

Analisis Implementasi Pembelajaran Online Pada Mata Pelajaran Matematika Jenjang Sekolah Dasar

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ABSTRACT

This study aims to analyze the implementation of online learning in mathematics subjects at the elementary school level. This research uses a qualitative method with a case study approach in several elementary schools in Indonesia. Data were collected through interviews with teachers and students, as well as direct observations of the learning process. The results show that online learning has several challenges, including limited internet access, low digital skills among students and teachers, and a lack of effective social interaction. However, several benefits were also found, such as time flexibility and more varied learning resources. This study concludes that despite some obstacles, online learning can be optimized with the right strategies, such as digital skills training for teachers and students, as well as improving technology infrastructure.

Keywords: Online Learning, Mathematics, Elementary School

1. Introduction

According to Suandito (2017), mathematics learning often involves understanding abstract concepts that require effective and innovative delivery methods. Suandito explains that informal evidence in mathematics learning such as observation and direct interaction can provide deep insights into how students understand the material. In the context of online learning, this approach must be adapted to digital media. Although technology offers tools that can support mathematics learning, such as simulations and educational videos, the limitations of direct interaction make it important to adapt these methods so that they remain effective in conveying mathematical concepts. Szpunar, Moulton, and Schacter (2013) highlight how digital technology can affect the learning process and information retention.

Their research reveals that the use of technology in education can not only increase student engagement but also affect the way students process and remember information. In the context of online mathematics learning, this suggests that digital tools must be carefully designed to facilitate deep and sustained understanding. The downside of online learning is the loss of some forms of direct interaction that support contextual understanding, so it is important to balance technology with pedagogical strategies that support students' cognitive processes.

Vortunata et al. (2020) discussed the implementation of online learning in elementary schools during the COVID-19 pandemic, showing the challenges and opportunities that emerged. They emphasized the need to

adjust the curriculum and teaching methods to accommodate online learning. This study showed that the pandemic has accelerated the adoption of technology in education, but also revealed gaps in infrastructure and technological readiness among students and teachers. In this context, online learning for mathematics subjects must face challenges such as uneven access to technology and limitations in evaluation methods.

Wiryanto (2020) provides an overview of the mathematics learning process in elementary schools during the COVID-19 pandemic, focusing on the adaptations needed to carry out learning effectively in an online format. This study highlights the challenges faced by teachers in adapting their teaching methods to online platforms as well as the need for new strategies that can overcome the obstacles arising from distance learning. Wiryanto's findings emphasize that although technology can support learning, success in an online context is highly dependent on teachers' ability to adapt and implement methods that are appropriate to digital media. Overall, the background of online learning in elementary school mathematics illustrates the need for innovation and adjustment in teaching methods.

The study shows that although technology offers a variety of tools that can enhance the learning process, challenges such as uneven access to technology, limited direct interaction, and curriculum adjustments require special attention. Online mathematics learning must be designed to address these challenges in a way that effectively supports student engagement and understanding, especially in situations such as the pandemic that accelerate changes in education. Wiryanto (2020) observed the mathematics learning process in elementary schools during the pandemic and noted that despite technical difficulties, teachers and students showed quite good adaptation to this new situation. He found that teachers need to develop more interactive and easy-to-understand teaching materials in digital format to ensure that students still gain a good understanding of mathematical concepts.

From the various literatures, it can be concluded that online learning presents unique opportunities and challenges, especially in subjects such as mathematics that require in-depth understanding and active student involvement. The implementation of effective online learning requires adequate technological support, training for teachers and students in the use of digital tools, and the development of teaching materials that are appropriate for the online format. This study also aims to explore how online learning can be optimized at the elementary school level. By considering various views from previous studies, it is hoped that this study can provide practical recommendations to improve the effectiveness of online learning, especially in mathematics. Support from the government and related parties is also needed to provide adequate infrastructure and training to support this process. Ultimately, this study is expected to make a significant contribution to the field of education, especially in understanding the dynamics of online learning in elementary schools. The findings of this study can be the basis for the development of education policies that are more responsive to learning needs in the digital era, and ensure that every student gets the same opportunity to learn and develop.

2. Methods

The method used in this study is descriptive qualitative, as explained by Akhmad (2015). This research method uses a literature study approach and qualitative descriptive to explore the effectiveness of online learning in mathematics subjects at the elementary school level. The literature study was conducted by collecting and analyzing various relevant academic sources, such as journal articles, books, research reports, and trusted online sources. This study focuses on previous findings regarding online learning, especially those related to mathematics subjects at the elementary school level.

This literature analysis aims to identify trends, challenges, and strategies that have been used to overcome various obstacles in online learning. The qualitative descriptive approach involves data collection Direct observation in virtual classes was also carried out to understand the dynamics of interactions between teachers and students and how mathematics materials are delivered and understood. The data collected were then analyzed thematically to identify key patterns and themes that emerged related to the effectiveness of online learning. This qualitative descriptive method allows researchers to dig deeper into the subjective experiences of participants and gain a deeper understanding of the context of online learning in mathematics subjects at elementary schools.

3. Findings and Discussions

This discussion will describe the results of research on the effectiveness of online learning in mathematics subjects at the elementary school level, by considering various aspects that have been identified through literature studies and qualitative descriptive approaches. **First**, the results of the study indicate that online learning has the potential to increase student engagement in the mathematics teaching and learning process. In many cases, interactive and engaging online learning platforms can motivate students to be more active in learning. The use of learning videos, mathematical simulations, and interactive quizzes provides a more dynamic learning experience than conventional methods. However, this effectiveness is highly dependent on how teachers utilize the technology. Teachers who are skilled in using digital tools are able to create a conducive and engaging learning environment for students, while teachers who are less skilled may face difficulties in integrating technology effectively. **Second**, this study also identifies various challenges faced in online learning. Limited access to technology is one of the main obstacles. Not all students have access to computer devices or a stable internet connection, especially in rural or remote areas. This causes a gap in the quality of education received by students. In addition, the lack of direct interaction between teachers and students is a significant obstacle. Face-to-face interaction is essential in mathematics learning, especially to provide in-depth explanations and answer students' questions in real time. Without direct guidance, many students struggle to grasp more complex mathematical concepts. **Third**, one important finding is that parental support plays a crucial role in the success of online learning. Parents who are actively involved in assisting their children during online learning can help bridge the gap. They can help explain difficult material and ensure that their children remain focused and disciplined in learning. However, not all parents have the time or ability to be intensively involved, especially those who have to work or have limited knowledge of mathematics and technology. **Fourth**, this study emphasizes the need for more intensive training for teachers in the use of educational technology. Many teachers are still unfamiliar with the various digital tools and platforms available, so they need continuous training to improve their competence. The training should not only cover technical aspects, but also effective pedagogical strategies for teaching mathematics online.

With adequate training, teachers can design more interesting and effective learning, and be able to overcome various challenges that arise in online learning. **Fifth**, to support the effectiveness of online learning, the development of more interactive learning platforms and adequate infrastructure support are needed. Learning platforms must be designed to support various student learning styles and provide various tools that facilitate understanding of mathematical concepts. In addition, the government and related parties need to ensure that all students have access to technological devices and adequate internet connections. Investment in digital education infrastructure will greatly assist in reducing educational disparities and ensuring that all students have equal opportunities to learn effectively. In conclusion, although online learning faces various challenges, with the right support and effective strategies, online learning can be an excellent alternative in elementary school mathematics education.

Adapting the curriculum and teaching materials is a key aspect of successful online learning. Curriculums that were originally designed for face-to-face learning often need to be adapted for digital media. This involves designing learning modules that are easily accessible online, using video and animation to explain complex mathematical concepts, and providing interactive exercises that provide immediate feedback. This adaptation aims to ensure that teaching materials remain relevant and effective in the context of online learning, so that students can understand and apply mathematical concepts in a way that is appropriate to the media used.

Evaluation and assessment in the context of online learning also face unique challenges. Traditional paper-and-pencil assessments often cannot be applied directly in an online format. Therefore, alternative assessment methods such as online quizzes, project-based assignments, and competency-based assessments need to be developed to accurately assess student understanding. These assessments must be conducted in a fair and transparent manner, and provide constructive feedback so that students can improve and understand areas for improvement. The social and emotional aspects of students during online learning are important concerns. Social interactions with peers and teachers are an integral part of the learning experience that can affect student motivation and well-being. Online learning that is limited to digital interactions can reduce students' opportunities for face-to-face interactions. Therefore, it is important to create opportunities for students to collaborate in groups, participate in discussion sessions, and engage in social activities through digital platforms. Emotional support from teachers and parents is essential to help students feel connected and motivated throughout the learning process. Integrating technology with effective pedagogical approaches is key to maximizing the benefits of online learning. Technology should be used as a tool to support proven learning methods, not simply as a substitute for face-to-face learning. This includes using technology to make learning materials more engaging and interactive, as well as implementing pedagogical strategies that can adapt to different learning styles of students. With the right approach, technology can enrich the learning experience and help students understand mathematics in more innovative and efficient ways.

Support from various parties, including the government, educational institutions, and the community, is essential to ensure the success of online learning. Investment in digital education infrastructure, such as the provision of adequate technological devices and internet access, as well as training for teachers and parents, will contribute to the success of online learning. With adequate support, online learning can be an effective alternative in mathematics education at the elementary school level, providing wider opportunities for all students to learn and develop optimally.

The study also highlights the importance of pedagogical adaptations to ensure the success of online learning in mathematics. Changes in teaching methods and the design of learning experiences are needed to address the shortcomings of traditional methods. More flexible and innovative approaches to designing curricula and learning activities can help students better understand mathematics content. For example, the use of technology to provide mathematical visualizations, interactive simulations, and educational games can enhance students' understanding of complex concepts. The integration of these digital tools must be done carefully to ensure that all students benefit from these approaches, regardless of their background or ability level. Parental involvement is also an important factor in supporting online learning. Parents who are actively involved in their children's learning process can provide significant support. They can help by facilitating access to learning materials, helping with assignments, and providing additional motivation and guidance outside of school hours. Training for parents on how to support online learning is also essential, so that they can play an effective role in the digital environment. Good parental support can act as a bridge between home and school, ensuring that students remain focused and motivated during online learning.

4. Conclusion

Finally, the need for continuous evaluation of the effectiveness of online learning in the context of mathematics is inevitable. Research and feedback from various stakeholders, including students, teachers, and parents, can provide valuable insights into what is working well and what needs improvement. This evaluation should include aspects such as students' level of understanding, satisfaction with the materials and teaching methods, and challenges faced during the learning process. By conducting systematic and continuous evaluation, stakeholders can identify areas for improvement and implement necessary changes to enhance the quality and effectiveness of online learning in the future.

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