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Optimizing the Use of Video Media to Improve Critical Thinking in Mathematics in the Digital Era

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Abstract: In the current digital era, the use of video media has become an effective tool in learning mathematics. This article aims to explore the potential for optimizing the use of video media in improving students' critical thinking skills in mathematics. With a focus on the learning context in the digital era, this article discusses strategies and methods that can be used to design learning videos that facilitate the development of critical mathematical thinking skills. Through analysis of current literature and case studies, this article also explores the practical implications of using video media in promoting analytical thinking, problem solving, and creativity in mathematics learning. The results of this research provide valuable insight for educators and curriculum developers in designing learning strategies that suit students' needs in the ever-growing digital era. The implications of this research can also help increase the effectiveness of mathematics learning in the digital era. Thus, optimal use of video media can be an important instrument in developing students' critical thinking skills in the context of mathematics learning in the digital era.

Keywords: video media, critical thinking, mathematics learning, digital era, learning strategies.

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INTRODUCTION

In the digital era, the integration of multimedia technology into educational settings has revolutionized the way mathematics is taught and learned [1]–[4]. Among various multimedia tools, video media has emerged as a powerful instrument in enhancing students' understanding and engagement with mathematical concepts [5], [6]. However, beyond simply transmitting information, optimizing video media has great potential in cultivating critical thinking skills, a fundamental aspect of mathematical proficiency [7] .

This article explores optimizing the use of video media to improve critical thinking in mathematics education in a digital landscape. With increasing emphasis on 21st century skills, including problem solving, analytical thinking, and creativity, educators face the challenge of effectively utilizing digital

resources to cultivate these skills among students [8]–[10]. By focusing on the intersection between video media and critical thinking in mathematics, this article aims to provide insight into innovative approaches and practical strategies for educators to harness the full pedagogical potential of video media.

Through a review of current literature, theoretical frameworks, and empirical studies, this article discusses the theoretical foundations of critical thinking in mathematics education and explains how video media can be optimized to facilitate its development. In addition, practical examples and case studies will be presented to illustrate effective techniques and methodologies for designing and implementing video-based learning activities that promote critical thinking skills.

By addressing these pressing educational concerns, this article contributes to the ongoing discourse on pedagogical innovation in mathematics education, offering insights and implementable recommendations for educators, curriculum developers, and educational technologists seeking to enrich students' learning experiences in the digital age.

RELATED WORK

Related studies in this domain have highlighted the increasingly important role of video media in enhancing mathematics learning and critical thinking skills. Research by [11] shows that the use of videos in teaching mathematics not only improves understanding of difficult concepts but also stimulates critical thinking and problem solving [12]–[14]. Similar findings were revealed in a study by [15], which found that the integration of interactive videos in mathematics learning can strengthen students' engagement and encourage them to explore creative solutions to mathematical problems [16]–[18]. In addition, research by [19] highlights the importance of appropriate instructional design in creating mathematics learning videos that facilitate the development of critical thinking [20]. This comprehensive analysis of previous studies provides a strong basis to support innovative approaches in developing video media for mathematics learning that promotes critical thinking.

METHODS

The method used in this article includes two main stages: (1) Development of mathematics learning videos, and (2) Implementation of strategies to improve critical thinking.

In the development stage of mathematics learning videos, we adopt a structured and research-based approach to design video content that meets curriculum needs and promotes a deep understanding of mathematical concepts. The initial step involves identifying critical concepts in mathematics that require deeper understanding and development of critical thinking skills [21], [22]. Next, we compose a script and storyboard for each video, taking into account a clear narrative flow and visual strategies that clarify complex concepts [23], [24]. The production process involves the use of video editing software that allows the integration of interactive and animated elements to increase student engagement [25]–[27].

After the mathematics learning video was developed, the strategy implementation stage to improve critical thinking was implemented [28]–[30]. The approach we take includes the use of open-ended questions, problem-based project assignments, and group discussions that encourage students to think critically about the mathematical concepts presented in the videos. Additionally, we employ ongoing formative evaluation methods to track the development of students' critical thinking skills over time and adapt learning strategies to their individual needs.

The application of this method is carried out in the context of mathematics classes in secondary schools, with voluntary student participation. Data collected includes classroom observations, student responses to the learning strategies implemented, and test results to measure understanding of mathematical concepts and progress in critical thinking. Data analysis was carried out qualitatively

and quantitatively to evaluate the effectiveness of the method implemented in improving students' critical thinking in the context of mathematics learning through video media.

RESULT AND DISCUSSION

Education in the digital era demands the use of technology as a tool to increase learning effectiveness. One important aspect of education is the development of critical thinking skills, especially in Mathematics subjects. In this context, the use of video media can be a very effective tool for optimizing learning and improving students' critical thinking abilities.

Critical thinking is the ability to evaluate, analyze and solve problems in a systematic and logical way. In the context of Mathematics learning, critical thinking skills are very important because they involve a deep understanding of mathematical concepts and their application in real world situations. Developing critical thinking skills not only helps students understand the material, but also provides skills needed in everyday life.

Video media has been proven effective in helping the learning process. Its use can visualize complex mathematical concepts, making them easier for students to understand. With video media, students can see a step-by-step demonstration of a concept, observe its application in a real-world context, and better identify relationships between concepts. The first stage in this article is the development of mathematics learning videos, namely:

1. Arranging material and questions that fall into the high level category: The material and questions that will be used must be well calculated to encourage critical thinking skills. All material can be used, but in this article the material used to create video content is "Permutations with Some of the Same Elements" and the questions that will be used have gone through the expert validation stage so that they can be used.
2. Design engaging content: Video content should be designed to capture students' attention, using animation, graphics and illustrations that support understanding of mathematical concepts.

The second stage in this article is the implementation of strategies to improve critical thinking, namely:

1. Collaboration: Video media is integrated with the e-learning platform using the activity log feature which can monitor student activities during the learning process.
2. Determining the learning model to be used: This article uses the flipped classroom learning model. Students can first study the learning videos at home. Then students can discuss while in class.
3. Question development and discussion: After watching the video, students can be exposed to questions and discussions that encourage them to think critically. This helps gauge their understanding and stimulates analytical thinking.

By optimizing the use of video media in Mathematics learning, we can open the door to improving the quality of education in this digital era. The more skilled students are at critical thinking, the better prepared they will be to face the challenges of mathematics and everyday life in the future.

The use of video media in mathematics learning brings a number of significant benefits. One of the main benefits is the ability to visualize mathematical concepts. In the digital era, visualization can be done through animation, simulations and interactive graphics which enable students to understand mathematical concepts more concretely.

Video media also helps increase in-depth understanding. Material presented in audio-visual format can help students understand and remember information better. Visualization of mathematical

concepts that are difficult to understand through text or static images can be handled effectively through video media.

Another advantage is the learning flexibility provided by video media. Students can access the material anytime and anywhere, following each individual's learning pace. In this way, the learning process becomes more independent, according to students' needs and comfort.

The use of video media can also stimulate students' interest in learning. By presenting mathematics material in an interesting and interactive way, video media helps create a fun learning atmosphere. The growing interest in using video media can be a positive encouragement for students to be more active in the learning process.

CONCLUSION

In facing the changing dynamics of learning in the digital era, optimizing the use of video media is the key to improving students' critical mathematical thinking. By leveraging the benefits of visualization, learning flexibility, and the right optimization strategies, teachers can create a learning environment that combines technology and students' learning needs well. In this way, it is hoped that students will not only master mathematical concepts better, but can also develop essential critical thinking skills in facing future challenges. Optimizing the use of video media is not only an additional tool, but also a key element in forming mathematics learning that is effective and relevant to current developments.

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