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Digital Media in Mathematics Learning

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Abstract Mathematical concepts can be easily understood for students if they are supported by using media that are in accordance with the characteristics of students, especially in the lower grades. The characteristics of low-grade students include the stage of concrete pre-operational thinking that requires media to achieve learning goals. In this digital era, the integration of technology in education is becoming increasingly important to improve the quality of learning. This study uses a literature study method by analyzing various relevant literature, including journal articles, books, and research reports, in order to identify the benefits, challenges, and implementation of digital media in the context of mathematics learning. The results of this literature study show that digital media, such as interactive learning applications, educational videos, and mathematics software, can significantly improve concept understanding, student engagement, and learning motivation. The use of digital media also allows for the delivery of more interesting and interactive material, which can help students overcome difficulties in understanding abstract concepts in mathematics. However, the study also found several challenges in the application of digital media, including infrastructure readiness, teachers' technological skills, and students' accessibility to digital devices. Therefore, to maximize the benefits of digital media in mathematics learning, continuous coaching for teachers, adequate infrastructure support, and the development of educational policies that support the integration of technology in the curriculum are needed.
Keywords: Media, Digital, Mathematics Teacher

INTRODUCTION

In the current era of globalization and digitalization, information and communication technology (ICT) has become an integral part of daily life, including in the field of education. Digital media, which includes software, apps,

interactive videos, and a variety of other technology-based learning tools, offers a wide range of potential to revolutionize teaching and learning methods, especially in complex disciplines such as mathematics.

Mathematics, as one of the fundamental subjects, is often considered difficult by many students. Difficulties in understanding abstract concepts and practical applications of mathematics can reduce students' interest and motivation in learning. Therefore, there is an urgent need to develop more effective and engaging learning strategies. One of the potential solutions is the integration of digital media in the learning process.

Learning media is a technology that is used to support the teaching and learning process. In the context of mathematics learning, learning media functions as a tool that helps students understand mathematical concepts more effectively and interactively.[1] Digital media not only provides a new way to present learning materials, but also allows for a more interactive and personalized learning experience. The use of animations, simulations, and interactive applications can help explain complex mathematical concepts in a way that is easier to understand. Additionally, digital media can provide instant feedback and opportunities for self-study, which can increase student engagement and motivation.

Although many studies have shown the benefits of digital media in education, its implementation still faces various challenges. Limited infrastructure, lack of training for teachers, and gaps in access to technology among students are some of the main obstacles that need to be addressed. As revealed by previous research by Yulia & Putra , in online learning there are obstacles including the lack of interaction between teachers and students, thus slowing down the formation of students' reasoning skills. The learning process is dominant to training rather than education with the majority of students not having the motivation to learn mathematics. Therefore, this study aims to examine the role of digital media in mathematics learning through literature studies, focusing on the benefits, challenges, and effective implementation strategies.

Through a comprehensive literature analysis, this study hopes to provide in-depth insights into how digital media can be effectively integrated in mathematics learning. In addition, this study also aims to identify key factors that can support or inhibit the use of digital media in the context of education, as well as provide recommendations to maximize the benefits of this technology in improving student learning outcomes.

METHOD

This study uses the literature review method. Literature studies are chosen because they allow researchers to systematically collect, analyze, and interpret various relevant sources of literature. This method helps identify trends, findings, and gaps in existing research on the use of digital media in mathematics learning.

RESULT

Based on the review of several articles related to the use of digital-based learning media in mathematics learning, it is presented in the following Table 1.

Table 1. Article Review of Mathematics Digital Media

Article	Data Source	Results of Article Review
Concrete versus Digital Mathematics Learning Media: Systematic Literature Review in the Era of the Industrial Revolution 4.0	Journal of Mathematics 3 (2)	Learning media has a pentin role for the field of Educators in the era of the industrial revolution 4.0, especially in the field of mathematics because Learning media is one of the educational innovations that can support the improvement of 4C skills. Learning media can be classified into concrete and digital learning media. Both digital and concrete learning media have the advantage of being able to help students to understand mathematical concepts , resulting in an increase in student learning outcomes.
The Utilization of Video	Muallimuna	Use of video for

Article	Data Source	Results of Article Review
as a Learning Media for Mathematics in SD/M	Madrasah Ibtidaiyah Journal	Mathematics learning in elementary school is divided into 4 types, namely: linear presentation videos, tutorial videos, video recordings, and songmatika video clips with lyrics. The advantages of video as a learning medium are easy to use and able to explain the content more concretely. The downside is that it is not interactive.
Digital Literacy of Students in Mathematics Learning Assisted Media Space Geometry Flipbook (Sgf)	Axiom: Journal of Mathematics Education Study Program	Digital literacy of students in mathematics learning with with the help of the SGF media is in the high category. Therefore, learning mathematics helps SGF media needs to be developed and applied so that students' digital literacy is higher.
Systematic Literature Review: The Effectiveness of the Use of Digital Evaluation Media in Mathematics Learning	Biomatics: Scientific journal of the faculty of teacher training and education	Asmany as 25 literature from various databases were then interpreted and produced reviews about the use and effectiveness for students and teachers of a digital evaluation media in web-based mathematics learning or special learning applications. Thus, the results of the study show that digital assessment media can increase students' interest and motivation to learn and in its use it is very helpful for teachers to convey learning materials interactively.

DISCUSSION

Based on previous research, it can be focused on the study of digital media for mathematics learning using smartphone and computer-assisted applications. The use of digital media such as SGV, videos, applications in mathematics

learning is able to increase students' interest and motivation to learn and in its use is very helpful for teachers to convey learning materials interactively, easy to use and able to explain the content more concretely, and help students to understand mathematical concepts, so that it results in an increase in the results of student learning.

Definition of Digital Media

Digital media is a form of electronic media that uses digital technology to create, store, manage, and distribute content. Digital media includes various formats, including text, images, audio, video, and other digital interactions that can be accessed through electronic devices such as computers, tablets, smartphones, and other devices connected to the internet.

Digital media is able to overcome the error of mathematical concepts, because it provides a lot of material and examples related to concepts conveyed in the developed media. From the aspect of maintenance of learning media, it does not require special maintenance such as concrete media, so it is used efficiently. In addition, in using digital media, teachers are required to choose digital media that suits the characteristics of their students. Elementary school children are at the level of concrete operational thinking. So that in selecting and developing media, it is necessary to review the aspects of needs, both in terms of content and the use of learning media. The mathematics learning approach can be applied to digital media such as the Realistic Mathematic Education approach which relates material to daily problems.

Digital media has become a very important tool in learning mathematics in this modern era. Here are some important aspects of using digital media in math learning:

1. Interactivity and Student Engagement

   Digital media allows for more interactive and engaging learning. Apps and software such as GeoGebra, Desmos and Khan Academy offer visual tools that help students understand complex math concepts through animations, interactive graphics and simulations.

2. Personalization of Learning

With digital media, learning can be personalized according to each student's needs. E-learning platforms can track students' progress and customize the material provided according to their level of understanding. This allows students to learn at their own pace.

3. Accessibility

   Digital media makes learning materials more accessible. Students can learn anytime and anywhere as long as they have access to digital devices and the internet. This is particularly beneficial for students who may have geographical or time constraints.

4. Collaborative Learning

   Digital platforms allow students to collaborate on math problem solving. They can work together virtually, share ideas and discuss solutions through discussion forums, video calls or other collaborative applications.

5. Use of Educational Games

   Educational games can make learning math more fun and interesting. Games like Prodigy and Math Blaster combine game elements with math concepts, so students can learn while playing.

6. Automatic Evaluation and Feedback

   Digital media can provide quick automatic evaluation and feedback. Online tests and interactive quizzes can provide immediate feedback to students, so they can immediately know their mistakes and correct them.

7. Technology Skill Development

   By using digital media, students not only learn math, but also develop technological skills that are essential in this digital age. They learn to use various software and applications that can be useful in the future.

8. Extensive Learning Resources

   The internet provides access to a variety of additional learning resources such as video tutorials, e-books, articles, and discussion forums that can enrich students' understanding of math. Sites like Coursera, Udemy and YouTube have a lot of quality educational content.

Pros and Cons of Digital Media in Math Learning

The advantages include:

1. Displaying Concrete Images: Digital media can display a concrete picture of the math material being taught, making it easier for students to understand abstract concepts more clearly and easily understood. This is very useful for low-grade students who are still in the pre-concrete operational stage of thinking.
2. Save Time: Online learning using digital media can save time, as learners can access materials online and do exercises independently. This is very useful for teachers who have a heavy workload and have limited time to teach.
3. Improving Literacy and Numeracy: The use of digital media is expected to improve learners' literacy and numeracy, especially in mathematics. This is very important in improving learners' ability to think critically and analytically.

The disadvantages include:

1. Time Spent: The time learners spend on the material can be a constraint. Learners must have enough time to understand the material provided, so that they do not take too long to open the material.
2. Technical and Nontechnical Constraints: Technical and nontechnical constraints such as internet access constraints, inadequate hardware, and teachers' ability to operate technology can be obstacles in using digital media.
3. Teacher and Learner Constraints: Another obstacle is teachers and learners who are not yet technology literate. Teachers must have good skills in operating technology, while learners must have good skills in using digital media.

Although the use of digital media has advantages, several previous studies have stated that digital media also has weaknesses. The disadvantages include technical obstacles such as internet connection problems or unstable software that can hinder the use of digital media, Not all schools have access to adequate technological devices, such as computers, tablets, or stable internet connections,

theselimitations can hinder the effective use of digital media. Non-technical obstacles such as students' difficulties in understanding the material provided through digital media can hinder the learning process, whileteachers' difficulties such as difficulties in developing digital media that suit the needs of students can hinder the use of digital media.

Examples of Digital Media:

1. Websites and Blogs: Websites that provide information in various digital formats.
2. Social Media: Platforms such as Facebook, Twitter, Instagram, and LinkedIn that allow users to share content and interact in real-time.
3. Video Streaming: Services such as YouTube, Netflix, and Hulu that provide video content online.
4. Mobile Applications: Applications that are downloaded and used on mobile devices for various purposes, such as education, entertainment, communication, and productivity.
5. E-books and E-magazines: Books and magazines in digital format that can be accessed through electronic devices.
6. Podcasts: Digital audio programs that can be downloaded or streamed.
7. Online Games: Games that are played over the internet, either individually or together.

CONCLUSION

Digital media has great potential to improve mathematics learning in a more interactive, engaging, and effective way. The use of digital media can help facilitate the learning process carried out remotely. The advantages of digital media in mathematics learning include being able to convey concrete illustrations of mathematics material, and can save time when online learning is carried out. In addition, digital media is able to train students' independent character in learning mathematics. The weakness of learning mathematics with digital media is the time used by students when opening the material given. The obstacles faced are technical and non-technical obstacles. Furthermore, the obstacles for students and

teachers who are not yet literate with technology. The use of digital media is needed to increase independence and train students' mathematical skills.

ADVICE

In the digital era, digital media is very important in math learning, offering many benefits. Optimizing the use of digital media makes learning more interactive and engaging, making it easier for students to understand complex concepts. Innovations with digital technologies, such as apps and software, help visualization and understanding of materials. This major change is driven by the role of digital media in improving learning effectiveness. Digital media also makes learning more engaging, motivates students and improves their understanding. Strategic integration of technology in mathematics learning is important to achieve optimal results, develop students' skills, and bring mathematics education to higher efficiency and effectiveness. The utilization of digital media is an important step towards better and modern education.

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