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Digital Teaching Competence and Challenges of Progressive Technology Integration in Public Elementary School

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ABSTRACT

Technology integration in education is essential for improving teaching and learning. However, internal and external challenges affect its implementation. This study examines the relationship between digital teaching competencies, external and internal challenges, and progressive technology integration. A quantitative research method was used to analyze correlation data from educators. The results show that digital teaching competencies have a moderate relationship with technology integration, while external challenges have a strong relationship. Internal challenges, such as teachers' attitudes, beliefs, and resistance to technology, show a weak to moderate relationship. The study concludes that while skills and resources impact technology use, addressing teachers' perceptions and support systems is also important. Schools should provide training, resources, and a positive environment to enhance technology integration. The study highlights the need for comprehensive training programs, institutional support, and policy reforms to enhance digital literacy, pedagogical competence, and adaptability among educators. Addressing these challenges can foster collaborative, innovative, and technology-driven learning environments in public elementary schools, ensuring educators are well-equipped for 21st-century teaching. The findings contribute to educational policies to bridge the digital gap and enhance effective technology integration in elementary education.

Keywords: Digital Competence, Progressive Technology Integration, Technology Integration, Pedagogical Digital Competence, Innovation in Education.

Introduction:

Some educators in Mauban, Quezon, specifically in the Mauban North District, who are 50 years of age and older and still employed, claim that current learning patterns show that not all educators use digital instruction in the classroom. Several educators have also mentioned the difficulties in integrating digital technology into the classroom. These difficulties include teachers' inability to use the technology because they lack the necessary training, knowledge, or confidence and inadequate resources. Four educators at San Lorenzo Elementary School claim they encounter numerous difficulties in their attempts to give the upcoming generation the tools they need to succeed in an increasingly digital world. These difficulties could range from issues with technology and accessibility to worries about online instruction.

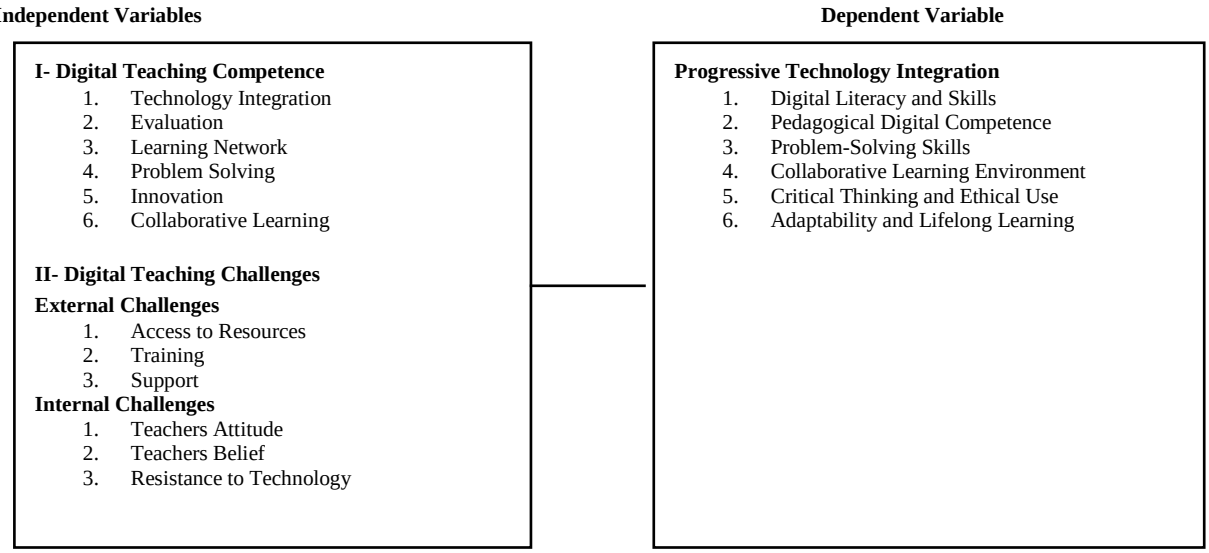
These days, advancements in digital technology and information impact educational practices. Students' independent learning is encouraged by the rise of advances in digital-based learning, including e-learning, virtual courses, computer-based learning, game-based learning, interactive multimedia, and more. Since learning can now be done online via computers and cellphones in addition to being restricted by time and classroom walls, 21st-century education must be innovative (Wahyudi, 2019).

The fast-changing digital environment today makes technology integration in the classroom not only necessary but also a must. Situations like watching lessons in a series, generating links with related topics online and applying computer-related tasks to learners are most evident in public elementary schools, as developing digital teaching competency creates phenomenal challenges and fascinating possibilities (Platil, 2022).

The low use of digital technology in education can be attributed to several factors, including teachers' experience teaching, pedagogical practices and skills, computer self-efficacy, support for computers and information technology, and the development of teachers' professional abilities in integrating digital technology in education (Gilakjani, 2013).

Therefore, it is necessary to understand teachers' perceptions of digital technology-based learning as the basis for finding solutions to problems related to the use of digital technology. The perception of digital technology plays a very important role because it is a component of the formation of cognition related to human knowledge of technology (Al-Awidi & Aldhafeeri, 2017).

Research Paradigm



Statement of the Problem

This study determined the relationship between digital competence and digital teaching challenges to progressive technology integration in public elementary schools for the school year 2023-2024.

Specifically, it aimed to answer the following questions:

1. What is the level of perceived digital competence of teachers in terms of:

   1.1 Technology Integration;

   1.2 Evaluation;

   1.3 Learning Network;

   1.4 Problem-Solving;

   1.5 Innovation; and

   1.6 Collaborative Learning?

2. What is the level of perceived external digital challenges of teachers in terms of:

2.1 Access to Resources;

2.2 Support, and

2.3 Training?

3. What is the level of perceived internal digital challenges in terms of:

3.1 Teachers' Attitude;

3.2 Teachers' Beliefs; and

3.3 Resistance to Technology?

4. What is the level of teachers' perceived contribution to progressive technology integration in terms of:

4.1 Digital Literacy and Skills;

4.2 Pedagogical Digital Competence;

4.3 Problem-Solving Skills;

4.4 Collaborative Learning Environments;

4.5 Critical Thinking and Ethical Use; and

4.6 Adaptability and Lifelong Learning?

5. Is progressive technology integration significantly related to

5.1 Digital teaching competence

5.2 Digital teaching, external challenges, and

5.3 Digital internal challenges?

Methodology:

The methodology used to investigate the relationship between Digital Teaching Competence and the Challenges to Progressive Technology Integration among public elementary school teachers in Mauban, Quezon, during the 2024–2025 academic years. A descriptive correlational research design was employed to determine the validity, acceptability, and continuity of digital teaching practices and the barriers that hinder effective integration of technology in teaching. The study used a researcher-made questionnaire divided into four parts: respondents' profile, digital teaching competencies, digital teaching challenges, and the frequency of progressive technology integration. The survey measured teachers' practices, challenges, and digital readiness using a Likert scale, with higher scores indicating greater competence or challenge, depending on the section.

A total of 120 randomly selected public elementary teachers (18 males and 102 females) participated in the study. To ensure the reliability of the instrument, a pilot test was conducted with 30 teachers, and Cronbach's Alpha was used to assess internal consistency. Prior to data collection, necessary approvals were secured from school and district officials. The final questionnaire was validated by the thesis adviser and panel members before being disseminated electronically via Google Forms. Data collected were organized, tabulated, and analyzed using descriptive statistics (mean, standard deviation) and Pearson Product-Moment Correlation to identify the strength of relationships between digital competence and technological challenges. The findings are expected to guide schools and policymakers in designing targeted interventions to support digital education efforts.

Results

Table: 2

Level of Perceived Digital Competence

Indicators		Mean	SD	VI
1.	Participate in online communication, attend webinars, and continuously learn through digital platforms.	4.25	.651	Highly Practiced
2.	Focus on applying digital tools to facilitate and enhance teaching and learning processes.	4.21	.620	Highly Practiced
3.	Include using technology for assessment purposes.	4.24	.722	Highly Practiced
4.	Use technology to empower students, foster their digital literacy and encourage them to use digital tools for learning and creativity.	4.25	.736	Highly Practiced
5.	Use and create digital resources, such as integrating multimedia content, using educational software, and curating online resources, to support diverse learning needs.	4.16	.756	Highly Practiced
Overall		4.22	.596	Highly Practiced

Legend: 1.0-1.49 (Not at all, Practiced); 1.50-2.49 (Fairly Practiced); 2.50-3.49 (Moderately Practiced); 3.50-4.49 (Highly Practiced); 4.50-5.0 (Very Highly Practiced)

The findings from Table 2 indicate that teachers highly practice digital teaching competencies, as reflected in an overall mean of 4.22. This suggests that teachers are actively integrating technology into their teaching, particularly in fostering digital literacy and participating in online learning (mean = 4.25). These results align with Koehler & Mishra's (2009) Technological Pedagogical Content Knowledge (TPACK) framework, which highlights the importance of teachers' digital competence in improving teaching effectiveness. Additionally, the data supports Redecker & Punie's (2017) framework on digital competence, which emphasizes continuous professional development in digital education. The relatively lower mean score for digital resource creation and curation (4.16) suggests a gap that needs further enhancement.

This is consistent with Cabangcala et al. (2021), who stressed that improving teachers' competence in developing and utilizing digital resources is crucial for maximizing technology's impact in education. The low standard deviation (0.620 to 0.756) signifies a consistent level of practice among teachers, further reinforcing the widespread adoption of digital teaching practices. These insights highlight the need for targeted training on digital resource creation and assessment tools to strengthen teachers' digital integration skills further.

In synthesis, the findings from Table 2 affirm that teachers in public elementary schools exhibit a strong level of digital teaching competence, as shown by the high overall mean of 4.22. This reflects their active use of technology in instruction, especially in areas like digital literacy and participation in online learning, in line with the principles of the TPACK framework (Koehler & Mishra, 2009).

The consistency of responses also suggests that this competence is widely practiced across the teaching population. However, the slightly lower score in digital resource creation and curation reveals a specific area for improvement. This supports the view of Cabangcala et al. (2021), who emphasized the importance of equipping teachers with the skills to develop and manage quality digital content. Moreover, the data reinforces Redecker & Punie's (2017) call for continuous professional development to sustain and enhance digital competence in education. While digital teaching is well-practiced, focused efforts on content creation and digital assessment tools are necessary to maximize technology integration in teaching and learning fully.

Table: 3

Level of Perceived Evaluation

Indicators	**Mean**	**SD**	**VI**
1. Design and implement digital learning activities in their lesson plans that integrate digital tools and assess student outcomes.	4.13	.660	Highly Practiced
2. Attend professional development programs focusing on digital competence, including assessments to measure student progress.	4.07	.676	Highly Practiced
3. Gather feedback from students about their learning experiences with digital tools to assess the effectiveness of digital teaching practices.	3.99	.704	Highly Practiced
4. Observations and peer reviews provide insights into how teachers use digital tools in real time.	4.06	.652	Highly Practiced
5. Use digitized self-assessment tools to evaluate their digital competence.	4.03	.685	Highly Practiced
Overall	4.06	.582	Highly Practiced

Legend: 1.0-1.49 (Not at all, Practiced); 1.50-2.49 (Fairly Practiced); 2.50-3.49 (Moderately Practiced); 3.50-4.49 (Highly Practiced); 4.50-5.0 (Very Highly Practiced)

Table 3 presents the Level of Perceived Evaluation in digital teaching practices, with an overall mean of 4.06 (Highly Practiced). This result suggests that teachers actively implement digital evaluation methods in their instruction. The highest-rated practice is designing and implementing digital learning activities (Mean = 4.13), showing that teachers prioritize integrating technology into lesson planning and student assessment.

However, the lowest-rated indicator (Mean = 3.99) highlights a relative gap in gathering student feedback on digital tools, indicating an area for improvement in student-centered assessment practices.

The standard deviations (SD = 0.582 to 0.704) suggest a relatively consistent perception among teachers regarding digital evaluation. Despite strong professional engagement in peer reviews and training, the findings imply that student feedback mechanisms need to be strengthened to enhance the effectiveness of digital instruction.

The synthesis of the findings from Table 2 indicates that teachers are generally proficient in employing digital evaluation practices, as reflected in the overall mean rating of 4.06 (Highly Practiced). This suggests a solid foundation in integrating technology into instructional planning and assessment, particularly in designing digital learning activities. However, a notable area for development lies in using student feedback to evaluate digital tools, which was rated the lowest.

This gap underscores the need for more student-centered assessment approaches to ensure the responsiveness and relevance of digital instruction. As shown by low standard deviations, the consistency of responses reflects a shared perception among educators regarding current digital evaluation practices. These insights are supported by the DigCompEdu framework (Redecker & Punie, 2017), which stresses both assessment literacy and professional engagement, and by Sillat et al. (2021), who emphasize the need for flexible digital evaluation strategies tailored to diverse learning contexts.

Table: 4

Level of Perceived Learning Network

Indicators	Mean	SD	VI
1. Use educational software, online platforms, and multimedia resources to enhance learning experiences.	4.23	.667	Highly Practiced
2. Create interactive and engaging lessons, facilitate online discussions, and use digital assessments to monitor student progress.	4.18	.644	Highly Practiced
3. Participate in professional learning communities, sharing resources and communicating through digital platforms.	4.16	.698	Highly Practiced
4. Engage in ongoing professional development to stay current with technological advancements and pedagogical approaches.	4.17	.665	Highly Practiced
5. Demonstrate an understanding of digital citizenship, including issues related to privacy, security, and ethical use of technology.	4.20	.656	Highly Practiced
Overall	4.19	.581	Highly Practiced

Legend: 1.0-1.49 (Not at all, Practiced); 1.50-2.49 (Fairly Practiced); 2.50-3.49 (Moderately Practiced); 3.50-4.49 (Highly Practiced); 4.50-5.0 (Very Highly Practiced)

Table 4 presents the Level of Perceived Learning Network, with an overall mean of 4.19 (Highly Practiced). This finding suggests teachers actively use digital learning networks to enhance their instructional strategies and professional growth.

The highest-rated practice (Mean = 4.23)—using educational software and multimedia resources—underscores the significant role of technology in enriching learning experiences. Meanwhile, participation in professional learning communities (Mean = 4.16) and facilitating online discussions (Mean = 4.18) reflect the importance of collaboration among educators in a digital learning environment.

The standard deviations (SD = 0.581 to 0.698) indicate a high level of agreement among respondents, confirming a strong inclination toward using digital tools for learning and networking.

The consistent practice of ongoing professional development (Mean = 4.17) also suggests that teachers actively update their digital competencies to keep pace with evolving educational technologies. Additionally, digital citizenship (Mean = 4.20) is well-practiced, showing that teachers understand the importance of ethical and responsible technology use.

These findings align with Redecker & Punie's (2017) DigCompEdu framework, particularly in digital resources, professional engagement, and digital pedagogy. The emphasis on multimedia tools and online collaboration supports research by Trust et al. (2018), highlighting that participation in digital learning networks enhances teacher efficacy and innovation.

Moreover, the focus on digital citizenship resonates with studies by Ribble (2011), which stress the need for educators to model ethical technology use. Further strengthening collaborative professional learning networks and integrating adaptive digital assessment tools could enhance teachers' ability to personalize and optimize learning experiences in the digital age.

Table: 5

Level of Perceived Problem-Solving

Indicators	Mean	SD	VI
1. Select appropriate digital tools and resources to address students special needs.	4.17	.665	Highly Practiced
2. Make informed decisions about digital resources, considering accessibility, relevance, and effectiveness.	4.12	.651	Highly Practiced
3. Guide students using digital tools to enhance their critical thinking and problem-solving skills.	4.08	.643	Highly Practiced
4. Incorporate technology into authentic, problem-based learning activities, helping students apply digital tools to real-world problems.	4.05	.696	Highly Practiced

5.	Involve staying updated with technological advancements and continuously adapting teaching strategies to incorporate new tools and methods.	4.15	.657	Highly Practiced
Overall		4.11	.577	Highly Practiced

Legend: 1.0-1.49 (Not at all, Practiced); 1.50-2.49 (Fairly Practiced); 2.50-3.49 (Moderately Practiced); 3.50-4.49 (Highly Practiced); 4.50-5.0 (Very Highly Practiced)

Table 5 presents the Level of Perceived Problem-Solving, with an overall mean of 4.11 (Highly Practiced), indicating that teachers actively integrate digital tools to enhance problem-solving skills in education. The highest-rated indicator (Mean = 4.17) highlights the selection of appropriate digital tools for students with special needs, underscoring a commitment to inclusive education. Other well-practiced aspects include teaching critical thinking through technology (Mean = 4.08) and applying digital tools in real-world problem-solving scenarios (Mean = 4.05). The standard deviations (SD = 0.577 to 0.696) indicate that responses are relatively consistent, reflecting a shared belief in the importance of digital problem-solving skills. Additionally, the ability to make informed decisions about digital resources (Mean = 4.12) and stay updated with technological advancements (Mean = 4.15) highlights the adaptability of educators in navigating digital transformations in the classroom. These findings align with Redecker & Punie's (2017) DigCompEdu framework, particularly in the Empowering Learners and Problem-Solving domains. Furthermore, the focus on critical thinking and real-world application of digital tools is consistent, highlighting technology's role in fostering higher-order thinking skills.

Table: 6

Level of Perceived Innovation

Indicators		**Mean**	**SD**	**VI**
1.	Use of digital tools and resources to enhance teaching and learning.	4.23	.645	Highly Practiced
2.	Use educational technology to implement innovative assessment methods, such as online quizzes, digital portfolios, and formative assessments.	4.07	.658	Highly Practiced
3.	Participate in online professional learning communities, attend webinars, and engage in continuous professional development related to digital teaching.	4.14	.652	Highly Practiced
4.	Use digital tools to foster student autonomy and personalized learning.	4.07	.663	Highly Practiced
5.	Help students develop their digital competencies by integrating digital literacy into the curriculum.	4.05	.672	Highly Practiced
Overall		4.11	.574	Highly Practiced

Legend: 1.0-1.49 (Not at all, Practiced); 1.50-2.49 (Fairly Practiced); 2.50-3.49 (Moderately Practiced); 3.50-4.49 (Highly Practiced); 4.50-5.0 (Very Highly Practiced)

Table 6 presents the Level of Perceived Innovation, with an overall mean of 4.11 (Highly Practiced), demonstrating that teachers actively embrace digital tools and innovative practices in education.

The highest-rated practice (Mean = 4.23) involves using digital tools to enhance teaching and learning, reflecting the transformative role of technology in modern pedagogy. Other well-practiced aspects include participation in professional learning communities (Mean = 4.14) and implementation of innovative assessments (Mean = 4.07), such as digital portfolios and online quizzes. The standard deviations (SD = 0.574 to 0.672) indicate a consistent teacher agreement, reinforcing a collective effort toward digital innovation. Additionally, using technology to foster student autonomy (Mean = 4.07) and developing students' digital competencies (Mean = 4.05) highlight the shift toward learner-centered education supported by technology.

These findings align with Redecker & Punie's (2017) DigCompEdu framework, particularly in the Innovative Teaching and Digital Resources domains, emphasizing using digital tools to personalize learning and assess students in diverse ways. Research by Mishra & Koehler (2006) on the TPACK (Technological Pedagogical Content Knowledge) model supports the idea that integrating technology effectively requires a balance between pedagogical, technological, and content knowledge.

Moreover, Heick (2019) argues that personalized learning and digital literacy integration foster 21st-century skills, including critical thinking, creativity, and autonomy. In synthesis, the data from Table 6 underscore that innovation in digital teaching is highly practiced among public elementary school teachers, with an overall mean of 4.11. This reflects a strong inclination toward embracing technology to improve educational delivery, particularly through digital tools to enhance teaching and learning (Mean = 4.23), the most prominent indicator. Teachers also consistently engage in online professional learning communities and innovative assessment strategies, aligning with the learner-centered approaches promoted by the DigCompEdu framework (Redecker & Punie, 2017).

Table: 7

Level of Perceived Collaborative Learning

Indicators		Mean	SD	VI
1.	Implement tools like Google Workspace, Microsoft Teams, or Slack to facilitate group projects and discussions.	4.00	.733	Highly Practiced
2.	Encourage students to use digital peer review and assignment feedback platforms.	3.96	.771	Highly Practiced
3.	Design and manage group projects that require students to collaborate virtually.	3.93	.753	Highly Practiced
4.	Utilize online discussion forums or platforms like Moodle. Blackboard or Edmodo can facilitate asynchronous discussions.	3.79	.766	Highly Practiced
5.	Use tools like Miro, Jamboard, or Padiet to create interactive whiteboards where students can collaboratively brainstorm, plan, and present their ideas.	3.72	.862	Highly Practiced
Overall		3.88	.696	Highly Practiced

Legend: 1.0-1.49 (Not at all, Practiced); 1.50-2.49 (Fairly Practiced); 2.50-3.49 (Moderately Practiced); 3.50-4.49 (Highly Practiced); 4.50-5.0 (Very Highly Practiced)

Table 7 presents the Level of Perceived Collaborative Learning, with an overall mean of 3.88 (Highly Practiced), showing that teachers actively promote digital collaboration in the classroom. The most widely practiced activity (Mean = 4.00) is using digital platforms like Google Workspace and Microsoft Teams to facilitate group projects and discussions, emphasizing technology's role in fostering teamwork.

However, interactive whiteboard tools (Mean = 3.72) received the lowest rating, suggesting that while collaboration is encouraged, some tools are underutilized. The standard deviations (SD = 0.696 to 0.862) indicate variability in how educators adopt digital collaborative tools. This may reflect differences in access, familiarity, or institutional support for integrating these tools effectively. These findings align with Vygotsky's (1978) Social Constructivist Theory, which emphasizes that learning is a social process, and digital platforms provide a medium for meaningful interaction and knowledge-sharing. Computer-supported collaborative learning (CSCL) enhances engagement by allowing students to co-construct knowledge through discussion, feedback, and shared tasks. Furthermore, Redecker & Punie's (2017) DigCompEdu framework highlights collaborative learning as a key digital competence, emphasizing the need for educators to use digital tools for student interaction and teamwork effectively. Studies by Fiock (2020) also suggest that asynchronous collaboration (e.g., discussion boards, peer reviews) can enhance student engagement and critical thinking.

The synthesis of the findings in Table 6 reveals that teachers highly practice digital collaborative learning, as evidenced by the overall mean of 3.88. This suggests a strong commitment to fostering student interaction and cooperation through digital platforms. Tools like Google Workspace and Microsoft Teams are the most commonly implemented, highlighting educators' reliance on accessible and well-supported technologies for facilitating group work. However, lower ratings for tools such as Miro, Jamboard, or Padlet indicate limited use of more interactive and creative digital resources, possibly due to unfamiliarity or lack of training. These results align with the European Framework for the Digital Competence of Educators (DigCompEdu), particularly in the area of "Collaborative Learning," which emphasizes the role of educators in enabling students to work together through digital means (Redecker & Punie, 2017).

Part II- Perceived Level of External Digital Challenges

The following section explores the perceived external challenges related to digital teaching and learning, highlighting the access to resources, support, and training necessary to implement digital education effectively.

Table: 8

Level of Perceived Access to Resources

Indicators		Mean	SD	VI
1.	Reliable and high-speed internet access is crucial for teachers and students.	4.32	.610	To a great extent
2.	Access to appropriate devices such as laptops, tablets, or smartphones is essential.	4.42	.588	To a great extent
3.	Teachers and students must have the skills to use digital tools and platforms effectively.	4.41	.572	To a great extent

4.	Ongoing technical support is necessary to troubleshoot issues and ensure the smooth operation of digital tools.	4.30	.574	To a great extent
5.	Access to high-quality, engaging, and relevant digital content is vital for effective teaching and learning.	4.30	.559	To a great extent
Overall		4.35	.479	To a great extent

Legend: 1.0-1.49 (Strongly Disagree); 1.50-2.49 (Disagree); 2.50-3.49 (Neutral); 3.50-4.49 (Agree); 4.50-5.0 (Strongly Agree)

The data in Table 8 reveal that while all indicators regarding access to resources for digital teaching and learning are rated "to a great extent," they still fall below the "strongly agree" threshold (mean scores all under 4.50). This indicates that despite acknowledging their importance, these areas are still perceived as barriers or challenges that schools face in effectively implementing digital education.

First, the indicator on reliable and high-speed internet access (M = 4.32, SD = .610) highlights ongoing issues in connectivity, particularly in geographically isolated or underserved areas. Poor internet access continues to be a major barrier to digital instruction, especially in rural and developing regions (Czerniewicz & World Bank, 2020). Teachers and students struggle to access online platforms and digital learning environments without consistent connectivity.

Access to appropriate devices (M = 4.42, SD = .588) also ranks high, yet it is not rated as "strongly agree," suggesting that there are still gaps in device availability. This reflects the persistent digital divide, where many students and educators share or lack personal devices, hindering individualized and uninterrupted learning (UNESCO, 2021). Socioeconomic disparities further exacerbate this problem, making device provision an ongoing concern for education systems.

Regarding digital literacy, the mean score of 4.41 for the need for skills to use digital tools signals that many stakeholders may not be fully equipped to maximize technology for educational purposes. Teachers' limited training in digital pedagogies remains a well-documented constraint (Trust & Whalen, 2020), impacting their confidence and effectiveness in integrating ICT in the classroom.

The rating for technical support (M = 4.30, SD = .574) implies that schools often lack the necessary infrastructure or personnel to resolve technical issues in real-time. The absence of sustained support affects the reliability and functionality of educational technologies, causing frustration and decreased adoption among educators (Almazova et al., 2020).

Lastly, the concern for high-quality and engaging digital content (M = 4.30, SD = .559) reflects the ongoing challenge of content relevance and alignment with curricular goals. Many schools rely on generic or outdated materials, and teachers often lack the resources or training to customize digital content for diverse learning needs (Bakia et al., 2019).

Overall, while respondents recognize the importance of these variables in digital education, their mean scores point to systemic barriers. These include inequitable access, insufficient training, lack of infrastructure, and inadequate digital resources, all of which must be addressed to ensure inclusive and effective digital learning environments.

The data in Table 8 show that teachers perceive access to digital resources as critically important in implementing effective digital education, as reflected by the overall mean of 4.35, interpreted as "to a great extent." All five indicators fall within this level, indicating strong agreement on the necessity of reliable internet, appropriate devices, digital literacy, technical support, and quality content. However, none reached the "strongly agree" category, suggesting that despite recognizing their importance, these resources are not yet fully accessible or optimized in many educational settings.

In summary, while teachers acknowledge the critical role of resource access in digital learning, the slightly below-optimal ratings point to gaps in infrastructure, skills training, and content quality—issues that need to be addressed to realize technology's potential in education fully.

Table: 9

Level of Perceived Support

Indicators		**Mean**	**SD**	**VI**
1.	Limited access to necessary digital tools and reliable internet connections can hinder effective teaching and learning.	4.13	.634	To a great extent
2.	Teacher training on using digital tools effectively can be a significant barrier.	4.10	.627	To a great extent
3.	Both teachers and students may lack the necessary digital literacy skills to navigate and utilize digital platforms efficiently.	4.03	.601	To a great extent
4.	Lack of institutional support, including clear policies, guidelines, and administrative backing, can impede the integration of digital technologies in teaching.	4.14	.626	To a great extent

5.	Teachers' and students' readiness to adapt to digital teaching methods, including attitudes, confidence, and pedagogical approaches, can affect the success of digital learning environments.	4.13	.607	To a great extent
Overall		4.11	.529	To a great extent

Legend: 1.0-1.49 (Strongly Disagree); 1.50-2.49 (Disagree); 2.50-3.49 (Neutral); 3.50-4.49 (Agree); 4.50-5.0 (Strongly Agree)

Table 9 reveals that respondents perceive multiple critical issues and barriers to digital teaching and learning, as reflected in their agreement "to a great extent" on all five indicators. While the overall mean score of 4.11 suggests moderate agreement, the consistent rating below the "strongly agree" threshold (4.50–5.00) signals persistent challenges in institutional and individual support for digital education.

The highest concern is the lack of institutional support (M = 4.14, SD = .626), underscoring the absence of clear policies, administrative backing, and structured implementation frameworks. This aligns with findings by König et al. (2020), who noted that without strong institutional leadership and policy guidance, digital integration tends to be fragmented and ineffective.

The next prominent issues include limited access to digital tools and internet connectivity (M = 4.13) and readiness to adapt to digital methods (M = 4.13). These figures suggest that infrastructure challenges limit digital participation, particularly in underserved communities, while teachers' and students' openness and confidence in adopting technology remain uneven (Bozkurt et al., 2020). Users' psychological and pedagogical readiness plays a significant role in determining how effectively digital teaching strategies are embraced and applied.

Respondents also identified teacher training (M = 4.10, SD = .627) and digital literacy gaps (M = 4.03, SD = .601) as major barriers. The relatively lower mean for digital literacy indicates a critical gap in skills required to navigate online platforms—a problem exacerbated by inconsistent or outdated professional development opportunities (Trust & Whalen, 2020). Teachers often lack sustained support and time to develop the competencies for effective digital instruction.

These findings emphasize that lack of training, institutional support, connectivity, and digital readiness are interconnected barriers that schools face in transitioning to and sustaining digital learning.

Respondents' perceptions of these challenges suggest that while digital tools may be present, the ecosystem of support around them is insufficient, impeding the full realization of digital education benefits.

Table: 10

Level of Perceived Training

Indicators		**Mean**	**SD**	**VI**
1.	Many educators struggle with the rapid pace of technological advancements.	4.18	.603	To a great extent
2.	Unequal access to reliable internet and digital devices can hinder teachers and students.	4.23	.576	To a great extent
3.	Transitioning from traditional to digital teaching methods requires a shift in pedagogy.	4.21	.593	To a great extent
4.	Maintaining student engagement in a virtual classroom is more challenging compared to a physical classroom.	4.12	.651	To a great extent
5.	Continuous professional development is crucial for teachers to stay updated with digital teaching methods.	4.26	.587	To a great extent
Overall		4.20	.510	To a great extent

Legend: 1.0-1.49 (Strongly Disagree); 1.50-2.49 (Disagree); 2.50-3.49 (Neutral); 3.50-4.49 (Agree); 4.50-5.0 (Strongly Agree)

Table 10 highlights critical training-related challenges in implementing effective digital teaching, as perceived by respondents. With an overall mean of 4.20, all indicators fall within the “to a great extent” range, emphasizing that educators recognize training and pedagogical adaptation as substantial issues in the shift to digital learning.

The highest-rated item is the importance of continuous professional development (M = 4.26, SD = .587), underscoring the need for ongoing training to keep up with evolving digital teaching methods. This supports the view that digital competence is not static but requires sustained learning, especially as new platforms, tools, and strategies emerge (Redecker, 2019). Closely following is the issue of unequal access to the internet and devices (M = 4.23), again pointing to equity as a training-related concern. Teachers cannot fully participate in digital training or apply what they learn if basic infrastructure is lacking—a challenge particularly prevalent in remote or economically disadvantaged communities (UNESCO, 2021). The need for a pedagogical shift from traditional to digital methods (M = 4.21, SD = .593) reveals that transitioning to digital instruction is not simply a matter of using new tools—it

requires a deep change in teaching philosophies and strategies. Many teachers face difficulty redesigning lessons to suit online platforms or asynchronous learning environments (Rapanta et al., 2020). Meanwhile, the indicator on technological advancement (M = 4.18) highlights a recurring issue where educators struggle to keep up with the speed of change. This gap in upskilling creates anxiety and a sense of unpreparedness, which hinders the adoption of innovative teaching techniques (Philippou & Nicolaidou, 2022).

Finally, maintaining student engagement in virtual settings (M = 4.12) remains a notable concern. Engagement strategies for digital environments differ significantly from those in face-to-face classrooms, and many educators feel ill-equipped to make this transition effectively (Bozkurt et al., 2020).

Part III- Perceived Level of Internal Digital Challenges

This part explores the internal digital challenges perceived by teachers in public elementary schools, focusing on attitudinal, belief-based, and resistance-related barriers that significantly affect the successful integration of digital teaching practices.

Table: 11

Level of Perceived Teachers' Attitude

Indicators		**Mean**	**SD**	**VI**
1.	Some teachers may hesitate to adopt new technologies due to comfort.	4.07	.618	To a great extent
2.	Teachers who doubt their ability to use digital tools effectively may avoid integrating them into their teaching practices.	4.05	.659	To a great extent
3.	If teachers do not see the value or benefits of digital technologies in enhancing learning outcomes, they may be less inclined to use them.	4.05	.646	To a great extent
4.	Teachers' personal beliefs about the role of technology in education can significantly influence their willingness to incorporate digital tools.	4.15	.617	To a great extent
5.	Teachers with low self-efficacy regarding their digital skills may feel overwhelmed by the prospect of using technology, leading to reluctance or avoidance.	4.08	.616	To a great extent
Overall		4.08	.547	To a great extent

Legend: 1.0-1.49 (Strongly Disagree); 1.50-2.49 (Disagree); 2.50-3.49 (Neutral); 3.50-4.49 (Agree); 4.50-5.0 (Strongly Agree)

The data in Table 11 highlight teachers' attitudes as a significant barrier to effectively integrating digital technologies in public elementary schools. With an overall mean of 4.08 (interpreted to a great extent), it is evident that attitudinal factors hinder the progressive adoption of digital teaching methods.

The highest-rated item, "Teachers' personal beliefs about the role of technology in education" (Mean = 4.15), suggests that individual ideologies strongly affect willingness to integrate technology. Teachers who question digital tools' value or are not convinced of their pedagogical effectiveness are likely to resist their use. This aligns with findings by Hubers et al. (2020), who emphasize that teachers' mindsets and professional identities can either support or obstruct technological integration, depending on their perceived relevance of technology to instructional goals.

Further, indicators such as teachers hesitating due to comfort with traditional methods (Mean = 4.07) and low digital self-efficacy (Mean = 4.08) reveal a lack of confidence and fear of change. Studies like that of Ching et al. (2020) point out that teachers who lack confidence in their digital abilities often avoid digital tools entirely, reinforcing systemic inertia in teaching practices.

Similarly, the statement "Teachers who doubt their ability to use digital tools may avoid integration" (Mean = 4.05) underscores the impact of self-doubt on instructional innovation. According to Howard et al. (2021), self-efficacy is a strong predictor of a teacher's intent to adopt and sustain the use of technology. Teachers with lower digital confidence are less likely to engage in digital pedagogy, regardless of access to infrastructure or tools.

Lastly, perceptions of digital tools' value in improving learning outcomes (Mean = 4.05) suggest another attitudinal barrier. Teachers may resist technology not due to its complexity but because they do not perceive a clear educational benefit, echoing findings from Ertmer and Ottenbreit-Leftwich (2020), who describe these as second-order barriers—deeply rooted beliefs that are harder to address than external issues like training or resources.

Overall, the relatively high mean scores across all indicators and the consistent standard deviations (SD = 0.547 to 0.659) indicate a shared concern across the teaching force. These attitudes act as internal barriers and pose a serious issue for schools seeking to implement digital teaching successfully. Addressing these requires skill-based training and transformational professional development that builds belief in technology's value and strengthens digital confidence (Tondeur et al., 2021).

Table: 12

Level of Perceived Teachers' Beliefs

Indicators	Mean	SD	VI
1. Teachers' confidence in their ability to effectively use digital tools and integrate them into their teaching practices.	4.21	.517	To a great extent
2. Teachers' overall attitudes and openness towards using digital tools in the classroom.	4.23	.530	To a great extent
3. Teachers' beliefs about the benefits and effectiveness of digital tools in enhancing teaching and learning.	4.29	.585	To a great extent
4. Teachers' beliefs about how easy or difficult it is to use digital tools.	4.22	.537	To a great extent
5. Teachers' beliefs about the adequacy of their training and professional development in digital teaching.	4.25	.569	To a great extent
	4.24	.492	To a great extent

Legend: 1.0-1.49 (Strongly Disagree); 1.50-2.49 (Disagree); 2.50-3.49 (Neutral); 3.50-4.49 (Agree); 4.50-5.0 (Strongly Agree)

Table 12 presents teachers' beliefs regarding digital teaching, with an overall mean of 4.24, interpreted as "to a great extent." At first glance, this suggests that teachers generally hold positive beliefs about technology use in the classroom. However, a deeper analysis reveals that even strong beliefs can mask underlying issues that challenge the sustainability and effectiveness of digital integration in public elementary schools. The highest-rated belief—"Teachers' beliefs about the benefits and effectiveness of digital tools in enhancing teaching and learning" (Mean = 4.29)—indicates that teachers recognize the potential of digital tools. However, such beliefs do not automatically translate into practice, especially if institutional support, infrastructure, or pedagogical training are lacking. According to Howard et al. (2021), a belief in technology's benefits must be accompanied by operational confidence and contextual readiness to achieve meaningful implementation.

Likewise, the high rating for training adequacy (Mean = 4.25) may reflect general satisfaction, but it can also point to varying interpretations of what constitutes "adequate training." Studies like Scherer et al. (2021) emphasize that many teachers overestimate their digital preparedness, leading to challenges when faced with actual digital tasks, especially in virtual or blended classrooms.

The item on ease or difficulty in using digital tools (Mean = 4.22) also shows that perceived usability is not a major barrier, yet usability beliefs alone do not address pedagogical complexity. Teachers may find tools easy to use for administrative tasks, but integrating them into instruction effectively is a deeper challenge, as Hsu & Chen (2020) noted. Additionally, while teachers' openness toward using digital tools (Mean = 4.23) and confidence in their skills (Mean = 4.21) are encouraging, the modest standard deviations (ranging from 0.492 to 0.585) suggest variability across the teaching population, meaning some may still struggle or hold private doubts. This aligns with Ifinedo et al. (2020), who found that despite positive beliefs, fear of failure, limited peer support, and lack of digital fluency can hinder full implementation.

In summary, while Table 12 highlights strong positive beliefs, these can coexist with hidden barriers, such as overconfidence, lack of in-depth pedagogical training, and contextual constraints.

Table: 13

Level of Perceived Resistance to Technology

Indicators	Mean	SD	VI
1. Teachers have preconceived notions that technology is not beneficial or is too complex to integrate into their teaching methods.	3.93	.676	To a great extent
2. Some educators feel insecure about using digital tools effectively, which can lead to a reluctance to adopt new technologies.	3.94	.677	To a great extent
3. Resistance stems from a fear of altering established teaching practices and routines, which can be perceived as disruptive.	3.93	.670	To a great extent
4. Teachers feel unprepared to use technology without adequate professional development and training, resulting in resistance.	4.01	.680	To a great extent

5.	Teachers may resist integration because they do not see technology's direct relevance or benefits in enhancing their teaching or students' learning outcomes.	3.89	.683	To a great extent
Overall		3.94	.610	To a great extent

Legend: 1.0-1.49 (Strongly Disagree); 1.50-2.49 (Disagree); 2.50-3.49 (Neutral); 3.50-4.49 (Agree); 4.50-5.0 (Strongly Agree)

Table 13 reveals the Level of Perceived Resistance to Technology among teachers, with an overall mean of 3.94 (interpreted as "to a great extent"). This highlights that resistance remains a significant issue in integrating digital teaching in public elementary schools. This resistance manifests through various psychological, pedagogical, and institutional barriers.

The highest-rated item, "Teachers feel unprepared to use technology without adequate professional development" (Mean = 4.01), indicates that insufficient training remains a core cause of resistance. Without structured and ongoing professional development, teachers may lack the skills and confidence to engage with technology (Koh, Chai, & Lim, 2021). This finding suggests a need for more hands-on, context-specific, and sustained training programs that go beyond one-time workshops.

Several indicators, such as fear of disrupting established teaching routines (Mean = 3.93) and preconceived notions about the complexity or irrelevance of technology (Mean = 3.93 and 3.89), show that habitual practices and attitudes pose psychological barriers to innovation.

As noted by Liu et al. (2020), teachers may resist change even when digital tools are available due to comfort with traditional methods or skepticism about technology's pedagogical value.

The belief that technology is too complex or not directly beneficial to teaching and learning is particularly troubling. These perceptions can prevent meaningful use of digital tools, even in resource-rich environments (Ertmer et al., 2019). The Technology Acceptance Model (TAM) supports this, suggesting that perceived usefulness and ease of use significantly influence whether educators embrace or resist technology.

Moreover, feelings of insecurity or low self-efficacy (Mean = 3.94) emphasize that resistance often stems not from outright refusal but from anxiety and lack of confidence, especially among older or less tech-savvy teachers (Tondeur et al., 2022). These concerns may not be visible but are critical underlying barriers to widespread digital adoption in schools.

Although all items fall within the "agree" range (3.50–4.49), their consistent elevation above 3.9 signals that resistance is not isolated or minor—it is a systemic challenge. The standard deviations (0.670–0.683) further indicate a shared perception among respondents, reinforcing the widespread nature of resistance in public school settings.

The data in Table 13 reflect that resistance to technology integration in teaching is a notable concern among educators, with an overall mean of 3.94, interpreted as "to a great extent."

All indicators suggest that various psychological and professional factors contribute to this resistance. The highest-rated statement (M = 4.01) points to inadequate training and professional development as a primary driver of hesitation, reinforcing that support systems are critical for successful technology adoption.

These findings are consistent with existing literature emphasizing that resistance often stems not from outright rejection but from a lack of confidence, preparation, and clear alignment with pedagogical goals (Ertmer & Ottenbreit-Leftwich, 2010). To address this resistance effectively, institutions must prioritize targeted training, promote the practical benefits of technology, and create safe spaces for experimentation and gradual integration.

Part IV- Progressive Technology Integration

This part delves into the integration of progressive technologies in education, examining educators' perceptions regarding key areas such as digital literacy, pedagogical competence, problem-solving skills, collaborative learning environments, ethical technology use, and adaptability for lifelong learning.

Table: 14

Level of Perceived Digital Literacy and Skills

Indicators		**Mean**	**SD**	**VI**
1.	Continuous training and professional development programs for teachers can help them stay updated with the latest technological tools, and digital literacy skills encompass knowledge.	4.42	.588	Highly Practiced
2.	Embedding digital literacy into the curriculum across all subjects helps students develop these skills in a contextual and meaningful way.	4.31	.591	Highly Practiced
3.	Providing equitable access to digital devices and high-speed internet is crucial.	4.36	.619	Highly Practiced

4.	Strong leadership and supportive policies at the institutional level can drive technology integration.	4.35	.589	Highly Practiced
5.	Engaging parents and the community in digital literacy initiatives can reinforce learning at home and in the community.	4.33	.613	Highly Practiced
Overall		4.35	.536	Highly Practiced

Legend: 1.0-1.49 (Never); 1.50-2.49 (Rarely); 2.50-3.49 (Sometimes); 3.50-4.49 (Often); 4.50-5.0 (Always)

The findings in Table 14 indicate that digital literacy and skills are highly practiced, with an overall mean of 4.35. The highest-rated factor (Mean = 4.42) underscores the necessity of continuous professional development for educators, ensuring they remain proficient in using evolving technological tools. This aligns with Reddecker (2017), who emphasized that sustained training programs enhance teachers' digital competencies, enabling them to integrate technology effectively into their instruction. Similarly, it found that professional development significantly impacts teachers' confidence and ability to implement digital tools in the classroom.The importance of equitable access to digital devices and high-speed internet (Mean = 4.36) is another critical factor. This supports Selwyn (2016), who highlighted that digital inequality remains a significant barrier to effective technology integration. Hohlfeld, Ritzhaupt, Dawson, and Wilson (2017) further explained that disparities in access to technology can widen educational gaps, emphasizing the need for schools to ensure equal digital opportunities for all students.

The study also emphasizes the role of strong institutional leadership and supportive policies in driving technology integration (Mean = 4.35). This finding aligns with Schrum and Levin's (2016) argument that school leadership is crucial in fostering a digital learning culture. The administrators must create policies that encourage the adoption of digital tools and provide necessary resources for teachers and students. Furthermore, embedding digital literacy across all subjects (Mean = 4.31) is recognized as an effective strategy for developing students' technological skills in meaningful ways. This supports Falloon (2020), who argued that integrating digital literacy into various disciplines enhances students' problem-solving abilities and prepares them for real-world challenges. Similarly, Ng (2017) stated that digital literacy should be incorporated into subject-specific contexts rather than taught in isolation to ensure its practical application. Lastly, engaging parents and the community in digital literacy initiatives (Mean = 4.33) reinforces learning beyond the classroom. It also emphasized that parental involvement in digital education positively influences students' ability to develop and apply technological skills. Community engagement also ensures that students receive continuous support, bridging the gap between formal education and real-world digital literacy applications.

Table: 15

Level of Perceived Pedagogical Digital Competence

Indicators		**Mean**	**SD**	**VI**
1.	Continuous professional development programs, workshops, and online courses can help educators build and enhance digital competencies.	4.43	.561	Highly Practiced
2.	Establishing communities of practice where educators can share experiences, resources, and best practices can foster a collaborative environment.	4.42	.616	Highly Practiced
3.	Embedding digital tools and resources into the curriculum ensures that technology is not an add-on but an integral part of the learning process.	4.35	.589	Highly Practiced
4.	Schools and educational institutions should invest in the necessary infrastructure to support technology integration.	4.37	.581	Highly Practiced
5.	Implementing assessment tools that measure students' and teachers' digital competencies can help identify areas for improvement.	4.39	.569	Highly Practiced
Overall		4.39	.540	Highly Practiced

Legend: 1.0-1.49 (Never); 1.50-2.49 (Rarely); 2.50-3.49 (Sometimes); 3.50-4.49 (Often); 4.50-5.0 (Always)

The findings in Table 15 indicate that pedagogical digital competence is highly practiced, with an overall mean of 4.39. The highest-rated factor (Mean = 4.43) highlights the importance of continuous professional development programs, workshops, and online courses in enhancing educators' digital skills. This aligns with Koehler and Mishra's (2016) Technological Pedagogical Content Knowledge (TPACK) framework, which emphasizes that teachers must develop a balance between technological, pedagogical, and content knowledge for effective technology integration. Similarly, Redecker (2017) stressed that professional development opportunities are critical in equipping educators with the necessary competencies to integrate digital tools into their teaching strategies.

The significance of communities of practice (Mean = 4.42) in fostering collaboration among educators further supports findings from Lantz-Andersson, Lundin, and Selwyn (2018), who argued that peer learning networks encourage teachers to share best practices and innovative approaches to technology

use. This perspective is reinforced by Trust (2018), who found that professional learning communities empower educators to overcome digital integration challenges through collective problem-solving and resource-sharing. Embedding digital tools into the curriculum (Mean = 4.35) ensures that technology is an integral part of the learning process rather than an add-on. It is emphasized that technology should be embedded into subject-specific instruction rather than treated as an isolated skill. This aligns with the European Framework for the Digital Competence of Educators (DigCompEdu), highlighting the need for digital tools to be meaningfully incorporated into pedagogy rather than used sporadically (Redecker & Punie, 2017). The study also underscores the role of infrastructure investments (Mean = 4.37) in supporting technology integration. It also found that a lack of technological infrastructure, including access to devices and reliable internet connectivity, is a major barrier to digital competency. Similarly, Pettersson (2018) emphasized that schools must provide adequate digital resources to ensure teachers can fully leverage technology in instruction. Furthermore, assessing digital competencies among students and teachers (Mean = 4.39) is essential for identifying areas of improvement. This supports López-Belmonte et al. (2021), who highlighted that assessment frameworks allow educators to refine their digital practices based on data-driven insights.

The findings in Table 16 indicate that problem-solving skills are highly practiced, with an overall mean of 4.29. The highest-rated indicators—integrating technology to promote digital literacy (Mean = 4.31) and providing professional development for teachers (Mean = 4.31)—highlight the importance of equipping students and educators with the necessary skills to navigate and solve complex problems in digital learning environments.

The integration of Problem-Based Learning (PBL) in classrooms (Mean = 4.25) aligns with research emphasizing that PBL fosters critical thinking, creativity, and problem-solving skills (Enjolras & Steen-Johnsen, 2017).

Table 16:

Level of Perceived Problem-Solving Skills

Indicators	Mean	SD	VI
1. Implementing PBL in the classroom encourages students to engage with real-world problems, fostering critical thinking and problem-solving skills.	4.25	.625	Highly Practiced
2. Utilizing collaborative technologies such as online discussion forums, shared documents, and project management software can enhance teamwork and communication skills.	4.27	.618	Highly Practiced
3. Creating interactive and engaging learning environments with the help of smartboards, simulations, and educational software can make problem-solving activities more dynamic and effective.	4.29	.614	Highly Practiced
4. Integrating technology to promote digital literacy ensures students are consumers and proficient technology users.	4.31	.619	Highly Practiced
5. Providing professional development for teachers on effectively integrating technology into their teaching practices is crucial.	4.31	.619	Highly Practiced
Overall	4.29	.568	Highly Practiced

Legend: 1.0-1.49 (Never); 1.50-2.49 (Rarely); 2.50-3.49 (Sometimes); 3.50-4.49 (Often); 4.50-5.0 (Always)

When students engage with real-world challenges, they develop deeper cognitive skills and the ability to apply theoretical knowledge to practical situations. Voogt et al. (2018) support using collaborative technologies (Mean = 4.27), such as online forums and project management tools. They found that digital tools enhance communication, teamwork, and the ability to co-construct knowledge.

Similarly, Gleason (2018) noted that digital collaboration prepares students for 21st-century workforce demands, where teamwork and technology integration are essential. Interactive learning environments, such as those incorporating smartboards, simulations, and educational software (Mean = 4.29), are also widely recognized as enhancing engagement and active learning.

It also found that technology-driven interactive environments improve students' cognitive engagement and help them develop problem-solving skills by allowing them to experiment, make decisions, and reflect on outcomes in real time. The integration of digital literacy in education (Mean = 4.31) is crucial for preparing students to be not only technology consumers but also proficient digital users.

According to Nicholas (2019), digital literacy is essential in helping students analyze, evaluate, and apply digital resources effectively. Highlight that digital literacy is a fundamental skill in modern education, enabling students to adapt to rapidly changing technological landscapes. Finally, professional development for teachers (Mean = 4.31) is essential for effectively implementing problem-solving strategies using technology. Trust, Krutka, and Carpenter (2019) emphasize that ongoing professional development helps educators integrate technology meaningfully and confidently into their teaching practices.

The findings in Table 17 indicate that collaborative learning environments are highly practiced, with an overall mean of 4.25. The highest-rated factor—ongoing training and support for teachers (4.28)—highlights the importance of equipping educators with the necessary skills to integrate technology effectively into their teaching.

Other key factors, such as technology-enhanced skill development (4.26) and the creation of physical and virtual spaces for social learning (4.25), further emphasize the role of digital tools in fostering collaboration and engagement.

Additionally, the integration of Future Learning Environment (FLE) models (4.23) and the use of smartboards, mobile devices, and online learning platforms (4.23) contribute to a dynamic and interactive learning experience. The relatively low standard deviations (0.530 to 0.598) suggest a consistent agreement among educators regarding these practices.

Table: 17

Level of Perceived Collaborative Learning Environments

Indicators		**Mean**	**SD**	**VI**
1.	Implementing models like the **Future Learning Environment (FLE-Tools)** can facilitate progressive inquiry.	4.23	.561	Highly Practiced
2.	Integrating technology to develop skills such as communication, critical thinking, collaboration, problem-solving, and computational thinking is crucial.	4.26	.572	Highly Practiced
3.	Creating physical and virtual spaces that support social learning and engagement is essential.	4.25	.598	Highly Practiced
4.	Leveraging tools like smartboards, mobile devices, and online learning platforms can enhance collaborative learning.	4.23	.576	Highly Practiced
5.	Providing ongoing training and support for teachers to integrate technology into their teaching practices effectively is vital.	4.28	.594	Highly Practiced
Overall		4.25	.530	Highly Practiced

Legend: 1.0-1.49 (Never); 1.50-2.49 (Rarely); 2.50-3.49 (Sometimes); 3.50-4.49 (Often); 4.50-5.0 (Always)

These findings align with recent literature on collaborative and technology-enhanced learning environments. Scardamalia and Bereiter (2017) emphasize that Future Learning Environments (FLEs) support inquiry-based learning, allowing students to engage deeply with knowledge construction.

Similarly, Lai (2019) and Voogt et al. (2018) argue that integrating technology in education enhances critical thinking, communication, collaboration, and problem-solving skills, essential for 21st-century learning.

The role of physical and virtual learning spaces is also well-documented. These environments promote social engagement and peer-to-peer learning, leading to more meaningful interactions.

Moreover, results found that smartboards, mobile devices, and online platforms significantly improve student participation and collaboration, making learning more interactive and engaging.

Finally, it stresses that ongoing teacher professional development is crucial for successfully implementing classroom technology. Without adequate training and support, educators may struggle to integrate digital tools effectively, limiting the potential benefits of collaborative learning environments.

The findings in Table 18 reveal that critical thinking and ethical technology use are highly practiced, with an overall mean of 4.29. The highest-rated factor—fostering a culture of continuous learning on emerging technologies and ethics (4.33)—highlights the importance of staying informed about the evolving digital landscape.

Integrating ethical decision-making frameworks through case studies (4.29) helps students understand the real-world consequences of technology use, while making critical thinking a core component of technology education (4.30) ensures they develop strong analytical skills.

Table: 18

Level of Perceived Critical Thinking and Ethical Use

Indicators		**Mean**	**SD**	**VI**
1.	Educators can integrate ethical decision-making frameworks into the curriculum by discussing case studies where technology has both positive and negative impacts, which can help students understand the importance of ethical considerations.	4.29	.585	Highly Practiced
2.	Critical thinking should be a core component of technology education.	4.30	.559	Highly Practiced

3.	AI-powered platforms can simulate real-world scenarios that require ethical decision-making.	4.22	.624	Highly Practiced
4.	Schools and educational institutions should establish clear guidelines and policies for the ethical use of technology.	4.31	.591	Highly Practiced
5.	Encourage a culture where educators and students continuously learn about emerging technologies and their ethical implications.	4.33	.585	Highly Practiced
Overall		4.29	.533	Highly Practiced

Legend: 1.0-1.49 (Never); 1.50-2.49 (Rarely); 2.50-3.49 (Sometimes); 3.50-4.49 (Often); 4.50-5.0 (Always)

Additionally, AI-powered simulations (4.22) provide interactive ways to practice ethical decision-making, and establishing clear institutional guidelines and policies (4.31) supports responsible technology use.

The relatively low standard deviations (0.533 to 0.624) indicate strong consensus among educators on these practices.

These results align with recent literature on ethical digital practices and critical thinking in education. According to Deb (2025), integrating ethical frameworks and real-world case studies into the curriculum enhances students' ability to assess the implications of technology use.

Similarly, Meneses (2021) emphasizes that critical thinking is essential in digital education, enabling students to question, analyze, and make informed decisions in an increasingly complex digital environment.

Research suggests that AI-powered simulations can significantly improve ethical decision-making skills by immersing students in real-life ethical dilemma analysis scenarios.

Meanwhile, the results stress the need for clear guidelines and policies to ensure responsible technology use, particularly as digital platforms continue to evolve.

Furthermore, it highlights the importance of fostering a culture of continuous digital ethics learning, ensuring that educators and students remain informed about emerging technologies and their implications.

Table 19 presents the respondents' perceived level of adaptability and lifelong learning.

The results indicate that educators practice adaptability and lifelong learning highly, with an overall mean of 4.36. The highest-rated factors include ongoing training and professional development (4.38) and fostering digital literacy (4.38), highlighting the importance of continuous learning and technological proficiency. Additionally, using collaborative platforms (4.34) and adaptive learning technologies (4.34) ensures that educators and students can effectively engage with digital tools.

Table: 19

Level of Practice in Adaptability and Lifelong Learning

Indicators		**Mean**	**SD**	**VI**
1.	Encourage ongoing training and professional development for educators and administrators to stay updated with technological advancements and teaching methodologies.	4.38	.597	Highly Practiced
2.	Develop adaptable curricula that can be easily updated to incorporate new technologies.	4.35	.575	Highly Practiced
3.	Foster digital literacy among students and educators by understanding how to use various digital tools effectively and safely.	4.38	.581	Highly Practiced
4.	Utilize collaborative platforms and tools that allow students and educators to collaborate, share resources, and engage in interactive learning.	4.34	.628	Highly Practiced
5.	Implement adaptive learning technologies that tailor educational content to each student’s needs and pace.	4.34	.615	Highly Practiced
Overall		4.36	.541	Highly Practiced

Legend: 1.0-1.49 (Never); 1.50-2.49 (Rarely); 2.50-3.49 (Sometimes); 3.50-4.49 (Often); 4.50-5.0 (Always)

These findings align with Hou et al. (2018), who emphasize that lifelong learning in digital education requires continuous adaptation to new technologies while retaining previously acquired knowledge. Similarly, Jarvie-Eggart et al. (2019) discuss how digital technology enhances adaptability by providing

flexible learning opportunities for diverse learners, including professionals, stay-at-home parents, and military personnel. The preference for online learning over traditional methods further supports the idea that adaptability is essential in modern education.

Furthermore, Mohamed Hashim et al. (2022) argue that digital transformation in education provides a competitive edge, allowing institutions to remain relevant amid global changes.

This is reinforced by Mardiana (2020), who highlights that educators must develop a mindset of continuous learning and technological proficiency to integrate digital tools into their teaching practices effectively.

The study supports the idea that adaptability and lifelong learning are crucial for educators and students in a rapidly evolving digital landscape. Institutions must continue investing in training, digital literacy, and adaptive learning technologies to ensure long-term success in education.

These findings align with global trends in 21st-century education that emphasize flexibility, digital competence, and lifelong learning as key attributes of modern teaching and learning frameworks (UNESCO, 2019; Redecker & Punie, 2017).

They also reinforce the importance of fostering teacher and student readiness for a fast-evolving digital landscape, enhancing overall educational resilience and responsiveness.

Part V. Test of Significant Relationships Between Variables

The findings indicate a significant relationship between progressive technology integration and digital teaching competencies, with moderate correlations across various aspects. Innovation has the strongest link to problem-solving skills (.541) and collaborative learning environments (.550), suggesting that fostering creativity enhances these areas.

Technology integration is also closely associated with digital literacy (.490) and collaborative learning (.500), highlighting the importance of these skills in modern education. While evaluation shows a weaker correlation, problem-solving and learning networks consistently support effective digital teaching. The findings are connected with Information and Communication Technology (ICT) innovations, which play a role in changing learning processes, but the educational system controls the progressive transformation.

Table: 20

Correlation Between Digital Teaching Competencies and Progressive Technology Integration

Digital Teaching Competencies	**Progressive Technology Integration**					
	DLS	PDC	PSS	CLE	CTEU	ALL
Technology Integration	.490**	.474**	.469**	.500**	.436**	.404**
Evaluation	.376**	.367**	.451**	.443**	.380**	.344**
Learning Network	.448**	.500**	.481**	.475**	.458**	.406**
Problem Solving	.484**	.522**	.500**	.491**	.496**	.466**
Innovation	.491**	.518**	.541**	.550**	.471**	.425**
Collaborative Learning	.406**	.390**	.462**	.491**	.454**	.311**

***Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).*

Verbal Interpretation of r-value: +1.0 Perfect positive +/- association +0.8 to +1.0 Very strong +/- association +0.6 to +0.8 Strong +/- association +0.4 to +0.6 Moderate +/- association +0.2 to +0.4 Weak +/- association 0.0 to +0.2 Very weak +/- or no association

The change of ICT technology is one of the important drivers of evolving skills (Wrahatnolo, T., 2018). Progressive technology integration and digital teaching competencies are closely associated because, although teachers with strong digital skills can successfully integrate technology into their lessons, other elements such as institutional support, resource availability, and individual attitudes toward technology are also significantly related.

Teachers with strong problem-solving and innovative abilities, for instance, can use interactive whiteboards and other digital tools to improve student engagement in math classes. However, some people might struggle to make the most of these technologies without sufficient assistance and instruction.

Digital platforms such as Google Classroom are frequently used by teachers who are excellent at collaborative learning to encourage student interaction; however, a lack of digital literacy or a reluctance to accept online collaboration may make integration difficult.

According to this moderate relationship, a combination of skills, resources, and institutional support is necessary for successful integration, even though digital competencies improve technology use.

The consistently significant associations affirm that as teachers enhance their competencies in areas such as Digital Literacy Skills (DLS), Pedagogical Digital Competence (PDC), and Adaptability and Lifelong Learning (ALL), they are more likely to adopt, sustain, and innovate with digital technologies in their classrooms.

These findings underscore the importance of continuous professional development and systemic support in fostering digital transformation in education.

Table: 21

Correlation Between Digital Teaching External Challenges and Progressive Technology Integration

Digital Teaching External Challenges	**Progressive Technology Integration**					
	DLS	PDC	PSS	CLE	CTEU	ALL
Access to Resources	.634**	.621**	.457**	.579**	.664**	.701**
Training	.635**	.584**	.534**	.594**	.676**	.623**
Support	.487**	.465**	.404**	.465**	.568**	.509**

***Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).*

Verbal Interpretation of r-value: +1.0 Perfect positive +/- association +0.8 to +1.0 Very strong +/- association +0.6 to +0.8 Strong +/- association +0.4 to +0.6 Moderate +/- association +0.2 to +0.4 Weak +/- association 0.0 to +0.2 Very weak +/- or no association

The results highlight a significant relationship between progressive technology integration and external challenges in digital teaching. Access to resources (.701) and training (.676) have the strongest correlations, indicating that well-equipped schools and continuous professional development are crucial for effective technology adoption. Support (.509) shows a moderate association, suggesting that while institutional backing is important, access to tools and training plays a more dominant role. The findings emphasize that overcoming external barriers can greatly enhance digital teaching competencies and successfully integrate technology in education.

External challenges in digital teaching have a moderate to strong relationship with progressive technology integration because access to resources, training, and support directly impact how effectively educators incorporate technology into their teaching.

Access to resources shows a strong correlation, as teachers with reliable internet, updated devices, and well-equipped classrooms are more likely to implement technology-driven lessons. However, limited access to these resources in underprivileged schools hinders full integration. Training also plays a significant role, as educators who receive continuous professional development on digital tools are more confident in integrating technology into their pedagogy.

Without proper training, many teachers struggle to maximize the potential of digital platforms, leading to inconsistent implementation. Support from school administrators and IT personnel further strengthens technology integration, as schools that provide technical assistance and encouragement enable teachers to experiment with new technologies without fear of failure.

In contrast, the absence of strong institutional support discourages educators from fully embracing digital teaching methods. These observations highlight that while educators may be willing to integrate technology; external factors significantly affect their ability to do so effectively. Furthermore, Koehler and Mishra's (2009)

The Technological Pedagogical Content Knowledge (TPACK) framework emphasizes that successful technology integration requires technical knowledge and pedagogical and content expertise. This supports the finding that school support—including guidance from administrators, IT staff, and peer collaboration—is crucial in empowering educators to use technology innovatively.

Teachers may struggle to overcome technical and pedagogical challenges without adequate institutional backing, leading to fragmented integration efforts. These studies reinforce that external challenges significantly shape the success of progressive technology integration, emphasizing the need for sufficient resources, ongoing training, and institutional support to enable effective and sustainable digital teaching practices.

Table: 22

Correlation Between Digital Teaching Internal Challenges and Progressive Technology Integration

Digital Teaching Internal Challenges	Progressive Technology Integration					
	DLS	PDC	PSS	CLE	CTEU	ALL
Teachers' Attitude	.429**	.432**	.389**	.386**	.431**	.431**
Teachers' Belief	.579**	.563**	.592**	.614**	.589**	.572**
Resistance to Technology	.229**	.256**	.289**	.280**	.274**	.246**

***Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).*

Verbal Interpretation of r-value: +1.0 Perfect positive +/- association +0.8 to +1.0 Very strong +/- association +0.6 to +0.8 Strong +/- association +0.4 to +0.6 Moderate +/- association +0.2 to +0.4 Weak +/- association 0.0 to +0.2 Very weak +/- or no association

The findings indicate a significant relationship between progressive technology integration and internal challenges in digital teaching. Teachers' beliefs (.614) show the strongest correlation, suggesting that educators' confidence and perception of technology's value greatly influence its integration. Teachers' attitudes (.431) also have a moderate association, highlighting the role of openness and willingness to adapt. Resistance to technology (.289) has the weakest correlation, implying that while some teachers hesitate to embrace digital tools, other factors play a larger role in adoption.

The weak to moderate relationship between digital teaching internal challenges and progressive technology integration suggests that while internal factors such as teachers' attitudes, beliefs, and resistance to technology impact integration, they are not the sole determinants of successful implementation. Internal Challenges, like teachers' beliefs and attitudes toward technology, play a role in digital adoption, but extrinsic factors, like resource availability and institutional support, often overshadow them. This explains why the correlation between internal challenges and integration is not as strong as that of external challenges.

For instance, although influential, teachers' attitudes toward technology may not necessarily prevent integration if external support exists. A teacher with a hesitant attitude toward digital tools may still integrate them into lessons if provided with structured training, mentorship, and user-friendly platforms. Similarly, teachers' beliefs about the effectiveness of technology in education moderately influence integration. Educators who believe digital tools enhance learning outcomes are more likely to adopt them. However, external factors like policy mandates and institutional support often override personal beliefs, making the relationship moderate rather than strong. Hernández-Ramos (2007) supports this view, emphasizing that addressing resistance requires a strategic approach, including training, support, and a focus on the benefits of digital tools for teaching and learning. Resistance to technology shows the weakest correlation with integration, as even teachers who initially resist may be compelled to adopt digital tools due to institutional requirements or peer influence. Koehler and Mishra's (2009) TPACK framework suggests that resistance diminishes when teachers acquire the necessary technological and pedagogical skills, indicating that professional development can mitigate this barrier.

Finally, while internal challenges like attitudes, beliefs, and resistance affect technology integration, their impact is weaker than external factors such as training, resources, and institutional support.

Conclusions:

It concludes that teachers with greater digital competency in problem-solving, collaborative learning, and technology integration are more likely to use Progressive technology integration in the classroom.

Limited access to resources, inadequate support, and insufficient training negatively impact teachers' ability to integrate digital technology into their teaching practices. Addressing these challenges is crucial for successful implementation.

Among internal challenges, teachers' beliefs strongly influence technology integration, indicating that positive perceptions and confidence in digital tools encourage adoption, while resistance to technology inhibits progress.

The study confirms that external and internal challenges affect the level of digital technology adoption. Overcoming these challenges through training, resource allocation, and mindset transformation will enhance progressive technology integration in public elementary schools.

Recommendations:

Based on the conclusions drawn, the following are the researchers' recommendations.

1. Schools and educational institutions may enhance Digital Training Programs for Teachers and provide regular training and workshops to improve teachers' digital competence, focusing on technology integration, problem-solving, and collaborative learning.

2. The Department of Education and school administrators may Increase Access to Digital Resources by allocating more resources for digital tools, stable internet access, and modern technological infrastructure to support effective digital learning environments.
3. Schools may strengthen support systems for teachers in establishing mentorship programs, technical support teams, and peer collaboration initiatives to assist teachers in integrating digital technology confidently and effectively.
4. Educational leaders may foster positive attitudes toward technology in promoting a growth mindset by encouraging teachers to embrace technology through success stories, incentives, and recognition of innovative digital teaching practices.
5. Schools and policymakers may develop policies for sustainable technology integration and create long-term strategies, including digital literacy programs, continuous professional development, and curriculum adjustments supporting progressive technology integration.
6. Future studies may conduct further research on digital teaching challenges and explore deeper factors affecting technology adoption, including the psychological, social, and economic barriers that may influence teachers' willingness and ability to integrate digital tools into education.

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