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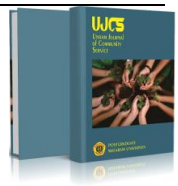

Introduction to Interactive Video-Based E-Learning to Improve Critical Thinking Skills in Vocational High School Students

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Abstract: This Community Service (PKM) activity aims to introduce interactive video-based e-learning to improve critical thinking skills in Vocational High School (SMK) students. Critical thinking skills are essential in facing the challenges of the world of work, especially for vocational school graduates. This activity was conducted online through the Zoom application, involving vocational school teachers as the main participants. The training focuses on using interactive videos as a learning medium that integrates interactive elements such as reflective questions, simulations, and problem-solving tasks to stimulate active student engagement. The evaluation was carried out through pre-test and post-test tests that showed a significant improvement in students' critical thinking skills, with an average post-test score of 80, an increase from 65 in the pre-test. In addition, a survey of teachers showed that 85% of participants benefited from using interactive videos to make learning more engaging and effective. However, some challenges related to internet infrastructure and students' technical ability to access video were identified. As a solution, materials are also provided offline. The results of this activity show that interactive video-based e-learning effectively improves the critical thinking skills of vocational school students. Hopefully, this method can be adapted more widely in the context of vocational education and contribute to developing the quality of education in Indonesia.

Keywords: E-learning; Interactive videos; Critical thinking; Vocational High School; Skill development

Introduction

Advances in information and communication technology have significantly impacted the world of education in terms of involvement, accessibility, and teaching methods (Baikuna et al., 2023; Dewi et al., 2023; Junaedy et al., 2021). This technology allows for a more personalized learning experience and facilitates closer collaboration between students and educators (Setiyati et al., 2024; Sundari, 2024). For example, using ICT tools such as blogs and social networks has increased student motivation and interaction, thus making learning more exciting and interactive (Tavares et al., 2024).

Additionally, integrating multimedia and intelligent boards in classrooms has modernized traditional teaching methods, encouraging active participation from students (Koshti et al., 2023). This technology also expands access to education, allowing a wide range of students to enjoy a more inclusive learning experience tailored to their needs (Tavares et al., 2024). However, significant challenges such as infrastructure gaps and unequal access to technology still demand more inclusive and equitable education policies (Koshti et al., 2023).

The shift towards distance learning and the use of electronic resources also encourages the need for a re-evaluation of the traditional education system (Alfiyanto & Hidayati, 2022; Amelia, 2023; Judijanto & Yulianti, 2024; Susanti et al., 2022). This involves the importance of continuous teacher training and adaptation to new technologies to optimize the use of ICT in education (Adzhemov & Denisova, 2024).

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Although the integration of ICT in education brings many benefits, there are concerns regarding equal access and the potential disruptions it causes, so a balanced and targeted implementation strategy is needed (Koshti et al., 2023).

One of the innovations proliferating is using e-learning as a means of learning (Alfiyanto et al., 2023; Mulyadi et al., 2023). E-learning allows the teaching and learning process to occur flexibly and interactively and is not limited by space and time (Anggraini, 2018; Sidhiq et al., 2022). However, as its use becomes more widespread, various challenges arise, including how e-learning can effectively develop students' critical thinking skills (Daulay, 2021), especially at the Vocational High School (SMK) level. Critical thinking skills are essential in the dynamic world of work, where vocational school graduates are expected to be able to face various problems and make the right decisions in the industrial environment (Rahmadani et al., 2023; Riza & Yoto, 2023; Wijaya et al., 2016).

Several previous studies have shown the potential of e-learning in improving critical thinking skills. For example, research by Hendi et al. (2020) and Wulandari et al. (2023) shows that using technology-based learning media can improve students' critical thinking skills. In addition, several previous studies have revealed that interactive e-learning platforms can facilitate students to be more active in the learning process, thereby improving their analytical skills (Dany et al., 2024; Putra et al., 2024; Said, 2023). However, most of this research still focuses on conventional e-learning platforms. At the same time, the potential of interactive video media as a more in-depth and effective teaching tool for stimulating critical thinking skills has not been widely explored, especially in vocational schools.

The innovation presented in this PKM activity is interactive video-based e-learning. Interactive videos present information visually and encourage students to interact directly with the learning material, such as through reflective questions, simulations, or problem-solving tasks in the video. Research conducted by several previous studies shows that using interactive videos in learning can increase student engagement and critical thinking skills (Hikmah & Radiansyah, 2023; Nurhayati et al., 2017). However, its implementation in vocational schools is still limited, so there is a gap in the literature related to how this media can be optimized in the vocational education environment.

The novelty of this PKM article lies in its specific focus, namely the application of interactive videos in e-learning to improve critical thinking skills in vocational school students. In contrast to previous studies exploring e-learning in general education, this article examines how this medium can be adapted to meet the specific needs of vocational school students with higher demands on practical and analytical skills. This is important because vocational school graduates must be ready to face challenges in an increasingly complex world of work, and critical thinking skills are one of the keys to their success.

This PKM article aims to introduce interactive video-based learning media to vocational school students in the context of e-learning and measure its impact on improving their critical thinking skills. It is hoped that through this approach, vocational school students can be better prepared to face challenges in the world of work, especially in terms of analytical and problem-solving skills.

Method

This Community Service (PKM) activity was carried out online through the Zoom application, focusing on introducing interactive video-based e-learning to improve the critical thinking skills of Vocational High School (SMK) students. The method used in this activity involves several systematic stages, ranging from the preparation to the preparation of PKM articles, which are explained as follows:

1. *Preparation Stage*

This stage includes identifying the needs of vocational school students related to improving critical thinking skills. We conducted an initial survey of vocational school teachers in several schools to discover the obstacles faced in online learning, especially in developing critical thinking skills. After that, the PKM team prepared interactive video-based learning materials, adapted them to the vocational school curriculum, and focused on developing critical thinking skills.

2. *Preparation of Interactive Video-Based Learning Modules*

At this stage, we design interactive videos that contain learning content with a problem-solving approach and case studies. Each video has interactive elements, such as reflective questions, problem-solving tasks, and simple simulations that invite students to think critically. The development of interactive videos is carried out in collaboration between the teaching team, educational technology experts, and multimedia designers so that the material presented is attractive and easy for students to understand.

3. *Implementation of Online Training*

The training activities were carried out online through the Zoom application. The training session involved vocational school teachers as the prominent participants in providing an understanding of how to use interactive videos in online learning. This training was carried out in several sessions, namely 1) The first

session, which is an introduction to the concept of interactive video-based e-learning and the importance of critical thinking skills; 2) The second session, namely a demonstration of the use of interactive videos in online learning; and 3) The third session, which is a practical exercise for teachers to design and use interactive videos in their classrooms. During the training, participants were also allowed to discuss and ask questions about the technical implementation of interactive video-based e-learning and how to integrate it into their learning plans.

4. *Evaluation and Assistance*

After the training, an evaluation was conducted on the teacher's understanding and skills in using interactive videos. The review was conducted by providing a final test and observing the use of learning media in online classes managed by the trainee teachers. In addition, the PKM team also provides regular assistance to teachers in implementing interactive video-based e-learning.

5. *Data Collection and Analysis*

Data collection was carried out to measure interactive videos' effectiveness in improving vocational school students' critical thinking skills. Data were taken from test results before and after media use and through interviews with teachers and students. Data analysis used quantitative and qualitative methods to see changes in students' critical thinking skills.

6. *Preparation of PKM Articles*

After completing the activity, the PKM team compiled a scientific article containing the results of implementing this interactive video-based e-learning. Articles are structured in a format that includes an introduction, a literature review, methods, results and discussion, and a conclusion. The data from the evaluation of the activities were analyzed to provide the findings about the effectiveness of the methods applied. This article is then prepared to be submitted to the Sinta 4 PKM journal.

Through this systematic stage, it is hoped that PKM activities can have a tangible impact on improving the critical thinking skills of vocational school students, as well as enriching literature on the use of interactive video-based e-learning in the realm of vocational education.

Result and Discussion

Several significant findings were obtained through quantitative and qualitative evaluations after a series of PKM activities involving the introduction of interactive video-based e-learning to improve critical thinking skills in vocational school students. The results include improving students' critical thinking skills, teachers' acceptance of interactive video media, and the challenges faced in implementing this method.

Improving Students' Critical Thinking Skills

One of the indicators of the success of this activity is the improvement of critical thinking skills of vocational school students after using interactive video-based learning media. From the results of the pre-test and post-test of the implementation of interactive videos, there was a significant improvement in students' critical thinking skills.

Students who previously tended to be passive in online learning began to show analytical thinking skills, such as identifying problems, evaluating solutions, and putting forward logical arguments. This is consistent with research conducted by Prasetyo (2021), where interactive video media has proven effective in encouraging student engagement and improving their critical thinking skills. From the data collected, the average pre-test score of students was 65, while after the implementation of the interactive video, the post-test score of students increased to 80.

Table 1. Comparison of Pre-test and Post-test Results of Students

Category	Pre-test	Post-test
Grade point average	65	80

These results show that interactive video-based e-learning can facilitate the improvement of vocational school students' critical thinking skills, which aligns with the goals of this PKM activity.

Teachers' Acceptance of Interactive Video Learning Media

The results of the evaluation of the trainee teachers showed that most teachers welcomed the use of interactive videos in online learning. Based on the results of interviews and questionnaires, as many as 85% of teachers feel that this media can make learning more exciting and interactive and help students focus more on understanding the material.

The teachers also assessed that interactive elements, such as reflective questions and simulations in the video, can encourage students to think critically and not just passively receive information. This is in line with the research of several previous studies, which show that interactive learning platforms can increase student engagement and help them develop critical thinking skills (Ediana et al., 2023; Said, 2023; Srimuliyani, 2023).

However, some teachers also expressed challenges in implementing this method, especially regarding the availability of infrastructure and students' technical ability to access and use video-based learning media. Several students in rural areas experience unstable

internet network constraints, so it is sometimes challenging to follow learning optimally.

Challenges and Solutions in Implementation

Although the results show a positive impact on students' critical thinking skills, several challenges are faced in implementing this interactive video-based e-learning. The main challenge is the limited internet access in some areas where vocational school students are. This causes some students to have difficulty accessing interactive video-based learning materials.

As a solution, we recommend that teachers provide versions of the learning materials in other formats, such as PDFs, to complement interactive videos for students facing technical difficulties. In addition, interactive videos are also provided offline to minimize dependence on a stable internet so that students can download and access materials at any time without needing a constant internet connection.

Novelty and Contribution to Previous Research

This activity provides novelty in the interactive video-based e-learning learning approach, especially in the context of vocational education at vocational schools. Previous studies, as conducted by several earlier studies, focused more on the use of e-learning in general without emphasizing the aspect of video interactivity (Elyas, 2018; H. Wulandari, 2017). In this PKM, interactive elements have been proven to be more effective in improving critical thinking skills compared to conventional e-learning learning media.

This reinforces the argument that interactive videos are a visual aid and a medium that encourages active student involvement in the learning process. The success of this method opens up opportunities for further development in various other educational contexts, especially in the field of vocational education, which demands practical and analytical skills from students.

Activity Objectives Achieved

With the increase in students' critical thinking skills and the high acceptance of teachers for the use of interactive videos, it can be concluded that the purpose of this PKM activity has been achieved. Interactive video-based e-learning can be an effective solution in improving online learning quality, especially in developing the critical thinking skills of vocational school students.

The results of this activity show that the application of interactive video-based e-learning effectively improves the critical thinking skills of vocational school students. Teachers and students benefit from this approach, although challenges such as limited internet infrastructure still need to be addressed. Thus, interactive videos can be further developed as an innovative learning medium in the vocational education environment, positively contributing to improving the quality of education in Indonesia.

Conclusion

Based on the PKM activities carried out, it can be concluded that the application of interactive video-based e-learning effectively improves the critical thinking skills of vocational school students. Interactive videos equipped with interactive elements, such as reflective questions and problem-solving tasks, have been proven to encourage students to be more actively involved in the learning process and improve their critical thinking skills. This is evidenced by a significant increase in student post-test results after using interactive videos compared to pre-test results.

In addition, vocational school teachers who participated in the training also welcomed this media because it makes learning more exciting and helps students focus more on understanding the material. However, challenges in terms of infrastructure and limited internet access are still obstacles that must be overcome, especially in rural areas.

Thus, interactive video-based e-learning has excellent potential to be implemented more widely in the context of vocational education, especially in developing students' critical thinking skills. Further development of this learning media, including the provision of materials in offline form, can be a solution to overcome infrastructure limitations. This PKM makes a positive contribution to efforts to improve the quality of online education in Indonesia and is expected to inspire similar activities in the future.

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