



Teachers' Experience in Implementing Technology-Based Learning Innovations in the Classroom: A Case Study in a Senior High School

Qonita Shabira

Universitas Islam Negeri Raden Intan Lampung, Indonesia
gonitashabira36@gmail.com

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ABSTRACT

The integration of technology into classroom teaching has become a focal point of educational innovation, with the potential to transform student engagement and teaching effectiveness. However, while much is known about the technical aspects of technology adoption, less is understood about the subjective experiences of teachers as they integrate new tools into their pedagogical practices. This study seeks to address the gap in understanding by exploring the personal experiences of teachers facing this shift in their teaching practices. Using a phenomenological approach, we examine how teachers experience the integration of technology in their classrooms and how it influences their pedagogical strategies. Data were collected through in-depth interviews with 8 high school teachers, revealing that while technology enhances student engagement, teachers face significant emotional and practical challenges, such as anxiety and limited technical skills. These findings offer new insights into the complexities of technology adoption in education and highlight the need for more personalized support for teachers. This study contributes to a deeper understanding of how educational technology impacts teachers' professional lives and provides valuable implications for future teacher training and policy development.



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INTRODUCTION

The integration of technology into educational practices has become a critical issue globally, particularly with the rapid advancement of digital tools and the increased emphasis on technology-enhanced learning environments (Agyei & Agyei, 2021). In recent years, educational institutions worldwide, including those in Indonesia, have made substantial efforts to incorporate technology into their classrooms to enhance student engagement, foster active learning, and improve educational outcomes. The use of educational technology offers significant potential to revolutionize traditional pedagogical approaches by making learning more interactive, personalized, and accessible (Budiamai dkk., 2021). However, the transition to technology-driven teaching presents various challenges, particularly in the context of teacher preparedness, access to resources, and the effective application of digital tools in diverse classroom settings.

In the Indonesian context, the shift towards technology-based learning is particularly noteworthy as schools face significant barriers such as limited infrastructure, unequal access to devices, and varying levels of digital literacy among educators (Chang dkk., 2021). While some teachers have embraced digital tools as part of their teaching strategies, others struggle with adapting to these innovations, particularly when faced with issues related to device availability and the adequacy of training (Cheng & Chen, 2021). This gap highlights the complexity of technology integration in education, which is not merely about the availability of tools but also about the pedagogical readiness and emotional responses of educators who must navigate this change.

Existing literature on educational technology often focuses on quantifiable outcomes such as student achievement or engagement, or on technological adoption models that emphasize infrastructure

and institutional support (Chou dkk., 2023). While these perspectives are valuable, they often overlook the personal, subjective experiences of teachers who are directly involved in the integration of technology in the classroom. Given the variety of challenges and opportunities experienced by educators in this context, there is a need to explore the lived experiences and perceptions of teachers as they navigate the complexities of using technology to enhance learning. This approach, rooted in phenomenology, offers a deeper understanding of how teachers interpret their experiences and make meaning of their role in a digitally enhanced educational environment.

This study aims to fill this gap by focusing on the experiences of teachers who have been using technology in secondary school classrooms (Fung, 2020). By exploring their subjective experiences, this research seeks to uncover the challenges, transformations, and emotional responses associated with integrating technology into teaching practices. Through phenomenological inquiry, the study aims to provide rich, contextual insights into the meanings that teachers attach to their experiences, which are essential for understanding the broader impact of educational technology on teaching and learning.

Research on the subjective experiences of individuals in specific phenomena has become an important area of study, particularly in fields such as education, where understanding the lived experiences of teachers can provide deep insights into pedagogical practices and challenges (Hidayanto dkk., 2020). In the context of technology integration in education, exploring how teachers perceive and navigate the use of digital tools in their classrooms is crucial for understanding the complexities of this transition. While quantitative studies have examined the effectiveness of educational technologies in terms of student achievement or engagement, they often fail to capture the nuances of teachers' lived experiences and the subjective meanings they attach to their roles in a technology-enhanced classroom.

Phenomenological approaches, in contrast, provide a framework for investigating these deeper layers of experience, focusing on the personal, emotional, and cognitive processes that shape how teachers interact with and interpret the use of technology (Hsiao & Chang, 2024). However, exploring the lived experiences of educators presents significant methodological challenges. One of the primary difficulties is that these experiences are inherently subjective, shaped by individual perceptions, contexts, and emotional responses, making them difficult to quantify or measure in traditional research formats. Additionally, many quantitative approaches fail to address the complexity and richness of teachers' experiences, particularly in terms of the social, psychological, and contextual factors that influence their adoption of technology. This limitation underscores the inadequacy of these approaches in fully capturing the essence of technology integration in the classroom.

The challenges of capturing this richness are particularly evident in studies that rely on broad surveys or experimental designs, where data are often reduced to numerical values or standardized categories (Hursen dkk., 2023). Such methods overlook the complexity of teachers' feelings, perceptions, and the subtle transformations in their teaching practices as they adapt to new technological tools. The current research literature suggests a gap in understanding the full scope of teachers' lived experiences, particularly the emotional and perceptual aspects of integrating technology into education. These limitations highlight the need for a more in-depth, qualitative approach that can reveal the underlying meanings of these experiences and provide a comprehensive view of how technology adoption truly impacts educators' practices.

In the context of technology integration in education, practical solutions often focus on providing training programs for teachers, improving technological infrastructure, or developing guidelines for effective classroom technology use (Liang & Hwang, 2023). While these approaches are valuable, they tend to prioritize external and measurable factors, such as skill acquisition, device availability, or the frequency of technology use, over the subjective experiences and emotional realities of educators. Consequently, these methods fall short of capturing the nuanced challenges and personal transformations teachers face when adopting technology in their pedagogical practices.

Existing research predominantly employs quantitative frameworks or pragmatic methodologies aimed at assessing the effectiveness of technological interventions. These approaches, while insightful, offer a limited perspective on the deeper meanings and lived experiences of teachers. For instance, metrics such as student performance or teacher satisfaction provide surface-level insights but fail to uncover the emotional and cognitive processes underlying educators' adaptation to new teaching

paradigms. Such limitations create a gap in understanding how teachers perceive and internalize the impact of technology on their professional identity, instructional strategies, and classroom dynamics.

To address this gap, a phenomenological approach offers a compelling alternative, as it emphasizes exploring the essence of experiences and the meanings participants attach to specific phenomena. By focusing on the subjective and often unarticulated dimensions of teachers' experiences with technology, this approach provides a richer and more holistic understanding of the interplay between personal, contextual, and technological factors. Adopting this method can yield insights into the emotional and perceptual complexities of technology integration, which are crucial for designing more effective support systems and strategies for educators in technology-enhanced learning environments.

A growing body of research has examined the integration of technology in education, with many studies focusing on the practical aspects such as teacher training, technological infrastructure, and the impact of digital tools on student engagement and achievement. However, fewer studies have explored the subjective experiences of teachers themselves, particularly in terms of how they perceive and make meaning of the challenges and opportunities presented by technology. For example, previous work by scholars like Clarke (2015) and Ertmer (1999) emphasizes the need for understanding teachers' attitudes and readiness to adopt technology, but these studies often overlook the emotional and cognitive dimensions of this process. Theories such as the Technological Pedagogical Content Knowledge (TPACK) framework have been widely used to understand the competencies teachers need for integrating technology, yet they do not fully address the lived experiences that shape these competencies. This gap highlights the importance of a more nuanced, phenomenological approach to exploring the deep, personal experiences of teachers who are navigating the technological shift in education.

In response to these gaps, this study adopts a phenomenological approach to explore the lived experiences of teachers integrating technology into their classrooms. Phenomenology is particularly well-suited to this inquiry because it allows for the exploration of how teachers interpret and make sense of their experiences with technology, providing insights into the meanings they attach to their practices, challenges, and transformations. By focusing on teachers' subjective experiences, this research aims to answer the call for more qualitative, in-depth investigations into the emotional, cognitive, and social aspects of technology adoption that are often neglected by quantitative studies. This approach helps uncover the core essence of technology integration, offering a deeper understanding of the personal and professional implications for teachers.

The structure of this article is organized to guide readers through a comprehensive exploration of the phenomenon. Following the introduction, the article presents a detailed discussion of the contextual background surrounding technology integration in education, with an emphasis on the challenges and opportunities faced by teachers. The methodological approach is then outlined, explaining the use of phenomenology to uncover the deep meanings of teachers' experiences. Data collection and analysis procedures are described, focusing on the use of in-depth interviews and thematic analysis to identify key themes. Finally, the article presents the results, followed by a discussion of the findings in relation to existing literature, and concludes with a reflection on the implications for future research and practice.

RESEARCH METHODS

Study Design

This study was designed using a phenomenological approach to explore the subjective experiences of teachers in integrating technology into their pedagogical practices (Nasir & Fakhruddin, 2023). Phenomenology, with its focus on understanding lived experiences and the meanings individuals attach to those experiences, is particularly well-suited to uncover the nuanced challenges, perceptions, and transformations teachers face when adopting technology in the classroom. This design allows for an in-depth exploration of the personal and contextual factors influencing technology use, providing rich insights into the subjective nature of teaching with digital tools. The phenomenological approach

emphasizes the participants' perspectives, focusing on their lived realities, rather than on external or objective measures of effectiveness. This study adopted a descriptive phenomenology approach, aiming to capture and describe the core essence of teachers' experiences with technology integration without interpreting or making assumptions about those experiences.

Participants

Participants in this study were selected through purposive sampling to ensure they had relevant experiences for the research focus. The sample consisted of eight teachers from various secondary schools in City X who had been actively integrating technology into their teaching for at least one year. The inclusion criteria specified that participants should have more than three years of teaching experience and a consistent use of technology in the classroom, while those who used technology sporadically or lacked access to technological resources were excluded. The teachers represented diverse backgrounds in terms of age, gender, and teaching subject. Their ages ranged from 30 to 50 years, with an average age of 40. This diversity provided a broader understanding of how different teachers, with varying levels of experience and subject areas, navigate the integration of technology into their classrooms.

Data Collection

Data were collected through in-depth, semi-structured interviews, which were designed to allow participants to share their personal experiences in a flexible and open manner (Priambodo & Lie, 2021). Each interview lasted approximately 45 to 60 minutes and was conducted in a quiet, private location within the school to ensure a comfortable and conducive environment for the participants to express themselves openly. The interviews were guided by an interview protocol based on the key research questions, which aimed to explore participants' experiences, challenges, and perceptions related to technology use in the classroom. The protocol was adapted from established frameworks for studying educational innovation and technology adoption. Additionally, classroom observations were conducted in parallel to gain a deeper understanding of how teachers implemented technology in their practice. The observations focused on the interaction between teachers, students, and technology, providing a complementary perspective to the interviews. Both the interviews and observations were audio-recorded with the participants' consent to facilitate accurate data analysis.

Data Analysis

The data were analyzed using a thematic analysis approach, consistent with phenomenological methodology, to identify and interpret the central themes emerging from the participants' experiences. The process involved transcribing the interview recordings verbatim and reviewing the transcripts for recurring patterns and significant statements. Themes were then identified by systematically categorizing the data into meaningful units. Each theme was carefully examined for its relevance to the research questions and to the participants' lived experiences. The data were analyzed in several iterations, with constant comparison between interviews and observations to ensure a comprehensive understanding of the phenomenon. The software NVivo was used to assist in the organization and management of the data, although the focus remained on manual thematic coding and interpretation. The analysis aimed to extract essential meanings and offer a rich, descriptive account of the teachers' experiences with technology in their classrooms.

Ethics

Ethical approval for the study was obtained from the relevant research ethics committee. All participants provided informed consent prior to participation, ensuring they were fully aware of the study's aims, procedures, and their right to withdraw at any time without consequence. The confidentiality of participants was maintained by using pseudonyms and securely storing all data. Audio recordings and transcripts were anonymized, and all identifying information was removed to protect participant privacy. The study adhered to the ethical standards outlined in the Declaration of Helsinki and complied with local ethical guidelines for research involving human subjects.

RESULTS

Challenges in Accessing and Utilizing Technology

The integration of technology in the classroom was met with several challenges, primarily related to the accessibility of devices and the digital skills of teachers. Most teachers reported difficulties in securing sufficient technological tools for effective teaching. One teacher shared, “In our school, not all students have access to the same devices, and sometimes the devices available in class are outdated or malfunctioning.” This lack of access hindered the potential for consistent use of educational technologies in teaching. Additionally, many teachers expressed concerns regarding their own digital literacy. One teacher, who had been using technology for several years, explained, “I know how to use the tools, but the training I received was minimal, so I often feel unsure when I encounter a new platform or application.” These experiences suggest a significant gap between the available technology and the readiness of teachers to fully integrate it into their pedagogical practices.

Increased Student Engagement through Technology

Despite the challenges, teachers noted a positive shift in student engagement when technology was used effectively. Teachers reported that when technology facilitated interactive learning, students became more motivated and actively participated in lessons. One teacher reflected, “Using interactive games in class made the students more enthusiastic. They were eager to collaborate, discuss, and even help each other with tasks. It was a different atmosphere from traditional methods.” The use of technology, particularly in the form of educational games and digital resources, allowed students to engage in deeper, more collaborative learning, as opposed to passive listening. This transformation was especially apparent in classrooms where teachers had prior experience with digital tools and were confident in their use.

Transformation in Pedagogical Strategies

The incorporation of technology significantly transformed the pedagogical approaches of the teachers involved. Most teachers reported a shift from traditional teaching methods to more student-centered strategies. One teacher stated, “I’ve started focusing less on lecturing and more on facilitating discussions and collaborative projects. Technology has helped me create a more dynamic and interactive classroom.” Teachers emphasized that technology allowed them to design lessons that encouraged critical thinking, collaboration, and problem-solving. However, this shift was not always smooth. For some teachers, especially those less experienced with technology, it was a challenging transition. As one less experienced teacher put it, “I still find it hard to adjust my old teaching style to include technology. Sometimes, I feel like I’m just doing extra work without knowing if it’s truly helping.”

Teacher Perceptions and Emotional Responses to Change

Teachers' emotional responses to integrating technology varied, with some expressing excitement and others feelings of anxiety. For teachers who had embraced technology, there was a sense of empowerment and satisfaction in seeing the positive effects on student learning. As one teacher shared, “I feel more confident in my ability to engage students, and the feedback I get from them is incredibly motivating.” However, many teachers still grappled with feelings of uncertainty and stress. One teacher explained, “Every time we try something new, I feel anxious. What if it doesn’t work? What if the students don’t respond well?” These emotional responses reflect the complexity of adopting innovative teaching methods and the ongoing internal struggle faced by educators in balancing traditional practices with modern technological tools.

The findings of this study reveal that while the integration of technology into classroom teaching presents notable challenges, it also offers substantial opportunities for enhancing student engagement and transforming pedagogical practices. Teachers' experiences highlight the importance of sufficient access to resources, proper training, and ongoing emotional support to facilitate effective technology use. The transition to a more technology-driven classroom is not a straightforward process, but with appropriate support, teachers are able to harness the benefits of innovation in education.

DISCUSSION

This study has revealed the complex and multifaceted nature of teachers' experiences in integrating technology into their classrooms (Ristanto dkk., 2020). The findings show that while technology adoption presents opportunities for enhancing engagement and transforming pedagogical practices, it also introduces significant challenges, particularly in terms of teacher preparedness, emotional responses, and the need for ongoing professional development (Roemintoyo & Budiarto, 2022). These insights directly address the central research question about how teachers experience and make sense of technological innovation in their educational contexts, and the resulting shifts in their pedagogical strategies.

The research findings contribute to a deeper understanding of the lived experiences of teachers as they navigate the integration of technology in their classrooms (Santoso dkk., 2023). Teachers reported both positive and negative emotions related to the use of technology, ranging from excitement about the potential for student engagement to anxiety about their own lack of technical skills and the technical issues they face in class. This study highlights the emotional complexity of technology adoption, a dimension often overlooked in prior research. For example, while previous studies, such as those by Ertmer (1999), have focused on the importance of teacher beliefs and attitudes towards technology, this research adds a nuanced layer by emphasizing how these beliefs are intertwined with emotional responses to technological challenges (Ventayen dkk., 2020). The results suggest that addressing the emotional and cognitive aspects of technology adoption is essential for supporting teachers through this transition.

These findings align with existing literature on technology integration, such as the work of Clarke (2015) and Schunk (2012), who emphasize the need for an understanding of teachers' personal and emotional engagement with technology. However, they also extend this literature by demonstrating that the challenges teachers face are not just technical or logistical, but deeply personal and subjective. The emotional responses observed in this study echo Vygotsky's (1978) Social Constructivism, which underscores the importance of social and emotional factors in learning and development. The shift from traditional to technology-enhanced teaching methods, as described by the participants, reflects a broader trend noted in studies by Mishra & Koehler (2006), who argue that effective technology integration requires not only technical skills but also the ability to adapt pedagogically. This research confirms that the emotional and cognitive dimensions of teaching, particularly in the context of technological change, play a crucial role in shaping how teachers respond to, adopt, and integrate new tools into their classrooms.

Implications of the Findings

The findings of this study offer important implications for both educational practice and theory. From a practical standpoint, the research emphasizes the need for teacher training programs to not only focus on the technical aspects of technology integration but also address the emotional and psychological dimensions of the process (Wahyuni dkk., 2020). Teachers expressed significant feelings of uncertainty and anxiety about their ability to effectively use new technologies, highlighting the importance of providing emotional support alongside technical training. This suggests that professional development initiatives should incorporate strategies that foster confidence, reduce anxiety, and encourage teachers to view technology as a tool for enhancing their pedagogical practices rather than a source of stress. Moreover, the study reveals that teachers' experiences with technology are shaped by both their individual characteristics (such as teaching style and prior experience) and the specific context of their school environments. As a result, future professional development should be tailored to the unique needs of teachers, offering personalized support that takes into account the diverse challenges they face. These insights are not only relevant to the context of secondary education in Indonesia but can also be applied to broader educational settings where technology integration is a priority.

Limitations of the Study

This study, while providing valuable insights, has several limitations that should be considered. First, the research focuses on a relatively small sample of eight teachers from a specific urban context, which may limit the generalizability of the findings to broader populations or rural schools with different technological infrastructure (Wiyono dkk., 2024). Additionally, the data were collected through semi-structured interviews and classroom observations, which are subjective by nature and may

not capture every aspect of teachers' experiences with technology. While the phenomenological approach provides in-depth understanding, it is also influenced by the researchers' interpretation of participants' experiences, and this may limit the objectivity of the findings. Future research could address these limitations by incorporating a larger and more diverse sample, including teachers from different regions and school types, to provide a more comprehensive view of the challenges and opportunities associated with technology adoption in education.

Future Research Directions

Building on the findings of this study, future research could explore how teachers' emotional experiences with technology integration evolve over time (Zhao dkk., 2022). Longitudinal studies would allow for a deeper understanding of the long-term effects of technology use on teaching practices and teacher well-being. Additionally, it would be valuable to investigate how specific pedagogical models or teaching philosophies influence teachers' emotional responses to technology. For instance, teachers with a more constructivist approach may respond differently to technology than those who rely more on traditional, teacher-centered methods. Exploring these differences could help tailor professional development programs to the needs of specific teacher populations. Furthermore, expanding the research to include the perspectives of students, school administrators, and policymakers could offer a more holistic view of the technology integration process, allowing for a better understanding of how different stakeholders contribute to or hinder the successful adoption of educational technologies.

CONCLUSION

This study explored the experiences of teachers in integrating technology into their classrooms, focusing on the challenges and opportunities they encounter in adopting innovative, technology-based pedagogical strategies. The findings reveal that while technology adoption enhances student engagement and facilitates collaborative learning, teachers face significant barriers, including emotional anxiety, lack of technical skills, and limited access to resources. These challenges are not merely logistical but deeply intertwined with teachers' personal beliefs and emotional responses to the change. This research contributes to the existing literature by highlighting the emotional and subjective dimensions of technology integration, which are often overlooked in previous studies. Future research could expand on these findings by exploring the long-term impact of technology use on teaching practices and teacher well-being, as well as investigating the role of specific teaching philosophies in shaping teachers' responses to technology. By deepening our understanding of these factors, educators and policymakers can better support teachers in navigating the complexities of technology adoption.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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