context of 21st-century education.

The questionnaire consisted of four parts:

Part I - Demographic Profile. This section will gather basic information of the respondents, such as age, training attended on digital technology, and year of teaching experience.

Part II - Digital Confidence. This section will assess teacher's digital confidence in providing 21st Century Education in terms of one's computer skills, device operation, internet navigation and creating material/lesson.

Part III - Digital Readiness. This part of the questionnaire focuses on assessing the level of teacher's digital readiness in providing 21st Century Education in terms of access to technology, basic digital literacy, use of digital tools in teaching.

Part IV - Challenges in Digital Integration. This portion will identify the obstacles faced by teachers in implementing digital tools in the 21st-century education.

The survey employed a Likert scale (e.g., 1 – Strongly Disagree to 5 – Strongly Agree) to quantify attitudes and perceptions. The instrument was validated by a panel of experts in the fields of education and educational technology to ensure its content validity, clarity, and reliability before being administered to the respondents.

D. Data Gathering Procedure

The data gathering process was conducted after securing the necessary permission from the school head of Mercedes Central School. First, a formal letter of request was submitted to the school principal to seek permission to conduct the study. Upon approval, school head granted and identified appropriate time for distributing the survey to ensure minimal disruption to the teachers as the respondents. Teacher respondents were also given a letter consent.

Before administering the instrument, the researcher explained the purpose of the study to the respondents and ensure them of the confidentiality of their responses, and they were informed that their participation is voluntary. The survey questionnaires were distributed in printed form and were completed by the respondents during their most convenient time.

After the completed questionnaires were collected, the data were reviewed for completeness and accuracy. The responses were then encoded, organized, and prepared for statistical analysis.

5. Results and Discussion

This chapter discusses the results of the study after the collection of data. It also provides the data analysis and interpretation of the study.

Problem 1: What is the Level of Teacher's Digital Competence in Providing 21st Century Education in Terms of:

1. device operation
2. internet navigation
3. creating materials/lesson using digital tools

Table 1
Level of teachers' digital competence in providing 21st century education in terms of device operation

Statement	Mean	Description
Word Processor (e.g. MS word)	3.16	Competent
Spreadsheets (e.g. excel)	2.76	Competent
Presentations (e.g. powerpoint)	3.18	Competent
Email	3.20	Competent
Search Engines	2.86	Competent
Video editing	2.58	Competent
Watching videos / listening to audios	3.40	Competent
Digital quizzes or polls	2.62	Competent
Interactive apps or games	2.74	Competent
Digital audio	2.90	Competent
Overall Mean/Description	**2.94**	**Competent**

Legend: Highly Competent (4.0 – 3.25); Competent (3.24 – 2.50); Less Competent (2.49 – 1.75); Not Competent (1.74 – 1.0)

Table 1 presents the data on teachers' competence in operating digital devices. The findings indicate that teachers are generally competent in this area, as evidenced by the overall mean score of 2.94. Among the specific skills assessed, watching videos/listening to audio received the highest mean score of 3.40, suggesting a strong level of competence. Conversely, video editing obtained the lowest mean of 2.58, although it still falls within the "competent" category.

Teachers also demonstrated competence in other digital tasks, including using email (M = 3.20), creating presentations (M = 3.18), word processing using software such as MS Word (M = 3.16), listening to digital audio (M = 2.90), navigating search engines (M = 2.86), using spreadsheets (M = 2.76), utilizing interactive apps or games (M = 2.74), and administering digital quizzes or polls (M = 2.62).

These results suggest that elementary teachers possess a competent level of digital device operation. However, while their current competencies are adequate, there is a need to enhance their skills further to maximize the potential of digital technologies. This is essential not only to address the demands of 21st-century education but also to foster more engaging and interactive teaching and learning experiences.

Table 2
Indices on the level of teachers' digital confidence in providing 21st century education in terms of device operation

Mean	Description
1.00 – 1.75	Disagree
1.76 – 2.50	Moderately Agree
2.51 – 3.25	Agree
3.26 – 4.00	Strongly Agree

Table 3 presents the teachers' self-assessed competence in navigating the Internet in support of 21st-century education. The overall mean score is 3.37, interpreted as "strongly agree," suggesting that teachers generally perceive themselves as competent in this area. The lowest mean score, 3.24, was recorded for the statement, "I use the Internet extensively and competently," which is interpreted as agree. In contrast, higher mean scores were observed for the following statements: "I use different Internet sites and search strategies to find and select a range of different digital resources" (M = 3.44), "I look for information online using a search engine" (M = 3.44), "I am confident in downloading and organizing online materials for lessons" (M = 3.40), and "I can teach students how to search for information responsibly online" (M = 3.32).

These findings indicate that while teachers are confident in basic Internet navigation and information retrieval, their lower agreement with extensive and competent internet use may reflect limited familiarity with more advanced digital tools such as online learning platforms, collaborative applications, or instructional technology systems. Factors such as limited access to digital infrastructure or insufficient professional development may also contribute to this gap. Overall, the data suggest that teachers are competent in navigating the Internet and show readiness to enhance their digital practices, particularly if provided with targeted support and ongoing training.

Table 4 presents the teachers' perceived competence in providing 21st-century education in terms of creating materials or lessons using digital tools, with an overall mean score of 3.16, interpreted as agree. Teachers strongly agreed with the following statements: "I can produce simple digital content (e.g., text, tables, images, audio files) in at least one format using digital tools" (M = 3.30), "I can guide my students in using digital tools safely and effectively" (M = 3.28), and another similarly worded item on producing simple digital content (M = 3.26). On the other hand, the statements "I use digital assessment formats to monitor student progress" (M = 3.00) and "I create my own digital resources and modify existing ones to adapt them to my needs" (M = 2.96) received slightly lower ratings, indicating agreement but not strong agreement.

These findings suggest that while teachers demonstrate competence in performing basic digital tasks and content creation, they are less confident in using digital tools for assessment and in customizing or developing their own digital instructional materials. This highlights a need for further training in the integration of more advanced digital tools, particularly in the areas of formative assessment and resource development. Enhancing these skills would enable teachers to better tailor instruction to student needs and more effectively monitor learning progress. Overall, the results indicate that teachers currently use digital technologies for basic instructional purposes, and professional development is necessary to expand their digital competence to more complex and pedagogically driven applications.

Table 3
Level of teachers' digital competence in providing 21st century education in terms of internet navigation

Statement	Mean	Description
I use different Internet sites and search strategies to find and select a range of different digital resources	3.44	Strongly Agree
I use the Internet extensively and competently	3.24	Agree
I can look for information online using a search engine.	3.44	Strongly Agree
I am confident downloading and organizing online materials for lessons.	3.40	Strongly Agree
I can teach students how to search for information responsibly online.	3.32	Strongly Agree
Overall Mean/Description	**3.37**	**Strongly Agree**

Legend: Disagree (1.-1.75); Strongly Disagree (1.76-2.50); Agree (2.51-3.25); Strongly agree (3.26-4)

Table 4
Level of teachers' digital competence in providing 21st century education in terms of creating materials/lesson using digital tools

Statement	Mean	Description
I create my own digital resources and modify existing ones to adapt them to my needs	2.96	Agree
I use digital assessment formats to monitor student progress	3	Agree
I can produce simple digital content (e.g. text, tables, images, audio files) in at least one format using digital tools	3.30	Strongly Agree
I can effectively integrate digital tools into my lessons.	3.26	Strongly Agree
I can guide my students in using digital tools safely and effectively.	3.28	Strongly Agree
Overall Mean/Description	**3.16**	**Agree**

Legend: Disagree (1.-1.75); Strongly Disagree (1.76-2.50); Agree (2.51-3.25); Strongly agree (3.26-4)

Table 5
Level of teachers' digital readiness in providing 21st century education in terms of access to technology

Statements	Mean	Description
1. I carry a mobile device that connects to the internet wherever I go	3.58	Strongly Agree
The internet connection of the institution is reliable and fast	2.58	Agree
Teachers have regular access to functioning digital devices such as laptops, tablets, or desktops	3.22	Agree
Interactive whiteboards, projectors, or similar presentation media are available in my teaching rooms	2.58	Agree
The internet connection of the institution is reliable and fast	2.76	Agree
Overall Mean/Description	**2.94**	**Agree**

Legend: Disagree (1.-1.75); Moderately agree (1.76-2.50); Agree (2.51-3.25); Strongly agree (3.26-4)

Problem 2: What is the Level of Teacher's Digital Readiness in Providing 21st Century Education in Terms of:

1. access to technology
2. basic digital literacy
3. use of digital tools in teaching

Table 5 presents the teachers' digital readiness in providing 21st-century education in terms of access to technology, with an overall mean score of 2.94, interpreted as agree. The highest mean score was recorded for the statement "I carry a mobile device that connects to the Internet wherever I go" (M = 3.58), indicating that the majority of teachers rely on mobile devices for internet access due to their convenience and accessibility. Meanwhile, respondents also agreed with the following statements: "Teachers have regular access to functioning digital devices such as laptops, tablets, or desktops" (M = 3.22), "The internet connection of the institution is reliable and fast" (M = 2.76), and two of the lowest-rated items: "The internet connection of the institution is reliable and fast" and "Interactive whiteboards, projectors, or similar presentation media are available in my teaching rooms", both with a mean score of 2.58.

These results suggest that while teachers have access to basic digital tools, significant challenges remain regarding institutional infrastructure. Factors such as unreliable internet connectivity, limited availability of digital resources, and lack of functional presentation equipment negatively impact teachers' digital readiness. These limitations hinder the full integration of technology into the teaching-learning process. Given the increasing reliance on digital platforms in 21st-century education, addressing these gaps is crucial to ensure teachers can effectively deliver quality, learner-centered, and technology-enhanced instruction. Therefore, improving access to reliable internet and modern digital tools is essential to support teacher readiness and enhance the overall educational experience.

Furthermore, these infrastructure challenges may affect not only instructional delivery but also lesson preparation, digital assessment practices, and student engagement, especially in technology-reliant activities. The results emphasize the need for schools and education authorities to invest in improving digital infrastructure by providing up-to-date devices, high-speed internet connectivity, and functional multimedia teaching tools. In doing so, teachers can better transition from basic digital use to more advanced and interactive technology integration that promotes collaboration, creativity, and critical thinking among learners.

Overall, while teachers exhibit digital readiness through personal initiative and device ownership, their institutional environments require significant upgrades to fully support 21st-century teaching and learning. Addressing these gaps is essential to equip teachers not only with the tools but also the confidence and capability to deliver quality, inclusive, and technology-enhanced education.

Table 6 shows that respondents strongly agree that teachers are ready and knowledgeable in basic digital literacy in delivering 21st-century education, with an overall mean score of 3.43. The following statements received strong agreement from respondents: "I am competent in using word processing software (e.g., MS Word)" (M = 3.60), "I can download files from the Internet and upload files to email" (M = 3.48), "I use social media (e.g., Facebook, Instagram) to communicate with my students" (M = 3.46), "I am competent in using presentation software such as PowerPoint, Google Slides, or Canva" (M = 3.34), and "I am competent in using email" (M = 3.28), which was the lowest among the strongly agreed items.

These results indicate that teachers possess the foundational skills and knowledge required to utilize basic digital tools, suggesting a high level of digital readiness in the context of 21st-century education. Proficiency in word processing, email communication, file management, and presentation software reflects a solid grounding in essential digital competencies. The use of social media platforms for student communication further indicates teachers' adaptability and willingness to engage with learners in modern, digital environments.

The findings also highlight the importance of equipping teachers with basic digital literacy, as it serves as a crucial foundation for integrating more advanced technologies into classroom instruction. In an era where education continuously evolves alongside technological advancements, it is essential for teachers to adapt to these changes to enhance instructional

Table 6
Level of teachers' digital readiness in providing 21st century education in terms of basic digital literacy

Statements	Mean	Description
I am competent in using email	3.28	Strongly Agree
I am competent in using word processing software (e.g. MS Word)	3.60	Strongly Agree
I can download files from the Internet and upload files to email	3.48	Strongly Agree
I use social media (e.g. Facebook, Instagram) to communicate with my students	3.46	Strongly Agree
I am competent in using presentations software such as PowerPoint, Google Slides, Canva	3.34	Strongly Agree
Overall Mean/Description	**3.43**	**Strongly Agree**

Legend: Disagree (1.-1.75); Moderately agree (1.76-2.50); Agree (2.51-3.25); Strongly agree (3.26-4)

Table 7
Level of teachers' digital readiness in providing 21st century education in terms of use of digital tools in teaching

Statements	Mean	Description
I can design online quizzes and use them in teaching my classes such as Google Forms, Kahoot!, or LMS-based quizzes	2.82	Agree
2. I am familiar with how to integrate technology in to the classroom	3.36	Strongly Agree
3. The use of digital technologies help teachers to improve teaching with more updated materials	3.46	Strongly Agree
4. I use digital technologies for students to participate in classes actively	3.10	Agree
5. I am aware of the great opportunities that digital technologies offer for effective teaching	3.52	Strongly Agree
Overall Mean/Description	**3.25**	**Agree**

Legend: Disagree (1.-1.75); Moderately agree (1.76-2.50); Agree (2.51-3.25); Strongly agree (3.26-4)

delivery, promote learner engagement, and foster interactive, student-centered learning experiences. Overall, the data support the conclusion that teachers are digitally prepared at a basic level and are well-positioned to further develop their competencies to meet the increasing demands of technology-enhanced education.

Table 7 presents the teachers' level of digital readiness in utilizing digital tools for instruction. The data reveal an overall mean of 3.25, which corresponds to the interpretation "Agree." The highest-rated statements, with responses interpreted as "Strongly Agree," include: "I am aware of the great opportunities that digital technologies offer for effective teaching" (mean = 3.52); "The use of digital technologies helps teachers improve teaching with more updated materials" (mean = 3.46); and "I am familiar with how to integrate technology into the classroom" (mean = 3.36). Meanwhile, the statement "I use digital technologies for students to participate in classes actively" received a mean score of 3.10, indicating agreement among respondents. The lowest-rated item, with a mean of 2.82, was "I can design online quizzes and use them in teaching my classes, such as Google Forms, Kahoot!, or LMS-based quizzes," which still falls within the "Agree" interpretation.

The results indicate that teachers believe the use of digital technology significantly supports their ability to explore various teaching strategies and deliver more effective instruction to address learners' needs. Furthermore, the findings suggest that while teachers are capable of integrating technology into classroom instruction, many are not yet prepared to create their own online quizzes or interactive applications that could enhance the teaching and learning experience. Several factors contribute to this limited implementation. These include the lack of essential infrastructure such as reliable internet connectivity, inadequate access to digital devices, and the absence of institutional support or technical assistance. Additionally, some teachers have not received sufficient professional development or training in the use of educational technologies, which affects their confidence and competence in applying these tools effectively in classroom settings. Time constraints, resistance to change, and lack of motivation are also cited in previous studies as barriers to digital integration. To address these challenges, it is crucial to provide ongoing training, invest in digital infrastructure, and foster a supportive environment that encourages innovation and the effective use of technology in education.

A. Problem 3: What are the Challenges Encountered by the Teachers in Providing 21st Century Education?

Table 8 reveals that teachers face challenges in delivering 21st-century education through the use of digital technologies, with an overall mean of 2.74. This indicates that teachers are experiencing difficulties adapting to the rapid shift, particularly in integrating digital tools into their teaching practices, which may, in turn, impact the quality of education in the 21st century. The results also show that the statement "Digital technology is unreliable" received the lowest mean of 2.48, suggesting that this is the least challenging aspect. This implies that most schools are already equipped with advanced technologies that are accessible and reliable for both teaching and learning. In the present time, people—especially teachers—tend to rely on technology to accomplish tasks more efficiently. The use of digital tools not only simplifies instructional tasks but also enhances the interactivity and enjoyment of the teaching and learning process.

The following statements highlight the challenges teachers face in utilizing digital technologies in 21st-century education. The highest-rated challenge is "Lack of funding," with a mean of 3.18, followed by "Support from administrators" (mean = 3.06), and "Lack of technical support" (mean = 2.74). Other challenges include "Integrating technology into instructional practices" (mean = 2.70), as well as "Not enough time to prepare for using digital technology" and "Lack of professional development on how to integrate technology," both with a mean of 2.68. Additionally, the statements "I don't know how skilled my students are at using technology" (mean = 2.64), "Knowledgeable in using technology," and "Lack of access to digital technologies" (both with a mean of 2.62) further indicate areas where teachers experience difficulties. These findings suggest that multiple factors—ranging from institutional support to personal readiness—contribute to the challenges in effectively implementing digital tools in the classroom.

This result implies that several factors influence teachers' access to technology, which significantly impacts the delivery of quality education. These factors are evident across educational institutions and should be carefully taken into consideration. As technology continues to evolve, it is essential that teachers are also equipped with the necessary skills and competencies to effectively use these tools in addressing the diverse educational needs of all learners. Therefore, continuous professional development, institutional support, and investment in digital infrastructure are crucial in empowering teachers to

Table 8
Level of challenges encountered by the teachers in providing 21st century education

Statements	Mean	Description
Digital technology is unreliable	2.48	Less Challenged
Knowledgeable in using technology	2.62	Challenged
Integrate technology into teaching instruction	2.70	Challenged
No enough time to prepare for using digital technology	2.68	Challenged
5. Lack of access to digital technologies	2.62	Challenged
6. Lack of technical support	2.74	Challenged
7. Lack of professional development on how to integrate technology	2.68	Challenged
8. Lack of funding	3.18	Challenged
Support from administrators	3.06	Challenged
I don't know how skilled my students are at using technology	2.64	Challenged
Overall Mean/Description	**2.74**	**Challenged**

Legend: Not at all Challenged (1.-1.75); Less Challenged (1.76-2.50); Challenged (2.51-3.25); Highly Challenged (3.26-4)

successfully integrate technology into 21st-century teaching and learning.

Problem 4: Is there a Significant Difference in the Level of Teachers Digital Competence when Variables are Grouped According to:

1. Age
2. Training
3. length of service

Table 9
Significant difference in the level of teacher's digital competence when variables are grouped according to age

Age	n	Mean	p-value	Interpretation
Under 25	1	3.65	0.001	Significant
25-34	9	3.23		
35-44	21	3.36		
45-54	16	2.86		
55-64	3	2.05		
Overall	**50**	**3.10**		

Table 9 presents the result of One-way Analysis of Variance (ANOVA) in the significant difference in the level of teachers' digital competence when variable are grouped according to age. The findings reveal a significant difference as indicated by a p-value of 0.001, which is below the 0.05 level of significance. This suggests that age is also a factor in the variation of digital competence among teachers. Teachers under the age of 25 recorded the highest mean score of 3.65, indicating a higher level of digital competence compared to other age groups. Exposure to digital tools can also be one of the factors that can be attributed to these young educators. Meanwhile, those aged 45–54 and 55–64 reported lower mean scores of 2.86 and 2.05, respectively, suggesting more limited digital competence among older teachers. The overall mean for all age groups was 3.10, interpreted as moderate digital competence. These results imply that younger teachers tend to be more digitally competent, highlighting the need for targeted training and support for older educators to bridge the digital skills gap and ensure equitable delivery of 21st-century education.

Table 10
Significant difference in the level of teacher's digital competence when variables are grouped according to training

Training	n	Mean	p-value	Interpretation
None	16	2.80	0.026	Significant
1-2 sessions	18	3.11		
3-5 sessions	15	3.36		
More than 10 sessions	1	3.90		
Overall	**50**	**3.10**		

In Table 10, the results of the one-way Analysis of Variance (ANOVA) indicate a statistically significant difference in the level of teachers' digital competence when grouped according to training, as reflected by a p-value of 0.026. This finding suggests that the extent of training received has a meaningful impact on teachers' competence in using digital tools. Teachers who attended more than ten training sessions obtained the highest mean score of 3.90, indicating a high level of digital competence. This is followed by those who attended three to five sessions, with a mean score of 3.36, and those who participated in one to two sessions, with a mean of 3.11. In contrast, teachers who did not undergo any training had the lowest mean score of 2.80. These results imply that increased exposure to training in digital tools correlates with higher levels of digital competence among teachers.

These findings highlight the crucial role of digital training in enhancing teachers' competence in integrating technology into their instruction. As the data suggest, teachers who have undergone more extensive training demonstrate greater digital proficiency and are more capable of incorporating technological tools into classroom activities. Given that today's learners are immersed in digital environments, it is imperative for educators to adapt their teaching methods accordingly. This is especially relevant for teachers in older age groups, who may be more accustomed to traditional instructional approaches. Embracing 21st-century education through the adoption of digital technologies not only supports effective teaching but also encourages innovation and creativity. Such integration can lead to more interactive and engaging learning experiences, ultimately improving student motivation and achievement.

Table 11 presents the results of a one-way Analysis of Variance (ANOVA) examining the significant difference in the level of teachers' digital competence when grouped according to years of teaching experience. The findings reveal a statistically significant difference, as indicated by a p-value of 0.002 which is less than the level of significance (α=0.05).

Teachers with 0–5 years of experience reported the highest mean digital competence score of 3.44, suggesting that novice teachers are more proficient in using digital tools compared to their more experienced counterparts. In contrast, teachers with 6–10 years of experience had the lowest mean score of 2.52, followed by those with 16 years and above (mean = 2.82) and 11–15 years (mean = 2.99). These results imply that newer teachers may have greater exposure to digital technologies through recent teacher education programs or early career professional development, highlighting the need for ongoing digital training and support for more experienced educators to ensure equitable digital competence across all levels of teaching experience.

To further examine these differences, a Tukey HSD post hoc test was conducted. Among all pairwise comparisons, only the difference between teachers with 6–10 years of experience and those with 16 years and above was statistically significant (p = 0.003), with the latter group showing significantly higher digital competence. While the comparison between teachers with 0–5 years and 16 years and above approached significance (p = 0.098), it did not meet the threshold for statistical significance.

These findings suggest that teachers in the mid-career stage (6–10 years) may have lower digital competence, potentially due to a gap in digital training opportunities during their entry into the profession. In contrast, early-career teachers likely benefit from updated pre-service programs that emphasize digital literacy, while more experienced teachers may have had more opportunities to engage in professional development or self-initiated learning over time. These results underscore the importance of providing targeted digital skills training for mid-

Table 11
Significant difference in the level of teacher's digital competence when variables are grouped according to years of teaching experience

Years of Teaching Experience	n	Mean	p-value	Interpretation
0-5 years	5	3.44	0.002	Significant
6-10 years	13	2.52		
11-15 years	11	2.99		
16 and above years	21	2.82		
Overall	50	3.10		

Table 12
Multiple Comparisons

Dependent Variable: competence
Tukey HSD

(I) Years in service	(J) Years in service	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
0-5 yrs	6-10 yrs	-.07923	.27630	.992	-.8157	.6573
	11-15 yrs	.44909	.28320	.397	-.3058	1.2039
	16 & above yrs	.61857	.26128	.098	-.0779	1.3150
6-10 yrs	0-5 yrs	.07923	.27630	.992	-.6573	.8157
	3.00	.52832	.21510	.081	-.0450	1.1017
	16 & above yrs	.69780*	.18530	.003	.2039	1.1917
11-15 yrs	0-5 yrs	-.44909	.28320	.397	-1.2039	.3058
	6-10 yrs	-.52832	.21510	.081	-1.1017	.0450
	16 & above yrs	.16948	.19542	.822	-.3514	.6904
16 and above yrs	0-5 yrs	-.61857	.26128	.098	-1.3150	.0779
	6-10 yrs	-.69780*	.18530	.003	-1.1917	-.2039
	11-15 yrs	-.16948	.19542	.822	-.6904	.3514

*. *The mean difference is significant at the 0.05 level*

career teachers to bridge this gap and ensure consistent digital competence across all experience levels.

B. Problem 5: Is there a Significant Difference in the Level of Teachers Digital Readiness when Variables are Grouped According to:

1. Age
2. Training
3. length of service

Table 13
Significant difference in the level of teacher's digital readiness when variables are grouped according to age

Age	n	Mean	p-value	Interpretation
Under 25	1	3.67		
25-34	9	3.45		
35-44	21	3.33	0.010	Significant
45-54	16	3.03		
55-64	3	2.36		
Overall	**50**	**3.20**		

Table 13 presents the significant difference in teachers' digital readiness according to age, with a p-value of 0.010, which is less than the level of significance (α = 0.05). This indicates that age has a statistically significant effect on digital readiness. Teachers under 25 years old have the highest mean score of 3.67, suggesting that younger teachers are more skilled, more exposed to digital tools, and more adaptable to 21st-century teaching practices. In contrast, teachers aged 55–64 exhibit the lowest level of digital readiness, with a mean score of 2.36, implying that they are more accustomed to traditional teaching methods and may be less comfortable using digital tools in the classroom. Teachers aged 25–34 have a mean score of 3.45, those aged 35–44 have a mean of 3.33, and teachers aged 45–54 also have a mean score of 3.33, indicating a gradual decline in digital readiness as age increases.

Table 14 presents the results of an analysis examining the significant difference in the level of teachers' digital readiness when grouped according to the amount of training received. The p-value is 0.220, which is greater than the standard level of significance (α = 0.05), indicating that there is no statistically significant difference in digital readiness among teachers based on their training experience.

Table 14
Significant difference in the level of teacher's digital readiness when variables are grouped according to training

Training	n	Mean	p-value	Interpretation
None	16	3.08		
1-2 sessions	18	3.14	0.220	Not Significant
3-5 sessions	15	3.38		
More than 10 sessions	1	3.93		
Overall	**50**	**3.21**		

Although not statistically significant, the mean scores show a trend: teachers who attended more than 10 training sessions recorded the highest mean digital readiness score of 3.93, suggesting greater confidence and preparedness in integrating digital tools. This is followed by teachers who attended 3–5 sessions (mean = 3.38), 1–2 sessions (mean = 3.14), and those with no training (mean = 3.08). These findings suggest a positive trend between the number of training sessions attended and higher digital readiness, though the differences were not strong enough to be statistically significant. This may imply that while training contributes to readiness, other factors such as personal initiative, experience, or institutional support may also play a role.

Table 15 shows the results of an analysis on the significant difference in the level of teachers' digital readiness when grouped according to years of teaching experience. The analysis yielded a p-value of 0.012, which is less than the significance level of α = 0.05, indicating that there is a statistically significant difference in digital readiness across different

Table 15
Significant difference in the level of teacher's digital readiness when variables are grouped according to years of teaching experience

Years of Teaching Experience	n	Mean	p-value	Interpretation
0-5 years	5	3.49	0.012	Significant
6-10 years	13	3.52		
11-15 years	11	3.23		
16 and above years	21	2.94		
Overall	**50**	**3.21**		

Table 16
Multiple comparisons

Dependent Variable: readiness
Tukey HSD

(I) Years in service	(J) Years in Service	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
0-5 yrs	6-10 yrs	-.02462	.26728	1.000	-.7371	.6878
	11-15 yrs	.26303	.27395	.773	-.4672	.9932
	16 & above yrs	.55365	.25274	.141	-.1200	1.2273
6-10 yrs	0-5 yrs	.02462	.26728	1.000	-.6878	.7371
	11-15 yrs	.28765	.20808	.517	-.2670	.8423
	16 & above yrs	.57827*	.17925	.012	.1005	1.0560
11-15 yrs	0-5 yrs	-.26303	.27395	.773	-.9932	.4672
	6-10 yrs	-.28765	.20808	.517	-.8423	.2670
	16 & above yrs	.29062	.18904	.424	-.2133	.7945
16 & above yrs	0-5 yrs	-.55365	.25274	.141	-1.2273	.1200
	6-10 yrs	-.57827*	.17925	.012	-1.0560	-.1005
	11-15 yrs	-.29062	.18904	.424	-.7945	.2133

*. *The mean difference is significant at the 0.05 level*

experience levels.

Teachers with 6–10 years of experience recorded the highest mean digital readiness score of 3.52, followed closely by those with 0–5 years (mean = 3.49). This suggests that early to mid-career teachers tend to be more digitally ready, possibly due to more recent training, exposure to digital tools, or integration of technology in their teacher preparation programs. Meanwhile, teachers with 11–15 years of experience had a lower mean score of 3.23, and those with 16 years and above showed the lowest level of digital readiness, with a mean score of 2.94.

These findings imply that as teaching experience increases, digital readiness tends to decrease. More experienced teachers may have had less formal exposure to technology during their initial training and may be less inclined or less comfortable integrating digital tools into their teaching practices. This highlights the importance of continuous professional development focused on digital skills, especially for more experienced educators, to ensure equitable readiness in delivering 21st-century education.

Table 16 presents the results of the Tukey HSD post hoc test conducted to determine specific group differences in teachers' digital readiness based on years of teaching experience. The analysis revealed a statistically significant difference between teachers with 6-10 years of experience and those with 16 years and above, with a mean difference of 0.57827 and a p-value of 0.012. This result indicates that teachers in the 6-10 years' experience group exhibit significantly higher levels of digital readiness compared to their counterparts with 16 or more years of service. No other pairwise comparisons yielded statistically significant results, as all other p-values exceeded the 0.05 threshold. The finding suggests that mid-career teachers may be more exposed to or more adaptable to digital tools than their more experienced peers, who may be less inclined or less trained to incorporate technology into their teaching. This highlights the need for targeted digital skills enhancement programs, particularly for veteran teachers, to ensure equitable integration of technology in classroom instruction.

6. Conclusion

Based on the findings, the researcher concludes that:

1. Teachers possess a competent level of digital skills, particularly in device operation and internet navigation, indicating their preparedness for basic digital instruction.
2. Although teachers are digitally ready, they face challenges in customizing digital materials and using technology for formative assessment, pointing to the need for deeper integration of digital pedagogy.
3. Teachers are generally ready to implement digital tools in the classroom, but their readiness is hindered by infrastructure-related issues and lack of technical support.
4. Significant differences in digital competence and readiness were found when grouped by age and years of teaching experience, with younger and less experienced teachers showing higher levels of competence.
5. No significant difference in digital readiness was found when grouped according to training, suggesting that not all training programs may be equally effective in enhancing digital readiness.

7. Recommendation

In light of the findings and conclusions of the study, the following recommendations are proposed to enhance teachers' digital competence and readiness in delivering 21st-century education.

A. Prioritize ICT Infrastructure Support in School

Ensure that teachers are supported by providing reliable internet connectivity within the institution, updated digital devices in every classroom, and accessible technical support. Adequate and up-to-date tools should be utilized so that teachers can effectively explore, learn, and enhance their digital skills.

B. Deploy Regional ICT Coaches or Mentors

Establish a system of regional or division-based ICT mentors who can provide ongoing support to schools, conduct on-site coaching, and assist teachers in integrating technology into their instructional strategies effectively.

C. Develop Open Access Digital Teaching Resources

Create and maintain a centralized online repository of digital teaching tools, lesson exemplars, and ICT-integrated instructional materials that teachers can access and adapt, regardless of their location or digital proficiency level.

D. Institutionalize Digital Literacy Training Programs

Educational institutions, in collaboration with relevant agencies, should develop and implement ongoing digital literacy training programs. These programs must be designed to meet the evolving needs of teachers, particularly in using digital tools for lesson planning, assessment, and interactive instruction.

References

[1] A. Maghfiroh et al., "Future-Ready Educators: Assessing Digital Competence and Teaching Preparedness Among Prospective Teachers in the 21st Century," in *Indonesian Journal on Learning and Advanced Education*, vol. 6, no. 1, Jan. 2024.