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# The Role of Mobile Devices in the Era of Digital Learning in Elementary Schools

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## ABSTRACT

**Background.** The use of mobile devices has brought significant changes to learning in elementary schools, offering quick access to learning resources and increasing interactivity in the learning process. This reflects a paradigm shift in education towards the use of technology as an effective and dynamic learning tool.

**Purpose.** The aim of this research is to fill the existing knowledge gap in the literature by investigating the views of PGSD students and elementary school teachers regarding the use of mobile devices in learning at school base. It is hoped that this research can provide a deeper understanding of the potential of mobile devices in supporting the learning process at the basic level, as well as becoming a basis for developing more effective learning strategies in the future.

**Method.** This research methodology uses a quantitative approach through a survey model involving 30 respondents, consisting of PGSD students and elementary school teachers. Data collection was carried out through distributing online questionnaires using Google Form. Data analysis was carried out using a quantitative data analysis approach, paying attention to the validity of the data through comparison with other relevant data sources.

**Results.** The results of the questionnaire analysis show that the majority of students use mobile devices regularly, indicating widespread adoption of technology in the educational context. However, challenges that need to be overcome include a lack of training and support for educators, as well as school policies that may not fully support the integration of technology in the curriculum.

**Conclusion**. The integration of mobile devices in learning in elementary schools promises many benefits, but also faces challenges that need to be overcome. With adequate support, it is hoped that the use of mobile devices can become an effective and inclusive learning tool for all students, preparing them to face the demands of an increasingly digitally connected world.

## KEYWORDS

Digital Learning, Education, Mobile Devices.

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## INTRODUCTION

Technological developments have had a significant impact in various fields, and education is no exception (Saputra, 2022). Over time, the role of technology in improving the quality of learning has become increasingly emphasized and understood. From the era of using overhead projectors to the introduction of desktop computers in classrooms, every technological innovation has shaped the mindset

and approach to the teaching and learning process (Cui et al., 2023). However, in this digital era, one of the most striking recent advances is the emergence of mobile devices. Mobile devices, such as smartphones and tablets, have become an integral part of the educational context in elementary schools (Maassen et al., 2020).

Primary school, as the initial stage in formal education, is an important foundation in forming students' mindsets and skills (Saks et al., 2021). In this context, mobile devices have had a significant impact in facilitating the learning process. Elementary school-age children, accustomed to technology from an early age, face new opportunities in classroom learning (Kim, 2020). They not only have easier access to various learning resources, but also have the opportunity to learn in a more interactive and interesting way through the use of mobile devices.

The development of mobile devices in elementary schools cannot be underestimated (Chou & Chou, 2019). As mobile devices become more affordable and internet accessibility increases, children in elementary school can easily access a variety of apps and learning resources designed specifically for them (Graves et al., 2021). Interactive and varied learning applications, from math to science, provide a fun and engaging learning experience for students. In addition, digital picture stories and other creative applications help increase students' imagination and creativity (Istiq'Faroh et al., 2020).

The role of teachers in integrating mobile devices in the curriculum is also very important. Not only as a tool in the teaching process, but also as a means to create a more interactive and interesting learning environment. Teachers in primary schools are increasingly aware of the potential of mobile devices in improving the quality of learning and strive to make maximum use of them (Nikolopoulou, 2021). They not only use mobile devices to present learning materials, but also to facilitate class discussions, provide feedback to students, and evaluate their learning progress.

Nevertheless, although these developments promise many benefits, further research is needed to fully understand the impact use of mobile devices in learning in elementary schools. Studies on the use of mobile devices in the context of basic education are still limited, especially in relation to the perceptions and experiences of student teachers and active teachers. Therefore, it is important to dig deeper into how mobile devices can be optimized to support effective and sustainable learning processes at the elementary level.

In the context of digital education in elementary schools, the role of technology becomes very important (Valverde-Berrocoso et al., 2021). Technology can help change the way teachers teach and students learn, and increase student engagement and motivation in learning. Through comprehensive research, we can better understand how mobile devices can influence learning dynamics in elementary schools, as well as explore the best strategies for integrating them into the curriculum (Ansari & Khan, 2020).

Previous research on autonomous learning has primarily focused on its implementation within traditional classroom settings. Studies have explored various strategies and interventions to promote autonomous learning among students, particularly at the secondary and tertiary education levels. However, there is a notable gap in the literature regarding autonomous learning among elementary school students outside the confines of traditional classroom instruction. The emergence of the COVID-19 pandemic prompted a shift towards remote and online education, providing an opportunity to explore autonomous learning in novel contexts. For instance, the Second Elementary School in Daxie, Ningbo City, Zhejiang Province, China, leveraged online education platforms during the pandemic to facilitate distance learning and student academic support, thereby fostering opportunities for independent learning at home. This highlights the importance of investigating the

teaching practices and efficacy of autonomous learning initiatives implemented during periods of educational disruption (Xie & Yang, 2020).

Previous research on the relationship between humans and digital technologies has primarily focused on examining their usage patterns, impacts, and implications in various contexts. However, there is a notable gap in the literature regarding the comprehensive analysis of digital technology use specifically within the context of a global pandemic crisis, such as the ongoing COVID-19 pandemic. The existing body of research provides valuable insights into the diverse array of digital technologies utilized during the pandemic, including computers, telemedicine platforms, and artificial intelligence systems. Studies have also highlighted the involvement of different populations in utilizing these technologies, with a particular emphasis on medical professionals as primary users. Additionally, research has documented a wide range of activities facilitated by digital technologies during the pandemic, such as remote health service provision, data analysis, and communication among individuals and groups. Moreover, studies have explored the effects of utilizing these digital technologies, revealing various outcomes such as improved patient outcomes, continuity of education, and mitigation of the pandemic's impact. However, despite the wealth of empirical evidence available, there remains a need for further research to delve deeper into the nuanced dynamics of technology-human interactions during global health crises. Future studies could explore factors influencing technology adoption and adaptation, assess long-term effects on societal behavior and norms, and identify potential challenges and opportunities for optimizing digital technology use in pandemic response efforts (Vargo et al., 2021).

Previous research on mobile learning has primarily focused on exploring the potential of personal electronic devices in enhancing learning experiences across various contexts. However, there remains a need for further empirical investigation into the actual impact and effectiveness of mobile learning initiatives. While existing literature has identified the promise of mobile learning in facilitating interactions with media, educators, peers, experts, and the broader world, there is a gap in understanding the specific ways in which mobile technologies influence learning processes and outcomes. Future research could delve deeper into the mechanisms through which mobile learning affects learning processes, including its interactions with other psychological constructs and its potential to collect previously unobtainable data. Additionally, there is a need for research that critically evaluates mobile learning initiatives and aligns them with established psychological and sociocultural theories of learning. By building upon empirical evidence and theoretical frameworks, future studies can provide valuable insights into the effectiveness and limitations of mobile learning, thus contributing to the advancement of both theory and practice in this emerging field (Bernacki et al., 2020).

Through previous research that has been compiled, we can see that the role of technology, especially mobile devices, has become increasingly important in the educational context. Studies on the use of mobile devices in primary school learning, the effects of their use during the COVID-19 pandemic crisis, and research on mobile learning highlight the significance and impact of technology in improving the learning process. These findings provide an important basis for further research, such as the aim of this research, which aims to fill knowledge gaps in the literature by exploring the perceptions of PGSD students and elementary school teachers towards the use of mobile devices in learning. By understanding more deeply the potential of mobile devices in supporting the learning process at the elementary level, this research provides a valuable contribution to the development of more effective learning strategies in the future, in line with the demands of an increasingly digital era.

Previous studies on the use of mobile devices in basic education has provided some valuable insights. However, much of this research remains limited in scope or focuses on specific aspects of the use of mobile devices in learning. Therefore, the novelty of this research lies in its comprehensive and inclusive approach towards understanding the role of mobile devices in primary school learning. By analyzing the experiences and perceptions of PGSD students and elementary school teachers, it is hoped that this research can make a significant contribution to the development of education at the elementary level.

The aim of this research is to fill existing knowledge gaps in the literature by comprehensively investigating the views of PGSD students and elementary school teachers regarding the use of mobile devices in learning in elementary schools. Thus, this research aims to provide a deeper understanding of the potential of mobile devices in supporting the learning process at the elementary level, as well as becoming a basis for the development of more effective learning strategies in the future. In this context, research on the role of mobile devices in learning in Primary school is becoming increasingly important. This research will not only provide insight into how mobile devices can be used effectively in learning, but will also help understand how this technology influences learning dynamics at a basic level. By analyzing the experiences and perceptions of student teachers and active teachers regarding the use of mobile devices in basic education, this research will provide a deeper understanding of the implications of mobile devices in basic education.

## RESEARCH METHODOLOGY

This research methodology aims to investigate the role of mobile devices in the era of digital learning in elementary schools, using a quantitative approach through a survey model (Almaiah et al., 2022). The respondents who will be involved in this research are 30 people consisting of students from the Primary School Teacher Education Study Program (PGSD) and Elementary School (SD) teachers. Data collection was carried out by distributing questionnaires to respondents using an online platform in the form of Google Form. The data collection process will be carried out by distributing the Google Form link to respondents who have been randomly selected according to the specified sample size. The questionnaire prepared will include questions related to respondents' perceptions and experiences in using mobile devices in the learning context in elementary schools. These questions will be carefully designed and focus on certain aspects that are relevant to the research objectives.

Data analysis will be carried out using a quantitative data analysis approach, referring to the Miles and Huberman data analysis model (Sechelski & Onwuegbuzie, 2019). The collected data will be analyzed statistically using appropriate data analysis techniques, such as descriptive and inferential analysis. This analysis will help in understanding general patterns and relationships between variables contained in survey data (Spector, 2019). The selection of respondent samples was carried out randomly to ensure the representativeness and generalisability of the research results. A random data sampling technique was used to select respondents from the population of PGSD students and elementary school teachers spread across various regions. This aims to obtain a sample that represents a variety of backgrounds and experiences in using mobile devices in elementary school learning.

To determine the validity of the data, this research will use source data validity techniques (Rose & Johnson, 2020). This means that the data obtained from respondents will be compared with other relevant data sources, such as scientific literature, educational policies, or the results of previous research. This is done to ensure the consistency and accuracy of the data obtained from

respondents. By following this methodology, it is hoped that this research can provide a deeper understanding of the role of mobile devices in learning in elementary schools. It is hoped that the results of this research can become the basis for developing learning strategies that are more effective and relevant to the demands of the current digital era.

## RESULT AND DISCUSSION

### Digital Learning in Elementary Schools

#### *Definition of Digital in Elementary Schools*

The concept of digital learning in elementary schools is an approach that places information and communication technology (ICT) as the main component in the educational process for students at the elementary level (Valencia-Arias et al., 2019). This definition includes the integration of various hardware, software, and online platforms specifically designed to support and enhance the student learning experience. By using this technology, digital learning in elementary schools aims to create a learning environment that is dynamic, diverse, and relevant to the context of an ever-evolving era (Julita & Zulyusri, 2023).

The use of technology in learning in elementary schools involves various tools and resources, starting from computers, tablets, to educational applications designed to facilitate the learning process. By presenting learning material in an interesting and interactive format, this concept aims to increase student involvement in learning and expand their access to information and knowledge.

Apart from the technical aspects, the concept of digital learning in elementary schools also emphasizes the development of digital and critical literacy skills in students (Hsu et al., 2019). This is important so that students can use technology effectively, wisely and responsibly in their daily lives, and are able to critically assess information obtained from various sources.

In its implementation, this concept also applies the principles of constructivist and differentiated learning instruction, taking into account students' individual learning styles and ability levels. By providing learning experiences that suit each student's needs, the concept of digital learning in elementary schools aims to create a learning environment that is inclusive, supportive, and allows each student to reach their maximum potential in the ever-growing digital era.

#### *Principles of Digital Learning Concepts in Elementary Schools*

*Inclusivity*

This concept emphasizes the importance of ensuring that every student has equal access and opportunities to develop skills and knowledge through the use of digital technology in learning. This principle includes efforts to overcome gaps in access to technology that may exist among students (Raes et al., 2020).

*Collaborative and Interactive*

Digital learning in elementary schools is based on the principle of collaboration between teachers and students, as well as between students among themselves (Al Rawashdeh et al., 2021). This concept encourages active interaction, discussion, and shared learning between members of the learning community, which enriches the learning experience.

*Flexibility and Adaptability*

This concept emphasizes flexibility in the implementation of learning, where teachers can adapt learning methods and digital resources according to student needs and characteristics (Himmetoglu et al., 2020). This approach allows for differentiation of instruction and learning organization tailored to each student's learning pace.

*Data-Based Monitoring and Assessment*

Digital learning in elementary schools includes the principle of continuously monitoring student learning progress using data generated from digital learning activities (Daragmeh et al., 2021). This principle allows teachers to provide more timely and evidence-based responses to individual student learning needs.

*Digital Literacy Development*

This concept pays attention to the importance of developing digital literacy skills among students, including the ability to access, evaluate, use and create digital content critically and responsibly (Dashtestani & Hojatpanah, 2022).

***Various Digital Learning Concepts in Elementary Schools***

*Digital Content-Based Learning*

This concept involves the use of digital content, such as e-books, learning videos, and online learning resources, to present information and learning concepts to students in a more dynamic and interesting way (Febriati et al., 2019).

*Educational Game-Based Learning*

This concept uses educational games and interactive simulations to facilitate learning of academic concepts and skills, while maintaining an engaging entertainment element for students.

*Online Collaborative Learning*

This concept includes collaboration between students on joint projects, online discussions, and other collaborative activities through digital learning platforms (Bovill, 2020).

*Adaptive and Personalized Learning*

This concept refers to the use of adaptive learning software that adapts material and level of difficulty to individual student needs and abilities.

*Project-Based Learning and Discovery*

This concept emphasizes project-based learning that provides students with opportunities to explore learning topics in depth through relevant and meaningful projects, supported by digital technology (Miller & Krajcik, 2019).

*Curriculum Integrated Learning*

This concept integrates digital technology into the elementary school curriculum.

***Examples of the Role of Technology in Supporting Learning at the Elementary Schools***

In terms of the role of technology in supporting learning at the elementary level, there are various examples of the use of technology that actively involve students in the learning process (Lai et al., 2019). One example is the use of interactive math applications, such as 'Prodigy' or 'Khan Academy Kids'. These applications not only present material in the form of fun games or challenges, but also provide direct feedback to students to improve their understanding of mathematical concepts.

In addition to mathematics applications, technology also allows the use of story-based learning software to increase student engagement in learning language and literature. An example of this is the application 'Epic!' which provides access to a digital library with thousands of storybooks and picture books that can be accessed online. Students can explore

stories and books that interest them, helping to improve their reading and comprehension skills.

In addition to apps and software, technology also allows the use of hardware, such as interactive projectors and digital whiteboards, to create a more dynamic learning experience and interactive in class. By using an interactive projector, teachers can present learning material in a more visual and interesting way, while giving students the opportunity to participate in direct learning activities.

Furthermore, technology also facilitates collaboration and communication between students and teachers outside the classroom through online learning platforms (Rannastu-Avalos & Siiman, 2020). For example, by using platforms such as 'Google Classroom' or 'Microsoft Teams', teachers can assign assignments, send learning materials and communicate with students online. This allows students to engage in learning outside of school hours and expand their learning experience.

Not only that, technology also supports project-based learning by providing access to rich and varied online resources (Geng et al., 2022). Students can use the internet to conduct research, find information, and collect data for their projects. This helps broaden students' horizons and provides a more contextual and authentic learning experience.

Finally, technology also facilitates more effective learning assessment and feedback through the use of online assessment software (Castro, 2019). Teachers can use tools like 'Kahoot!' or 'Quizizz' to create interactive quizzes that allow them to formatively assess students' understanding and provide immediate feedback to them.

Thus, through various examples of the use of these technologies, the role of technology in supporting learning at the elementary level is proven to provide significant benefits for developing students' skills and knowledge and improving the overall quality of learning.

**Survey Results of the Role of Technology in Supporting Learning at the Elementary Schools**

After analyzing the results of the questionnaire with the first question, How often do you use mobile devices for learning in elementary school? With the following answer options: Every day, Several times a week, Once a week, Rarely and Never. With the following answer results:

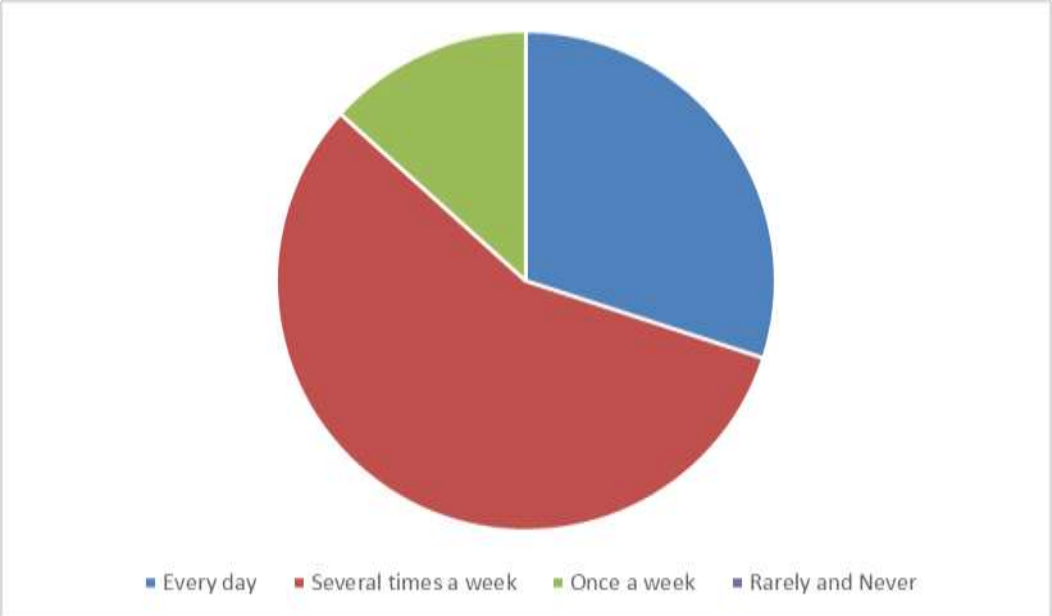


**Figure 1**. mobile device usage activities for learning in primary school

From the results of this data analysis, it can be concluded that the use of mobile devices for learning in elementary schools has become increasingly common and integrated into daily learning activities. This phenomenon reflects a global trend in which technology is increasingly playing a central role in the world of education. With the majority of respondents using mobile devices every day or several times a week, this shows that education has widely adopted technology as a tool in facilitating the teaching and learning process. This also indicates that digital education is increasingly becoming an integral part of the primary school curriculum, helping prepare students to face the challenges of a modern, increasingly digitally connected world.

However, it should be noted that there is still a small percentage of respondents who use mobile devices for learning with a lower frequency. This may indicate variations in technology accessibility among elementary school students, which could be influenced by factors such as infrastructure availability, level of device sophistication, or even personal preferences. Therefore, it is important for educational institutions and the government to continue to pay attention to gaps in technology access that may occur among these students, so that all students can feel the benefits of integrating technology in the learning process. Thus, increasing the accessibility and use of mobile technology in education can bring broader and equitable benefits to all students in elementary schools.

Next question, In your opinion, what are the main benefits of using mobile devices in learning in elementary schools? With the following answer options: Quick access to learning resources, Interactive and interesting for students, Increasing student involvement, Facilitating differentiation of instruction and Providing support for students with special needs. With the following answer results:

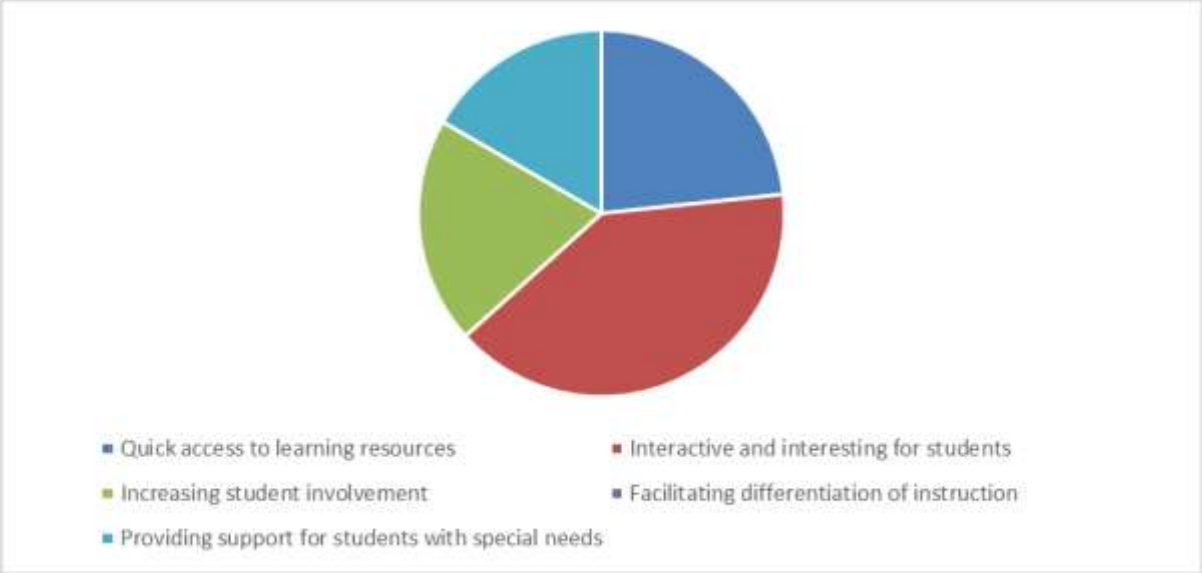


**Figure 2.** Key benefits of using mobile devices in primary school learning

Based on the results of data analysis from questions related to the main benefits of using mobile devices in learning in elementary schools, there is quite an interesting understanding. The majority of respondents, 12 people or around 40% of the total respondents, stated that the main benefit of using mobile devices is that they are interactive and interesting for students. This reflects the importance of aspects of the learning experience that are fun and interesting to maintain student interest and motivation in the learning process. Furthermore, as many as 7 people or around 23% of the total respondents, identified fast access to learning resources as the main benefit of using mobile

devices. This shows that mobile technology allows students to easily access information and learning materials directly, thus speeding up the process of searching and finding relevant information.

In addition, as many as 6 people or around 20% of the total respondents, stated that the use of mobile devices increases student involvement in learning. This shows that mobile technology has the potential to arouse students' interest and make them more active in the learning process. However, the number of respondents who identified the benefits of differentiated instruction and support for students with special needs was slightly lower, at 5 each or around 17% of the total respondents. However, these results still highlight the potential of mobile devices in providing learning experiences tailored to students' individual needs, as well as providing additional support for those who require special assistance. Thus, these results confirm that the use of mobile devices in learning in elementary schools has various benefits and can increase the effectiveness of the overall learning process.

Next question, How ready are you to integrate mobile devices in future teaching practices (for PGSD students) or have you already integrated them (for elementary school teachers)? With the following answer options: Very ready, Somewhat ready, Not so ready and Not ready at all. With the following answer results:

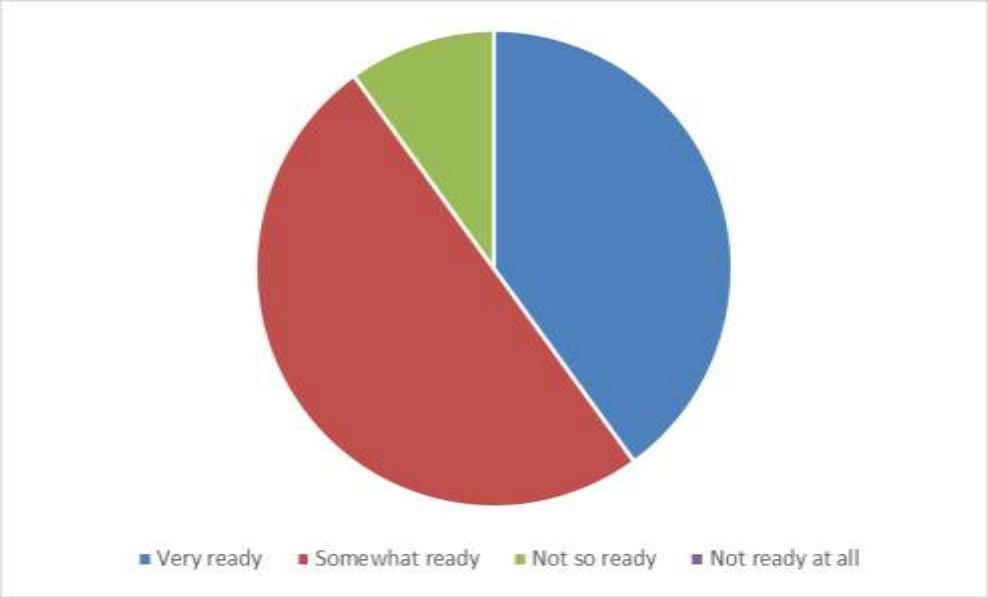


**Figure 3.** Readiness to integrate mobile devices in future teaching practice

Based on the results of data analysis regarding the level of readiness in integrating mobile devices in future teaching practices, it appears that the majority of respondents showed a fairly high level of readiness. Of the total of 30 respondents, 12 people or around 40% stated that they were very ready to integrate mobile devices in their teaching practices in the future. This reflects a strong awareness of the importance of technology in education and the readiness of respondents to adopt mobile devices as a tool in the learning process.

In addition, as many as 15 people or around 50% of the total respondents stated that they were quite ready to integrate mobile devices in future teaching practice. Although not as many as expressed very high readiness, this number still shows that the majority of respondents are aware of the importance of technology in education and are willing to develop the skills and knowledge necessary to integrate it in their teaching practices.

Nonetheless, there was a small number of respondents , namely 3 people or around 10% of the total respondents, who stated that they were not yet ready to integrate mobile devices in teaching practices in the future. This may reflect certain challenges or barriers they face, such as a lack of sufficient training or understanding of how to effectively integrate technology in learning. Therefore, it is important for educational institutions and teacher training programs to provide the necessary support and resources so that all teachers can increase their readiness to adopt technology in learning in the future.

Next question, Do you feel there is a need for additional training or support in using mobile devices in elementary school learning? With the following answer options: Yes, very necessary, Yes, somewhat necessary, Not very necessary and Not necessary at all. With the following answer results:

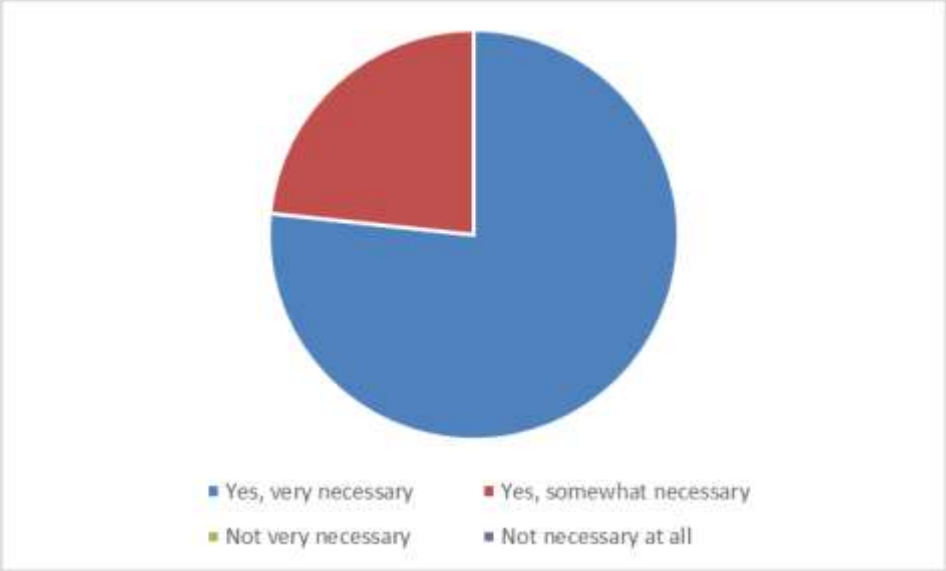


**Figure 4.** Respondents would need additional training or support in using mobile devices for learning in primary schools

The results of the analysis show that the majority of respondents, 23 people or around 77% of the total respondents, stated that they felt they really needed additional training or support in using mobile devices in elementary school learning. This highlights awareness of the complexity and importance of deeply understanding the use of mobile devices as an effective learning tool. Meanwhile, 7 people or around 23% of the total respondents said that they needed some additional training or support. Although this proportion is smaller, it still shows that some respondents recognize the need for increased skills and knowledge in integrating mobile technology in their teaching practices. Thus, these results emphasize the need to provide additional training and support for educators so that they can exploit the full potential of the use of mobile devices in the learning process in primary schools.

Final question, What are the main obstacles you experience in optimizing the use of mobile devices in learning in elementary schools? With the following answer options: Limited access to technology, lack of training or support, concerns about disrupting student concentration, school policies that do not support the use of technology and time constraints in preparing learning materials using mobile devices. With the following answer results:

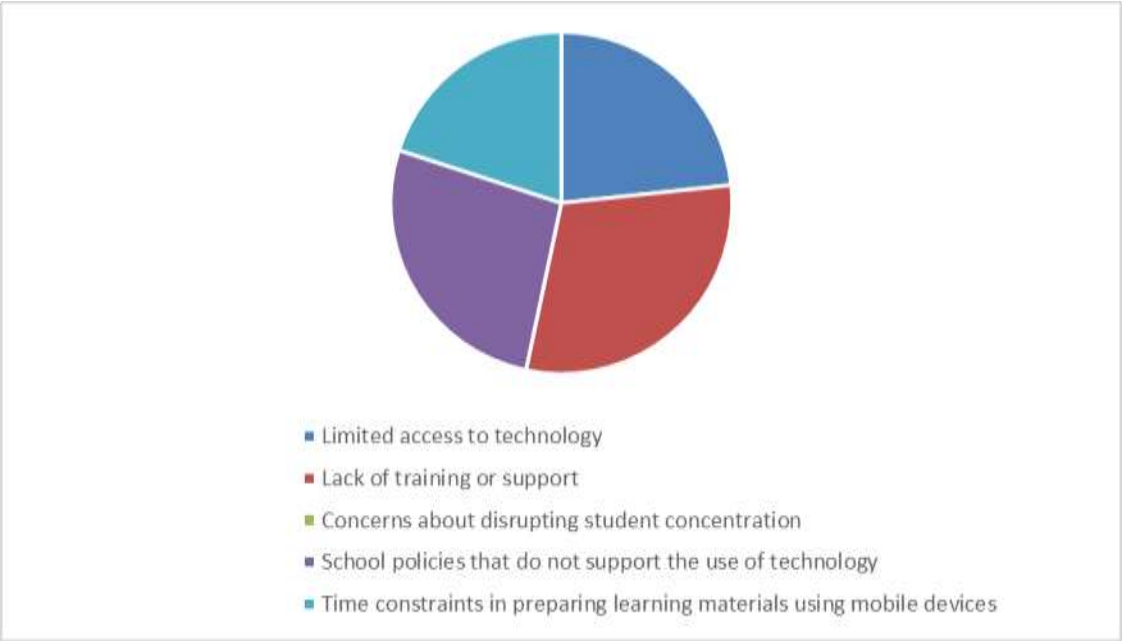


**Figure 5.** key constraints to optimising the use of mobile devices in primary school learning

Based on the results of data analysis regarding the main obstacles experienced in optimizing the use of mobile devices in learning in elementary schools, there are several interesting findings. Significantly, the majority of respondents, namely 9 people or around 30% of the total respondents, identified lack of training or support as the main obstacle. This shows the need to provide adequate resources and training for educators so that they can develop the skills and knowledge needed to utilize mobile technology effectively in learning.

Furthermore, as many as 8 people or around 27% of the total respondents, highlighted school policies which does not support the use of technology as the main obstacle. This shows the importance of adopting policies that support and facilitate the integration of technology in learning practices at the primary school level. In addition, a number of respondents also noted limited access to technology as an obstacle, with 7 people or around 23% of the total respondents identifying it. This highlights the need to increase the accessibility of technological infrastructure, such as internet access and hardware, so that all students and educators can utilize technology in learning.

On the other hand, as many as 6 people or around 20% of the total respondents stated that time constraints in preparing learning materials using mobile devices is a major obstacle. This shows the importance of developing efficient strategies in compiling and integrating digital learning materials into the elementary school curriculum. By understanding these barriers, educational institutions and governments can take concrete steps to overcome the challenges and maximize the potential of using mobile devices in elementary school learning.

## CONCLUSION

The use of mobile devices has brought significant changes to learning in primary schools, offering quick access to learning resources and increasing interactivity in the learning process. The results of the questionnaire analysis show that the majority of students use mobile devices regularly, indicating widespread adoption of technology in educational contexts. However, there are challenges that need to be overcome, such as a lack of training and support for educators, as well as school policies that may not fully support the integration of technology in the curriculum.

Lack of training and support for educators is a major obstacle in optimizing the use of mobile devices in learning. Although most respondents expressed readiness to integrate technology in teaching practices, further efforts are still needed to improve their understanding and skills. In addition, school policies that do not support the use of technology are also an obstacle, indicating the need for more inclusive and progressive policy reform in supporting the use of technology in learning.

So the integration of mobile devices in learning in elementary schools promises many benefits, but also faces a number of challenges. needs to be addressed. With adequate support from educational institutions, governments and other stakeholders, the use of mobile devices can be an effective and inclusive learning tool for all students, preparing them to face the demands of an increasingly digitally connected world.

## AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.
Author 3: Data curation; Investigation.
Author 4: Formal analysis; Methodology; Writing - original draft.
Author 5: Supervision; Validation.

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