

# The Pivotal Impact of Technology Integration in Primary Education

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**Abstract.** The research investigates technology integration in elementary education, focusing on teachers' experiences, challenges, and strategies in Semarang City and Blora Regency, Indonesia. As technology rapidly evolves, its application in education becomes increasingly vital, yet the effective integration of digital tools remains a challenge in many primary schools. Teachers' perspectives and practices are critical in shaping how technology impacts learning outcomes. The primary objective of this study is to explore the various strategies teachers employ in integrating technology into the classroom, identify the challenges they encounter, and assess the overall impact of technology on students' learning experiences. A qualitative research method was used, employing in-depth interviews and classroom observations with elementary school teachers from selected schools in Semarang and Blora. The findings reveal that while teachers recognize the potential of technology in enhancing learning, they face several challenges, such as limited resources, insufficient training, and resistance from students or parents. However, many teachers have developed innovative strategies to overcome these obstacles, incorporating various digital tools to foster interactive and engaging learning environments. In conclusion, the research highlights the need for more comprehensive support, professional development, and resource allocation to integrate technology into elementary education effectively. This study provides valuable insights for policymakers and educators to enhance technology adoption and improve primary school educational practices.

**Key words:** technology integration; elementary education; digital skills; technological barriers; digital strategies

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## INTRODUCTION

Technology integration into education has become a cornerstone of modern pedagogical practices, influencing how knowledge is imparted and absorbed in the classroom (Cao et al., 2022). As the digital age continues to evolve, primary education systems worldwide are increasingly exploring ways to incorporate digital tools, interactive media, and online platforms to enhance the learning experience (How & Hung, 2019). This transition is particularly crucial for elementary education, where foundational learning shapes future academic and cognitive development (Ishak & Jiang, 2022). Technology integration in primary education in Indonesia, particularly in regions such as Semarang City and Blora Regency, has recently gained considerable attention. However, despite the growing emphasis on digital learning (Wang et al., 2024), a significant gap exists in understanding how teachers in these locales navigate the challenges and opportunities technology integration presents (Utaminingsih, Sumartiningsih, et al., 2024).

Introducing technology into education promises to transform teaching methodologies, engage students more effectively, and provide individualized learning opportunities (Hassan et al., 2023). However, the integration process is fraught with obstacles. Teachers face many challenges, ranging from limited access to digital tools and infrastructure to the need for training in using technology effectively within the curriculum (Sudarsana et al., 2019). Additionally, cultural and contextual factors may influence the degree of technology adoption in primary schools (Utaminingsih, Ramadhani, et al., 2024). In Semarang City and Blora Regency, the disparity in technological infrastructure between urban and rural areas may contribute to an uneven application of technology in the classroom, further complicating the situation.

Research has shown that integrating technology can improve learning outcomes but requires substantial support, including teacher professional development, resource access, and administrative buy-in (Lee & Ho, 2023). Previous studies have primarily focused on urban areas with better access to technology, leaving a gap in understanding the dynamics of technological integration in rural or less-resourced settings such as those in Semarang and Blora. Moreover, the local context in these areas presents unique challenges and opportunities that still need to be thoroughly examined in existing

research (Chauhan, 2017).

While there is a growing body of literature on technology integration in education, many studies focus primarily on urban areas or higher education institutions, where technological resources and teacher expertise are more readily available (Durriyah & Zuhdi, 2018). Few studies have explored teachers' experiences in primary schools located in less urbanized regions such as Blora Regency (Utaminingsih & Purwati, 2024). There is also a need for more research explicitly addressing how teachers in Semarang City and Blora Regency navigate technology integration in their classrooms, their strategies, and their unique challenges. This gap in the literature highlights the need for further investigation into the local, contextual factors that influence technology adoption at the primary education level in these areas.

This research is crucial for understanding the complexities surrounding technology integration in primary education in Indonesia, particularly in areas with varying levels of access to digital resources. By focusing on Semarang City and Blora Regency, this study will provide insights into the unique challenges and strategies employed by teachers in these regions. It will also contribute to the broader discourse on the equitable distribution of educational technology resources (Comi et al., 2016), shedding light on teachers' needs and disparities in urban and rural settings (Utaminingsih, 2023).

Given the current emphasis on digital literacy as a critical education component, this research is paramount for policymakers, educators, and stakeholders in the education sector (Santi et al., 2022). The findings could inform the development of targeted interventions, such as tailored professional development programs and resource allocation strategies, to improve the effectiveness of technology integration in primary schools (Ditaningsih et al., 2021). The impact of this research lies in its potential to inform the future direction of technology integration in primary education in Indonesia (Urip & Riwanto, 2020). By examining teachers' experiences, challenges, and strategies in both urban and rural contexts, this study aims to provide actionable recommendations for improving technology adoption in schools (Park et al., 2015). Furthermore, the research could serve as a model for similar studies in other regions, contributing to the global dialogue on digital education reform (Hsu et al., 2019).

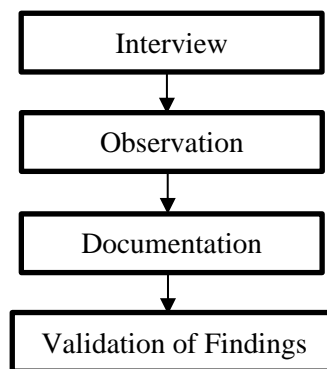
This study is expected to influence educational policy, curriculum design, and teacher training programs, ensuring that technology integration enhances learning and is an inclusive and accessible process for all educators, regardless of their geographical location. The primary objective of this research is to explore teachers' experiences, challenges, and strategies in integrating technology into primary school learning in Semarang City and Blora Regency. Specifically, this study aims to: examine teachers' experiences using digital tools and technology in their classrooms; identify teachers' challenges in integrating technology into primary school education, including infrastructure, training, and resource limitations; investigate teachers' strategies to overcome these challenges and effectively integrate technology into their teaching practices; analyse the impact of technology integration on student engagement, learning outcomes, and teacher-student interactions; provides recommendations for improving technology integration in primary schools, focusing on addressing the specific needs of teachers in Semarang City and Blora Regency. By addressing these objectives, this research aims to contribute to a deeper understanding of technology's role in shaping the future of primary education in Indonesia.

## METHODS

The study used qualitative research methods with a case study approach, aiming to explore the experiences, challenges, and strategies of primary school teachers in integrating technology into classroom instruction. The research focuses on teachers in two distinct regions: Semarang City, known for having relatively advanced technological infrastructure, and Blora Regency, which faces more limited conditions for the use of technology. The investigation is centered on three key areas: experiences of teachers, obstacles encountered in the process, and strategies employed to address challenges. The study examines how technology is integrated into the learning process, how students respond to technological implementation, internal challenges such as limited teacher competence, and external obstacles like inadequate technological infrastructure. Additionally, the study evaluates strategies implemented by teachers to overcome these challenges and optimize available resources to support technology-based learning.

The research subjects consist of six elementary school teachers selected through purposive sampling based on several criteria: having at least two years of teaching experience, experience in using technology for teaching purposes, and willingness to participate as research subjects. Among the six participants, three teachers represent Semarang, and two teachers come from Blora Regency. Data collection techniques include in-depth interviews, non-participant classroom observations, and document analysis. Semi-structured interviews were conducted to explore the experiences, challenges, and strategies of teachers in integrating technology. Non-participant observation was carried out in classrooms where technology was applied to examine teaching practices, student responses, and technical challenges faced during the learning process. Documentation was used to gather lesson plans, technology-based teaching materials, and evaluation reports, providing additional context and verification of observed practices.

The validity of the data was ensured through source triangulation, which involved comparing information obtained from interviews, observations, and documentation. Interviews captured the perspectives and experiences of six elementary school teachers. Observations were conducted to verify how technology was utilized in classroom settings and how students interacted with technology-based learning materials. Document analysis further validated the findings by reviewing teaching materials, lesson plans, and evaluation reports. The triangulation technique helped establish the credibility and reliability of research findings. A visualization of the triangulation process is presented in Figure 1.

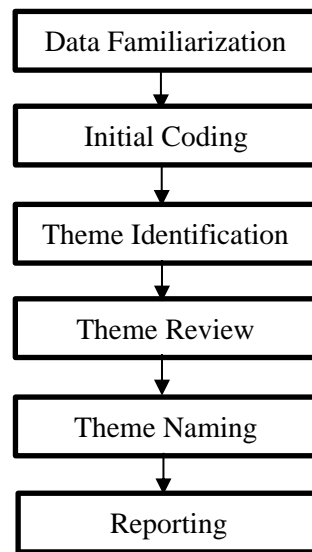


**Figure 1.** The triangulation technique chart

The research was carried out in a systematic manner. The first step involved identifying teachers who met the specified criteria and selecting them as research participants. In-depth interviews were then conducted to gather detailed information about the experiences, challenges, and strategies related to the integration of technology in teaching. Classroom observations took place during lessons involving technological tools, providing direct insight into teaching practices and student engagement. Simultaneously, relevant documents, such as lesson plans and evaluation reports, were collected and analyzed to further support the data collected from interviews and observations. The data obtained through these three methods were compared and cross-validated through the triangulation process to identify patterns and confirm consistent findings, ensuring that the research objectives were met effectively and that reliable conclusions could be drawn.

The data analysis technique used is thematic analysis, which is based on the theory of Braun & Clarke (2021). This technique was chosen because it is suitable for identifying key themes from qualitative data, such as interviews and observations. This study's qualitative data analysis process is conducted systematically through several stages. First, data familiarization is performed by re-reading the collected data from interviews, observations, and documentation to understand its context comprehensively. Second, initial coding is implemented by identifying and marking essential data relevant to the research focus. For instance, codes such as "Technical bottlenecks," "Technological benefits," or "Solution strategy" are applied. Third, theme identification is carried out by grouping similar codes into broader themes that reflect patterns observed in the data. Subsequently, a theme review is conducted to ensure the identified themes align with the data and the research objectives. Once verified, the themes are given representative names, such as "Benefits of Technology Integration" or "Infrastructure Barriers," during the theme naming stage. Finally, the reporting phase involves preparing a comprehensive narrative,

synthesizing the findings, and providing insightful conclusions based on the analyzed data. Data Analysis Process Chart is presented in Figure 2.



**Figure 2.** Data Analysis Process Chart by Braun and Clark

This research method includes an in-depth qualitative approach, data analysis based on Braun and Clarke's theory, and data validity through source triangulation. With a focus on teachers' experiences, barriers, and strategies in two different regions, this study provides a comprehensive and relevant picture of integrating technology in primary school learning.

## RESULTS AND DISCUSSION

All teachers interviewed reported that using technology in learning significantly increased student motivation and participation.

**Table 1.** Benefits of Technology Integration in Learning

No.	Key Findings	Indication	Connection to Research Objectives
1.	Increased student motivation and participation.	Teacher A from Semarang reported that interactive media increased student participation. Observations showed students were more active in discussions and exploration.	Supports the objective to explore how technology enhances student engagement and participation.
2.	Development of 21st-century skills such as digital literacy, creativity, problem-solving, and collaboration.	Teacher C from Blora described project-based assignments that enhanced information literacy and critical thinking. Lesson plans included group collaboration using digital platforms.	Addresses the objective to foster essential competencies through technology integration.
3.	More effective and engaging delivery of subject matter.	Teacher B from Semarang used digital simulations to explain abstract concepts. Learning materials demonstrated the effective use of interactive videos and simulations.	Aligns with the goal of improving knowledge acquisition and retention through engaging delivery methods.
4.	Personalized learning adapted to individual student needs.	Teacher E utilized adaptive learning applications to provide differentiated tasks. E-learning documentation showed individualized feedback and progress tracking.	Supports the objective to provide adaptive, differentiated learning experiences for students.

5.	Access to a wider range of up-to-date learning resources.	Teacher D from Blora highlighted the use of the internet for accessing articles and educational materials. Students independently explored supplemental materials.	Fulfills objectives related to expanding learning content and promoting independent exploration.
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**Table 2.** Internal Barriers to the Use of Technology

No.	Key Findings	Indication	Connection to Research Objectives
1.	Limited technological skills among teachers.	Teacher D admitted difficulties in using educational software, leading to reliance on traditional methods.	Identifies internal challenges that hinder effective technology adoption, addressing readiness and competence issues.
2.	Lack of confidence and motivation to use technology.	Teacher E feared losing authority when making mistakes with technology.	Highlights psychological barriers that affect teachers' willingness to innovate and experiment.
3.	Limited time to study and prepare technology-based materials.	Teacher B highlighted time constraints due to administrative duties, limiting the preparation of digital materials.	Emphasizes the need for time management solutions to support technology-based teaching.

**Table 3.** External Barriers Related to Infrastructure and Support

No.	Key Findings	Indication	Connection to Research Objectives
1.	Limitations of technology infrastructure in schools.	Teacher C observed outdated computers and unstable internet connections in Blora schools.	Explains how infrastructure gaps impact the capacity for technology integration.
2.	Limited student access to technology at home.	Teacher D highlighted that many students lacked home technology devices, limiting their ability to complete assignments.	Describes how limited student access restricts learning beyond the classroom.
3.	Lack of institutional support for teachers.	Teacher E noted minimally structured training programs and limited budgets for technology development.	Shows the role of organizational support in enabling or hindering effective technology integration.

**Table 4.** Teachers' Strategies for Overcoming Obstacles

No.	Key Findings	Indication	Connection to Research Objectives
1.	Self-study and personal initiative to overcome skill limitations.	Teacher B frequently followed online tutorials and webinars on educational technology.	Demonstrates teachers' proactive approaches to overcoming skill gaps through self-initiated learning.
2.	Collaboration and knowledge sharing among teachers.	Teacher A described discussion groups where teachers shared knowledge and helped each other resolve technical issues.	Highlights the value of collaboration in building collective knowledge and competence.
3.	Creative utilization of available resources.	Teacher C maximized available resources like personal devices and free digital tools.	Describes how teachers creatively navigate resource constraints to maintain effective technology use.
4.	Participation in external training and workshops.	Teacher E participated in workshops on interactive media and immediately applied the knowledge in class.	Emphasizes the importance of external learning opportunities for teacher professional development.

**Table 5.** Need for Further Support

No.	Key Findings	Indication	Connection to Research Objectives
1.	Procurement and improvement of technology infrastructure.	Teacher D emphasized the need for updated computers and a stronger internet connection.	Highlights the need for external intervention to provide essential technological infrastructure.
2.	Structured professional training and development programs.	Teacher B called for comprehensive and structured training programs tailored to teachers' needs.	Supports the development of teacher competence through continuous professional training.

3.	Supportive policies and management.	school	Teacher A highlighted that schools with supportive policies allocated budgets for technology integration.	Shows how policies can drive or limit effective technology implementation.
4.	Stakeholder and community engagement.		Teacher C mentioned hopes for partnerships with the private sector and local communities for resource support.	Demonstrates how community engagement can enhance resource availability and technology access.
5.	Development of relevant and contextual learning materials.		Teacher E noted a lack of curriculum-aligned technology-based learning resources.	Stresses the importance of localized learning materials for effective implementation.

**Table 6.** Differences in Context Between Semarang City and Blora Regency

No.	Key Findings	Indication	Connection to Research Objectives
1.	Differences in availability of technology infrastructure.	Teacher A from Semarang described classrooms with projectors, broadband internet, and smartboards.	Explains how access to better infrastructure enables more effective technology use in Semarang.
2.	Differences in institutional support and school policy.	Teacher B described supportive policies and regular ICT-focused training programs.	Describes how supportive policies contribute to a smoother integration process.
3.	Differences in the role of local communities and stakeholders.	Teacher E highlighted cooperation between schools and external stakeholders, enhancing technology integration.	Shows how community involvement can address resource shortages and enhance adoption.
4.	Differences in teacher readiness and competence.	Teacher D observed limited training access in Blora, requiring teachers to travel to other cities.	Explains how limited training affects teacher readiness in Blora.
5.	Differences in school culture and attitudes towards technology.	Teacher A described supportive parents and students familiar with daily technology use, promoting adoption in learning.	Describes how positive school culture and family support drive successful technology adoption in Semarang.

The study reveals that integrating technology in primary school learning provides significant benefits, including increased student motivation and participation, 21st-century skill development, more practical material delivery, personalized learning, and access to a broader range of learning resources. However, the difference in context between Semarang City and Blora Regency shows that there needs to be more infrastructure availability, institutional support, community involvement, teacher readiness, and attitudes toward technology. Teachers face internal obstacles, such as skills limitations, and external obstacles, such as infrastructure limitations. Nonetheless, they have developed strategies to overcome those obstacles and have solid hopes for increased support in the future. Teachers hope for policies that support technology integration, continuous professional training, collaboration between schools, responsible use of technology, increased community participation, development of local learning resources, and efforts to reduce the digital divide. By understanding these findings, relevant parties can take strategic steps to encourage more effective technology integration in learning in elementary schools (Megahantara, 2019), thereby improving the quality of education and equitable access throughout Indonesia (Utaminingsih & Hermasari, 2024).

### Benefits of Technology Integration in Learning

The study's findings show that integrating technology into learning in elementary schools increases student motivation and participation. This is in line with the research of (Utaminingsih et al., 2023), which found that using technology in the classroom improves student engagement and learning outcomes. They emphasized that technology provides an engaging platform for students to engage actively in learning. In addition, research Bandyopadhyay & Sharma (2022) supports these findings, stating that technology can create a more interactive and engaging learning environment, increasing student motivation. Technology allows for a more varied and visual presentation of material, facilitating an understanding of complex concepts.

The integration of technology aids in developing 21st-century skills, such as digital literacy, problem-solving, creativity, and collaboration. UNESCO emphasized the importance of digital literacy as a critical competency in education in the 21st century (Wahab et al., 2022). The findings of this study show that students who engage in technology-based learning have the opportunity to develop these skills practically. Research by Yohana (2020) Supports this, stating that information and communication technology (ICT) is essential in developing 21st-century competencies. They highlight that ICT allows students to collaborate, communicate, and think critically through activities involving technology. The findings show that technology allows for more effective and engaging material delivery. This is consistent with research by Muliandi et al. (2021) on the principles of multimedia in learning, which states that using images, audio, and animation can improve students' comprehension and retention of information. Furthermore, research Bakri & Muliati (2017) on e-learning and the science of learning shows that technology can support various student learning styles, allowing teachers to deliver material more adaptively and responsively to individual needs.

The findings regarding personalization of learning through technology are supported by research by Minn (2022), which found that adaptive learning systems can improve learning outcomes by adjusting the material and difficulty level according to each student's ability. Technology integration opens access to a broader range of learning resources. (Islam et al., 2021) highlight that access to global information through the Internet can enrich students' learning experiences and broaden their horizons.

### **Internal Barriers to the Use of Technology**

The study's findings show that the limitations of technology skills in teachers are a significant obstacle to integrating technology into learning. Teachers feel they need to be more proficient in using educational software and learning applications, thus reducing their confidence in implementing technology. This is in line with the findings of Purushothaman & Zhou (2014), who identified first-order barriers, such as teachers' limited skills and knowledge of technology, are the main barriers to technology integration. The level of teacher technology competence is positively related to the level of technology integration in learning. Teachers with higher technology skills use technology more often and effectively in the classroom. This emphasizes the importance of developing technology skills for teachers to increase confidence and effectiveness in using technology.

Teachers' lack of confidence and motivation in using technology is also a significant internal obstacle. Teachers are worried about making mistakes when using technology in front of the classroom, which can affect their authority as educators. Chang et al. (2022) showed that teachers' technology self-efficacy significantly affects their intention to use technology in teaching. If teachers feel insecure, they are likely reluctant to try new methods involving technology. In addition, the high workload and limited time to learn new technologies reduce teachers' motivation to innovate. Hao and Lee (2016) found that teachers' attitudes and perceptions towards technology affect the acceptance and use of technology in education. Teachers with a positive and motivated attitude are likelier to adopt technology in their teaching practices.

### **External Barriers Related to Infrastructure and Support**

Limitations in technological infrastructure, such as the need for computer devices, projectors, and unstable internet connections, are major external obstacles, especially in rural areas such as the Blora Regency. These findings are consistent with Williamson (2019) study identified that limited equipment and internet access are the main obstacles to ICT implementation in schools. With adequate infrastructure, efforts to integrate technology into learning are maintained. Utama et al. (2022), also emphasized that inadequate infrastructure hinders teachers' ability to use technology in learning. They mentioned that adequate hardware and software availability is necessary for teachers to implement technology effectively.

In addition to infrastructure at school, students' limited access to technology at home is also an obstacle. Students who do not have technological devices or internet access at home need help completing tasks that require technology. This is in line with the concept of the digital divide, where there is a disparity in access and use of technology between different groups of people (Azubuike et al., 2021). These disparities can exacerbate inequalities in education, as students from low-economic backgrounds have limited access to technology. The need for more support from schools and education offices in providing facilities and training programs is also a significant obstacle. Khan et al. (2017)

emphasize that institutional support and supportive leadership are critical in driving technology integration. Without solid policy and management support, teachers may feel unsupported and less motivated to adopt technology in learning.

### **Teachers' Strategies for Overcoming Obstacles**

To overcome skill limitations, many teachers take the initiative to learn independently through online tutorials and other resources. This indicates a high level of commitment from teachers to improving their competence despite the limitations of institutional support. Utaminingsih, Anwar, et al. (2024) show that personal initiative and willingness to learn are essential to teachers' technology adoption. Teachers who are proactive in their professional development are more likely to succeed in integrating technology.

Forming informal groups to share knowledge and experience reflects the importance of professional learning communities. Farrar & Simpson (2024) emphasized that professional learning communities can improve teaching practices and support innovation, including technology integration. Teachers can overcome individual limitations and develop skills by supporting each other and sharing resources.

Teachers try to maximize available resources, even if they are limited. This shows the creativity and adaptability of teachers when facing limitations. Harrison (2020) found that teachers with a positive and adaptive attitude toward technology are more successful in integrating technology, even with limited resources. Creativity in utilizing existing technology can help teachers overcome infrastructure barriers. Teachers who are proactive in seeking external training and workshops demonstrate their commitment to professional development. Wilson et al. (2020) emphasized the importance of continuous professional development in educational technology to improve teacher competence and the effectiveness of technology integration. Although not facilitated by the institution, teachers' efforts to participate in external training are a positive step in improving their skills (Bonafini & Lee, 2021).

### **Need for Further Support**

Teachers emphasized the need to improve technological infrastructure in schools. This supports the previous finding that adequate infrastructure is a prerequisite for effective technology integration (Webster & Son, 2015). Investment in infrastructure will allow teachers and students to access technology more widely so that the potential of technology to improve the quality of learning can be optimized (Williamson, 2019).

A structured and ongoing training program is essential. Normalini et al. (2024) stated that effective professional development must be sustainable, practice-focused, and relevant to the teacher's teaching context. With adequate training, teachers may have the necessary skills and knowledge to integrate technology effectively. Support from school management in the form of policies and budget allocations is urgently needed. Supportive school leadership is critical in facilitating technology integration. Clear policies and financial support will encourage teachers to adopt technology in learning and provide them with the necessary resources.

The involvement of parents, communities, and the private sector can provide additional support through resources and facilities. Paulauskaite-Taraseviciene et al. (2022) showed that collaboration between schools and communities can strengthen technology integration efforts and overcome resource limitations. Stakeholder participation can help in the procurement of equipment, the provision of internet connectivity, and the implementation of training programs.

Teachers need technology-based learning materials relevant to the curriculum and local context. Research Hajirasouli et al. (2023) on culturally responsive pedagogy emphasizes the importance of learning materials appropriate to students' cultural backgrounds to increase engagement and understanding. Developing local resources will make technology more meaningful and effective in learning and support the achievement of national curriculum goals.

### **Differences in Context Between Semarang City and Blora Regency**

Significant differences in the availability of technological infrastructure between urban and rural areas were found in this study. This is in line with the findings of Suminar et al. (2023), which identified that limited infrastructure and access to technology are the main obstacles to technology integration in education, especially in areas with limited resources.

Research by Suprianto et al. (2022) also highlights that the digital divide between urban and rural areas can affect the effectiveness of technology implementation in education. This limited access can



hinder students in rural areas from getting the same benefits from technology as students in urban areas. The finding that institutional support is more vital in Semarang City than in Blora Regency reflects the importance of school policy and management in the success of technology integration. Mathibe et al. (2022) emphasized that support from school administration and supportive policies are key factors in encouraging teachers to integrate technology.

Differences in community engagement and local stakeholders between the two regions suggest that collaboration between schools and communities can affect the availability of resources and support for technology integration. Research by Zou et al. (2023) shows that the social environment and professional networks can influence teachers' adoption of technology.

Teachers' readiness and competence in using technology, which is higher in Semarang City, shows the importance of training and professional development. Effective professional development in educational technology must be sustainable and relevant to teachers' teaching practices (Nipyrakis et al., 2023). The difference in attitudes towards technology between the two regions reflects the findings of Rogers in the diffusion theory of innovation, where the adoption of technology is influenced by the perception of individuals and organizational culture towards the innovation (Webster & Son, 2015).

The difference in context between Semarang City and Blora Regency suggests that environmental factors, including infrastructure, institutional support, community involvement, and school culture, play an essential role in the success of technology integration. This research adds insight into how the local context in Indonesia affects the implementation of technology in primary education, which can be an essential consideration in formulating policy and intervention programs.

## CONCLUSION

The integration of technology into elementary education in Indonesia demonstrates significant potential to enhance educational quality by promoting student motivation, participation, and the mastery of 21st-century competencies such as digital literacy, creativity, problem-solving, and collaboration while creating interactive and effective learning experiences. Various challenges emerge during implementation, including limited teacher proficiency and confidence in utilizing technology, insufficient time for material preparation, inadequate school infrastructure, restricted home access to technological devices, and a lack of institutional and policy support. Teachers have adopted strategies such as independent learning, resource optimization, collaboration, and participation in professional development programs to address these obstacles. However, research findings highlight the necessity for comprehensive support, including improvements in technological infrastructure, structured training, professional development, and active involvement from multiple stakeholders. The research offers valuable insights into the significance of context-sensitive approaches in educational transformation, suggesting that collaborative efforts among educators, policymakers, and communities are essential for achieving sustainable improvements in education and equitable learning opportunities across Indonesia.

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