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A New Era of Education: Exploring Teachers' Perspectives on the Utilization of ICT-Based Learning Resources in Schools

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Article abstract

In the digital revolution era, the role of teachers in utilizing ICT-based learning resources in schools has become very important. However, the utilization of ICT that is not optimal has been identified, which often occurs in some schools in developing countries, possibly because of factors such as human resources readiness, facilities, and regulations inherent in each educational institution. This research aims to describe teachers' perspectives on ICT learning resources that have been used for the learning process. This research is a qualitative study with a case study type, involving a sample of 7 teachers at the high school level in Central Java and West Java. Data collection techniques include semi-structured interviews, followed by an interview guide as the data collection instrument. As for an interview, it was analyzed thematically to describe an overview of the issues commonly raised by teachers during the data collection process.

The research results show that there are 3 themes that are often the main topics of discussion, namely motivation and readiness of teachers in utilizing ICT-based learning resources, teachers' perspectives and resource support the implementation of ICT-based learning resources, and the challenges that teachers face when implementing ICT-based learning in the classroom. The results of this research have the potential to assist in the professional development of teachers in integrating ICT to embrace dynamic and innovative learning in the digital era.

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A New Era of Education: Exploring Teachers' Perspectives on the Utilization of ICT-Based Learning Resources in Schools

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Abstract

In the digital-revolutionary era, the role of teachers utilizing ICT-based learning resources in schools has become very important. However, it has become evident that its application is not always optimal. This can be the case in some schools in developing countries, possibly because of factors such as human resources, readiness, facilities, and regulations inherent in each educational institution. This research aims to describe teachers' perspectives on ICT learning resources that have been used for the learning process. It is a qualitative, case study, involving a sample of seven teachers at the high-school level in Central Java and West Java, Indonesia. Data collection techniques include semi-structured interviews, followed by an interview guide as the data collection instrument. The interviews were analyzed thematically, in order to describe an overview of the issues that were commonly raised by the teachers during the data-collection process.

The research results show that there are three themes that were often the main topics of discussion, namely motivation and readiness of teachers in utilizing ICT-based learning resources, teachers' perspectives and resource support of the implementation of ICT-based learning resources, and the challenges that teachers faced when implementing ICT-based learning in the classroom. These findings have the potential to assist in the professional development of teachers in integrating ICT for dynamic and innovative learning in the digital era.

Introduction

Integrating Information and Communication Technology (ICT) into education, especially in high schools, is very important in the current digital era. These tools, including computers, smartphones, and internet resources, can create a dynamic and interactive learning environment (Martines, 2021). This technology not only improves the teaching and learning process, but also imparts crucial digital skills that are necessary for success in the 21st century (Murithi & Yoo, 2021).

In addition, ICT facilitates inclusivity by providing students with access to the material that they study. Integrating ICT in secondary-school education is considered essential in order to prepare students for the future. This entails providing the basics of digital literacy (Teeroovengadum et al., 2017). This integration encourages collaboration and communication, leading to the habit of sharing knowledge through a culture of cooperative learning. Increasing the relevance and practicality of the use of ICT in secondary-school education also facilitates the application of theoretical concepts in the real world (Gonçalves & Capucha, 2020; Yang, 2023). Thus, ICT is considered capable of providing a platform for students to acquire creative competencies, the ability to think innovatively, and offers opportunities to acquire comprehensive learning experiences.

The integration of ICT in secondary education also aims to prepare students to face the demands of future careers. In the current digital era, most professions require extensive technological skills. By incorporating ICT into every learning activity, teachers can more efficiently provide the skills and knowledge that students need (Kartikasari et al., 2018; Yudiono et al., 2022). This integration also helps to develop student collaboration habits when completing a project (Demir & Zengin, 2023). As one form of digital transformation, ICT strives to enhance its role in order to improve productivity, value creation, and the social welfare of various parties (Hafifah & Sulistyo, 2020; Makarova & Makarova, 2018). Overall, the application of these tools in secondary education has an essential role in preparing students to face the ever-changing digital era.

An in-depth understanding of teachers' views regarding the integration of ICT-based educational materials has significant implications for improving educational standards in secondary schools. This research seeks to create appropriate, professional-development programs for educators at this level, including training in using ICT tools and applications. As a result, schools can ensure that educators have the skills and knowledge necessary to effectively implement technology into the learning process.

Understanding what students want and need, in using technology in learning, allows teachers to design more relevant and motivating learning experiences that can be implemented into the learning process. Therefore, the main focus of this research is to gain a better understanding of the views of teachers in secondary schools regarding the use of technology in learning activities.

The main question driving this research is, "How do high school teachers feel about integrating technology into their current teaching and learning activities?"

Literature Review

Integration and challenges of using ICT in education

Teachers require the necessary skills in order to effectively use ICT as a learning tool, so that their students can maximize its benefits (Han & Niu, 2019). In addition, teachers also have the responsibility to ensure that the use of ICT is in accordance with the required curriculum and learning objectives. It is also paramount that the digital learning environment is safe and inclusive, so that all students garner its benefits (Kaniawati et al., 2021; Muslimin, 2023). Teachers must have enough familiarity with this technology, so that it can be integrated in ways that achieve optimal student learning outcomes.

Teachers play a crucial role in ensuring the effective incorporation of ICT in education. It is imperative for them to stay abreast of the most recent technological advancements and teaching techniques, while also participating in ongoing professional growth (Mahmud & Wong, 2022). It is important to foster a positive attitude towards ICT among students, which means that teachers need to be able to demonstrate the superiority of ICT in their teaching practices, so that students have an idea of the various types of ICT-based learning resources that can be used (Berthelsen & Tannert, 2020). Educators can also enhance collaborative learning experiences through ICT, encouraging teamwork and communication skills among students, resulting in a positive view of this technology from the students' perspective. The role of teachers in implementing ICT in education is complex, so it requires a combination of technical skills, teaching expertise, and dedication to learning (Murithi & Yoo, 2021). Numerous studies have demonstrated that effective ICT integration significantly improves student learning outcomes and engagement (Gonçalves & Capucha, 2020; Hoesni et al., 2020; Teeroovengadum et al., 2017).

Previous research has shown how integrating ICT has a significant and positive impact on the skills acquisition of secondary-school students (Fahmi et al., 2021). Other research has also proven that using ICT-based tools and resources in learning improves student learning outcomes, because of its interactive nature (Apriyanti et al., 2020; Saraswati et al., 2019). The incorporation of these learning formats into secondary-school education has been shown to provide numerous advantages (Gyasi Mensah & Osman, 2022). This includes improving students' digital capabilities, which are increasingly emphasized in today's era. By working with information and communication technology, students can develop digital literacy, critical-thinking abilities, and problem-solving skills, which are considered 21st-century competencies.

In the last few decades, the development of ICT has changed the perspective on the implementation of education. It has initiated a paradigm shift in learning approaches, from teacher-centred to student-centred. With the emergence of various online resources, interactive learning applications, and online learning platforms, students now have unlimited access to information and learning materials that suit their needs and interests (Divayana et al., 2021; Moreira et al., 2019). This trend has fostered a more dynamic, inclusive, and collaborative learning environment. Teachers are no longer the main learning source, but instead, are learning facilitators who guide students in exploring, analyzing, and synthesizing information from various sources (Baharuldin et al., 2019; Sutama et al., 2022).

Effective integration of technology into teaching practices is highly dependent on teachers' abilities to integrate ICT. Hence, it is crucial to provide the necessary training and support to

teachers, in order to improve their skills for optimal integration of this technology into the classroom (Andyani et al., 2020; Wastiau et al., 2013). In addition, teachers must also be encouraged to become accustomed to exploring and experimenting with various ICT-based learning resources, and the effective teaching strategies to combine them. In summary, the role of teachers in utilizing ICT as a learning resource is more than just the use of this technology; it also requires a complete transformation of the teaching and learning process to create a more interesting, inclusive, and effective educational experience (Marín-Díaz et al., 2020).

Furthermore, teachers can implement ICT according to students' needs, and can offer them advice on how to use technology ethically and responsibly. The participation of teachers in incorporating ICT, as a learning tool, is crucial for achieving success in transitioning to a digitalized educational setting (Munje & Jita, 2020). Therefore, teachers must seriously learn to effectively integrate technology into learning, develop the necessary digital skills, and continuously update their knowledge about the latest developments in the field of ICT (Chisango et al., 2020). Other considerations include ethical and security issues related to the use of technology in the classroom, in order to avoid the misuse of learning activities (Gyasi Mensah & Osman, 2022). However, for teachers to fulfill these responsibilities effectively, they need ongoing professional development and support in integrating ICT into their teaching practices.

Theoretical framework: The Technology Acceptance Model (TAM) and Diffusion of Innovations Theory

The Technology Acceptance Model (TAM) focuses on two key concepts: perceived usefulness and perceived ease of use (Yao et al., 2022; Weng et al., 2018). Perceived usefulness refers to teachers' belief that the use of ICT will enhance teaching effectiveness, such as by increasing student engagement and enriching learning resources (Teeroovengadum et al., 2017). The interview findings indicate that teachers perceive significant benefits from ICT, and view these technologies as user-friendly, particularly because they are already accustomed to using devices like smartphones and laptops, which became common tools during the pandemic.

The thematic analysis of the interview data aligns with the core concepts of TAM, where perceived usefulness and perceived ease of use are dominant factors influencing teachers' adoption of ICT. Teachers highlighted that the widespread use of smartphones among students makes them competent in working with ICT, which can be an effective learning tool, demonstrating significant perceived usefulness (Tuyet et al., 2021). Additionally, the familiarity and ease of use of digital devices encourage teachers to be more open to integrating ICT into their teaching practices, reflecting a high-perceived ease of use. Thus, TAM provides a strong theoretical foundation for understanding teachers' perspectives on the integration of ICT in the classroom.

In addition to using the Technology Acceptance Model (TAM), this study also adopted elements from TPACK (Technological Pedagogical Content Knowledge) and Diffusion of Innovations Theory by Rogers (Schunk, 2012). The TPACK framework provides a more specific perspective on how technological, pedagogical, and content knowledge are integrated into teaching, which is relevant for teachers who are using ICT in the classroom (Shafie et al., 2019). Meanwhile, the Diffusion of Innovations Theory helps to explain how technological innovations, such as ICT, are adopted by teachers-- from innovators to laggards-- and the factors that influence such adoption. Thus, the combination of TAM, TPACK, and Diffusion of Innovations Theory offers a stronger foundation for understanding teachers' motivation, readiness, and challenges in integrating ICT in learning (Rahman et al., 2023; Teeroovengadum et al., 2017). This approach is expected to provide deeper insight into the theoretical factors that drive technology acceptance in

educational contexts, as well as open up opportunities for further research to test the effectiveness of more innovative ICT implementation strategies.

Design and Methods

Research design

In line with the stated research objectives, this study adopted a qualitative, case study approach (Bhangu et al., 2023). The literature indicates that the use of this method can provide an overview of the phenomenon being studied, namely regarding the views of teachers regarding the application of technology in the learning process in high school.

Research participants

This investigation involved multiple schools as the research population. The criteria used to select them included quality equivalence, internet access, and the inclination towards using technology in teaching. Seven teachers participated in this study, and were chosen through a purposive sampling technique (Miles et al., 2016), based on these criteria: having two years or more of teaching experience, being adept at using technology for educational purposes, possessing a teaching certificate, or holding a minimum of a master's degree in education. Although the sample size in this study is small (seven teachers), it is considered sufficient for a qualitative case-study approach, which prioritizes depth of exploration over the generalization of findings. Below is a concise overview of the research subjects.

Table 1: Subject demography.

	Initial	Teaching Experiences (years)	Education Degree	Teacher Certificated	Location (Province)	Country
1.	Teacher A	14	Bachelor	V	West Java	Indonesia
2.	Teacher B	4	Master	-	West Java	
3.	Teacher C	18	Master	V	West Java	
4.	Teacher D	8	Bachelor	V	West Java	
5.	Teacher E	4	Bachelor	-	Central Java	
6.	Teacher F	11	Master	V	Central Java	
7.	Teacher G	5	Bachelor	-	Central Java	

Instrument and data collection technique

The data collection technique utilized in this research was a non-test through semi-structured interview activities (Saputri et al., 2018). These were accompanied by the use of instruments regarding several aspects, such as an understanding of ICT, availability of ICT support facilities in schools, and how ICT is used during the learning process. These features were derived by adopting questions from previous studies by Ningsih et al. (2022), Lomos et al. (2023), and Budiarto et al. (2021). The interviews were conducted online using two methods, namely interviews with the teachers, or a Google-form link containing the interview questions. The instrument grid used in this research can be seen in Table 2.

Table 2: Interview guide indicator.

	Aspect	Indicator
1.	Teacher's understanding of ICT for learning	Knowledge of ICT
		Preparation for using ICT during learning
		Quantity of ICT utilization
		Types of ICT used
		Obstacles experienced using ICT
2.	Availability of supporting facilities in schools	The type of school facilities
		Rules or regulations regarding the use of ICT in the classroom
		Condition of ICT-based facilities in schools
		Facilities or learning resources at the school that are frequently used

Adaptation from research (Ningsih et al., 2022; Lomos et al., 2023; Budiarto et al., 2021)

Validity and reliability

In order to maintain rigour in the study, the following steps were take.: First, reliability was established by conducting member checking, where interview results were reconfirmed with the participants to ensure the accuracy of the data interpretation. Second, validity was ensured through triangulation, by combining interview data with school documents and observation notes to verify the consistency of findings (Creswell, 2014). Third, a thematic analysis was conducted systematically, with two independent researchers involved in the coding process to minimize bias and increase data reliability (Lester et al., 2020).

Data analysis technique

The results of the interviews with several teachers were analyzed using thematic-descriptive analysis (Nurkhin et al., 2020), a technique that aims to describe and depict the interview results in depth and systematically. This analysis begins by transcribing the interview results; then the researcher reads and marks important parts that are relevant to the research question. The next step is to identify themes by grouping codes that have similar meanings. The final step is to prepare a clear and concise description of the interview results, based on the themes that have been identified (Lassoued et al., 2020). The description must be accurate and consistent with the interview results. The data analysis procedure is illustrated in Figure 1.

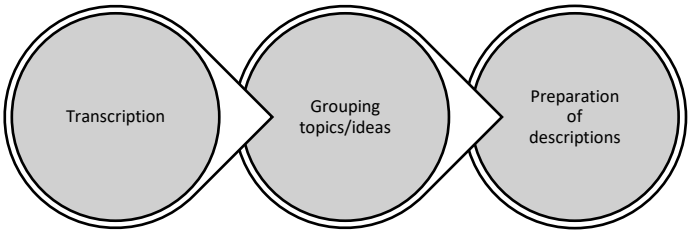

Figure 1: Data analysis technique (Lassoued et al., 2020).

Results and Discussion

To accommodate the research objectives, an analysis of the interview results was then conducted. A semi-structured interview activity was carried out with seven high-school teachers. Based on the analysis of several questions that were used in this research, three main themes emerged from the teachers' responses, namely, motivation and readiness of teachers in utilizing ICT, the perception of ease in implementing ICT-based learning resources in schools, and challenges that teachers face in integrating ICT into the learning process.

Teacher motivation and readiness when applying ICT for learning

Based on the results, it is evident that all of the teachers who were interviewed emphasized that it was easier to integrate ICT into the learning process with students who are already very familiar with technology. In addition, the teachers also tended to be influenced by the abundance of daily-life practices that rely on technology, such as smartphones. For example, Teacher D advised these students to utilize ICT in learning for accessing materials or meetings. It is not surprising that almost all of the high-school students that they teach have smartphones, therefore, Teacher A stated that he uses this medium to facilitate and enrich lesson information so that it can be easily accessed by students. In addition, Teacher C also emphasized that ICT is an important part of the learning process in the current era, as he often brings a laptop to class, and presents learning resources in the form of audio-visual presentations.

Field findings from the interviews also indicate that teachers use technology as a teaching medium, rather than it being a crucial element in the teaching and learning process. The peak utilization of ICT was during the COVID-19 pandemic, when the majority of teachers were highly motivated to implement it. As expressed by Teacher B, when students were unable to meet their teachers, the use of technology through smartphones, internet networks, and other relevant learning resources became the preferred choice for education. Table 3 displays a summary of the teachers' viewpoints.

Table 3: Motivation and readiness of teachers in implementing ICT.

	Statement	Coding
Teacher D	Actually, I am fully prepared to implement ICT as a learning resource. My motivation and readiness are enhanced by the fact that students are already	Use of gadgets, application of ICT

	accustomed to using gadgets, especially since they have gone through the COVID-19 pandemic, during which learning was done with the help of technology.	
Teacher A	During the learning activities, I am accustomed to utilizing technology in the form of a smartphone, considering that almost all students already own smartphones. Therefore, I do not limit learning resources solely to printed books.	Use of smartphones, exploration of learning resources
Teacher C	During class, I often bring my laptop to provide audio-visual learning resources to clarify the concepts and practical procedures that I teach.	Learning resources, audio-visual media formats, clarify concepts/practices
Teacher B	I am familiar with incorporating technology into the learning process, particularly during the COVID-19 pandemic. I effectively utilize various platforms to provide materials for students to learn independently with guidance, making me well-prepared for the use of ICT-based learning resources.	Utilization of ICT, learning resources

In general, the interview results show that teachers are prepared to integrate ICT into the learning process, as long as the type of ICT device to be integrated is not specified. They emphasize the importance of keeping up with technological advancements and continuously improving their digital skills to effectively integrate ICT into their teaching. Although teachers show enthusiasm in utilizing ICT in teaching, their interviews underline the importance of ongoing professional development and institutional support to overcome barriers and enhance their readiness to effectively implement it.

In addition, the interview results revealed that teachers are highly motivated and ready to apply ICT in learning. They stated that they felt compelled to integrate ICT in teaching, because they recognized the importance of preparing students with operational digital skills. They also realize that their students belong to a generation familiar with technology, so it is easy for them to adapt to ICT, when it is used in the classroom. The interview results also show that the teachers are ready to learn, use various ICT-based applications and tools to support learning, and are willing to continue developing their skills. In conclusion, teachers have reason and willingness to apply ICT for learning, because they are driven by the awareness of the need for digital literacy, which students must master, increasingly encouraging teachers to try all possible means to create interactive and dynamic learning.

Perception of the availability of ICT utilization facilities in schools

During the interviews with the teachers regarding the availability of facilities to integrate ICT into the learning process, the second theme that emerged was the ease of access and use of technology in the learning context. The results of the interviews indicate that the participating teachers were able to efficiently operate technology in the school environment. For example, Teacher G revealed that he often uses mobile devices, and has found various tutorials that help him to understand how to operate them. This shows that widespread access to mobile technology has made it easier for teachers to integrate it into the learning process. Teacher D revealed that it was important for schools to have ICT-based facilities that could be utilized optimally. He emphasized that the existence of facilities, such as language and computer laboratories, helps teachers in their efforts to create an ICT-based learning environment. In general, the availability of these facilities provides important support for teachers in creating rich and varied learning

experiences using ICT. Thus, the results of this study show the importance of availability and easy access to technology within academic facilities in order to support the integration of ICT into learning activities.

The results of the interviews with the research subjects involved confirmed that their perceptions of the utilization of ICT heavily depends on the availability of facilities in the school environment. Teachers indicate that access to computer laboratories, fast internet speed, and relevant software influences their desire and ability to use ICT in the learning process. They believe that with adequate facilities, they can more effectively integrate ICT into the curriculum, and create more engaging and interactive learning experiences for students. Table 4 summarizes the viewpoints of multiple teachers from the interviews.

Table 4: Teachers' perceptions of facilities availability.

	Statement	Coding
Teacher G	During classroom instruction, I frequently make use of mobile devices for certain conceptual topics, as students are already highly familiar with them, making it easier for me to incorporate them. Additionally, supportive resources, such as internet connectivity or school Wi-Fi can be effectively utilized when accessing information.	Internet network, mobile device
Teacher D	I personally believe that facilities such as language laboratories and computer laboratories in schools are essential for the integration and utilization of ICT in learning activities.	Laboratories, school facilities, use of ICT

Teachers also underlined the importance of regulations for using ICT as a learning resource in the school environment. They argue that policies that are too strict can hinder the use of ICT, because they can limit teacher creativity and flexibility in utilizing various ICT learning resources. However, teachers also emphasize the importance of regulations governing the use of ICT to ensure security, and that its use is in accordance with the characteristics of the material and learning objectives. Based on the results of these interviews, teachers continue to monitor the use of ICT devices, such as smartphones, in the classroom, even though they realize the great potential of these devices in facilitating more optimal learning and achieving learning goals. Therefore, the results of the interviews in this section highlight the importance of facilities and regulations that support the effective use of ICT in the learning process in schools.

Teacher challenges for integrating ICT in learning activities

Analysis of the results of the teacher interviews revealed that there were three main challenges in adopting mobile technology for the teaching and learning process in secondary schools. First, there were infrastructure problems, as evidenced by the opinions of Teacher F and Teacher E regarding limited internet access due to weak network signals in their school environment. Second, there were difficulties related to teachers' technological knowledge, influencing their ability to integrate mobile technology into teaching. Third, there were obstacles in school policy, such as frequent changes to the regulations regarding the use of ICT-based learning resources, which Teacher G expressed regarding the policies for the use of smartphones in the classroom. Furthermore, there were other problems related to the types of ICT that teachers

used as learning resources, because some teachers need training on how to effectively use them. The summary of the interview results with teachers G, E, and F can be seen in Table 5.

Table 5: Teachers' perceptions of challenges in using ICT.

	Statement	Coding
Teacher E & F	In our current school, it appears that the internet network is still a challenge, as the Wi-Fi signal is not very good in some areas. This makes it difficult for students to access additional information through the internet. Furthermore, in terms of policy, it also poses a challenge as the school has never established standardized rules for the use of smartphones or other ICT devices to support the learning process. The policy always changes with the turnover of school management leadership.	Policies, Wi-Fi networks, regulations
Teacher G	Some of my colleagues are still very limited in utilizing various types or formats of ICT-based media for learning, as they do not master the variety of learning media or information media that can be used for learning activities.	Diverse forms of media, educational media variations.

These challenges highlight the need for collective efforts to find the right solutions. Consistent and clear school policies, along with focused professional training and development aimed at enhancing teachers' technological knowledge, are crucial steps in overcoming these obstacles. Furthermore, teachers' awareness of the importance of adopting technology in learning in the digital era also needs to be enhanced. Thus, through collaboration among schools, teachers, and other relevant parties, these challenges can be addressed, and the use of mobile technology in learning can become more effective and targeted.

The interviews conducted with the seven educators across various high schools have yielded significant insights into their views on the integration of ICT for educational purposes in an era when students are already well-acquainted with ICT. It is widely acknowledged that there exists substantial empirical evidence supporting the notion that ICT can aid teachers in managing the learning process, encompassing both instructional delivery and assessment of learning outcomes. In line with the study by Kristriani and Usodo (2022), ICT-based media serves not only as a means of content delivery, but also as a tool for assessing learning outcomes through interactive quiz formats. In addition, this research finding also successfully demonstrates that one of the factors that motivates and prepares teachers to implement technology-assisted learning is because the students themselves are already very familiar with technology, so it does not require much effort for teachers to introduce technologies that can aid in the learning process. This finding is consistent with the studies conducted by Montiel et al. (2020) and Widodo et al. (2020), which state that Generation Z students are accustomed to the presence of technology in their daily lives, and sometimes their mastery of it exceeds that of their teachers, if they do not adapt to technological advancements promptly. It is reasonable to expect that the presence of this type of media in the learning process will receive full support, when introduced into classrooms.

The presence of ICT in the learning process can be seen through the various types of ICT-based media that are adopted, such as smartphones, computers, laptops, and even virtual reality (Ansari et al., 2023; Sari et al., 2020 ; Shang & Liang, 2021). Research findings also indicate that some teachers have integrated smartphones for classroom teaching, which has been found to enhance students' attention in learning. This result is supported by the research conducted by Bukhori et al. (2019), which shows that the implementation of Android-based applications, that can be operated on smartphones, has been found to improve students' motivation, reading intensity,

and academic achievement. In line with this, numerous studies have also indicated that the integration of ICT into the learning process has a positive impact and contribution to the improvement of students' academic achievement and soft skills, which include communication, collaboration, critical thinking and writing skills (Demir & Tavil, 2021; Triyono et al., 2022).

The utilization of ICT-based technology in the teaching and learning process requires preparation and supporting facilities that are owned by schools. For example, in some schools, the Wi-Fi network is often an issue, due to differences in providers among students, and weak internet signals. In addition, teachers' skills in utilizing ICT-based learning media also pose a challenge that needs to be addressed, as research revealed by Shambare et al. (2022) which shows that most teachers consider ICT beneficial in the teaching and learning process However, teachers' attitudes vary, based on the level of training and ICT support that they receive. Therefore, it is expected that further professional development and training in ICT integration needs to be provided to teachers. In line with this, research conducted by Ríos et al. (2023) and Munje and Jita (2020) demonstrate strong concerns about the use of mobile learning, virtual reality, and augmented reality in learning, considering that sometimes students are easily distracted by notifications that suddenly appear on their smartphones.

These issues may be factors hindering the integration of technology in the classroom, therefore, it is important for schools to determine their stance on policies promoting this use of technology (Molotsi, 2022). Considering that school policies allow students to bring technological devices, such as smartphones or laptops, to their classrooms have led to an increase in students' self-efficacy in using technology for learning (Jamil et al., 2023; Julaihi & Hamdan, 2020). While the findings of this study largely align with previous literature on motivation, readiness, and challenges in ICT integration, it provides significant contributions through its focus on the local context of Indonesia, particularly in the post-pandemic adaptation phase. This context offers a unique perspective on how Indonesian teachers have navigated infrastructure and policy barriers, which often pose major obstacles to the effective use of ICT (Mahawan & Langprayoon, 2020; Tondeur et al., 2016). The experiences of adaptation during the COVID-19 pandemic have accelerated the adoption of technology by teachers, providing additional insights into practical strategies and approaches that can be employed to support the sustainable integration of ICT in schools.

In addition, this study identified that rapid adaptation to technology during the pandemic has driven significant changes in teaching practices, such as the use of online learning applications and smartphones as primary learning media (Ratheeswari, 2018; Tukenova et al., 2019). This suggests a potential that has not been widely explored in previous research, particularly in relation to how the pandemic experience can be leveraged to drive broader systemic changes in educational policies. Thus, this study not only strengthens the existing literature, but also offers a new contribution by showing how the dynamics of technology adaptation in Indonesia could serve as a model for other developing countries facing similar challenges.

However, this study also acknowledges the limitation of a small sample size, which may affect the generalizability of the findings. Nonetheless, the qualitative, case-study approach aims to provide an in-depth understanding of the phenomenon under investigation, rather than drawing generalizable conclusions. This sample size allows for a more detailed exploration of teachers' perspectives on ICT integration, offering rich and contextual insights that may not be captured through quantitative methods.

Conclusion

Research findings indicate that technology plays a crucial role in the continuity of the learning process, particularly following the COVID-19 pandemic, which has significantly increased the reliance on technology for education. Interviews with teachers revealed several key factors, such as the trend of smartphone-based learning and the use of online learning applications among educators in Indonesia. The benefits of technological adoption are evident in enhanced teaching effectiveness and increased student engagement, as well as the positive impact of mobile technology on teaching practices. However, this study also identified several challenges faced by teachers in implementing technology-assisted learning, including limited supporting facilities in schools, uneven internet network coverage, and inconsistent school policies.

However, this investigation has several limitations. First, the small sample size and the use of data collection methods that only focus on interviews, may limit the generalizability of the findings, and affect the depth of understanding of the complex aspects of the use of ICT-based learning resources. These drawbacks indicate the need for future research that combines mixed methods, such as classroom observation and document analysis, in order to provide a more holistic understanding, and reduce potential bias in data interpretation. Second, the results show that teacher motivation and readiness are greatly influenced by their perceptions of the benefits and ease of use of technology. Therefore, policies that support the development of teachers' digital competencies through intensive training programs, provision of adequate technological facilities, and ongoing support from school management are needed. In addition, the development of professional programs, based on direct practice and mentor guidance, can help to improve teachers' abilities in utilizing technology effectively in the classroom.

Future research is recommended to develop ICT-based learning platforms tailored to the characteristics of the instructional content, students' needs, and the availability of resources. Such refined approaches aim to optimize the implementation of ICT in the learning process. By taking these steps, it is expected that the benefits of ICT integration will become increasingly significant for students, and make a substantial contribution to enhancing the quality of education in schools.

Authors' Bios

Mochamad Kamil Budiarto is a doctoral student in the Department of Educational Sciences' Faculty of Teacher Training and Education at Sebelas Maret University, and a tutor at Tuton in Univeritas Terbuka. His research focuses on educational technology, interactive learning media, e-learning, and entrepreneurial learning.

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