Development of Video-Based Learning Media on SLETV Material to Improve Mathematics Learning Outcomes

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ABSTRACT

This study aims to determine the impact of using video learning media on improving the learning outcomes of eighth-grade students. Employing a Research and Development (R&D) approach, the study utilizes the ARCS research model, which encompasses student attention to the product (attention), assessment of product relevance (relevance), student confidence in using the product (confidence), and student satisfaction with the product (satisfaction). Data collection techniques include observations and structured questionnaires. The sample consists of eighth-grade students selected through purposive sampling. The research procedure involves needs analysis, design, and development of the video learning media using the Renderforest application, implementation in classroom settings, and evaluation through collected data. Descriptive statistics summarize students' responses, while paired sample t-tests compare pretest and posttest scores to assess learning improvements. The study reveals that video learning media significantly enhances student engagement, comprehension of SLETV material, and overall satisfaction with learning. The findings underscore the importance of integrating motivational elements into educational media to foster better academic outcomes. This research contributes to understanding digital learning tools in education, offering practical insights for educators to enhance student learning experiences through innovative media.

Keywords: learning video, mathematics, motivational elements, problem-solving ability, SLETV

INTRODUCTION

A developed nation has high-quality human resources with critical, systematic, logical, creative, reasoning, and effective collaboration skills [1]. One way to achieve this goal is through educational reform, particularly in mathematics [2]. The Ministry of Education and Culture (MoEC) of Indonesia released the results of the 2018 Program for International Student Assessment (PISA) study, showing that Indonesian students' math and science scores are below average [3]. Indonesia scored 379 in math, while the average score of other countries was 487.

According to educational observers and other research findings, the low math skills of students are due to the abilities of teachers [4], curriculum systems [5], and support from the surrounding environment [6]. Various efforts have been made by teachers to address the low math scores of students. However, students always consider math difficult to understand. In essence, education is an effort to develop students' potential through a complex process that changes with technological and informational advances.

The learning process will continue, now transferred through the "Learning From Home" program in the form of distance learning or online learning. During this process, parents now play a primary role in ensuring the continuity of their children's learning by directly monitoring their development [7]. Currently, rapid technological and informational advancements have been well utilized in education by several schools [8], especially during the COVID-19 pandemic, where learning was conducted online from home. Therefore, the author took the initiative to contribute new ideas to make math lessons more interesting and aligned with the times. Teachers also play an important role in achieving learning objectives [9]. In addition to being more creative, teachers are also required to be more innovative in creating various things that support the learning process [19]. One way to achieve this is by developing learning media to make the material taught by teachers more engaging and easier to understand for students. Additionally, teachers must ensure that the learning competencies they aim to achieve are met without forcing curriculum completion. These competencies can be achieved through good interaction and communication between teachers and students in learning media.

Given the problems mentioned above, learning media is a supporting element for the success of the learning process. In the learning process, media can enhance specific lessons, such as information and communication technology [11]. One of the efforts is developing digital learning media. The current use of technology in learning includes learning trajectory, video animation, and more [12]. The chosen and considered effective learning media to improve students' math learning outcomes is video animation. Animated videos, integrating video, audio, text, and animation, offer substantial advantages for both teachers and students [13]. These include facilitating effective learning, particularly in subjects emphasizing practical skills, maximizing the achievement of learning objectives efficiently, stimulating students' interest in self-directed learning [14], enhancing concentration and focus [15], improving students' reasoning abilities [16], and motivating active student engagement [17]. Consequently, animated videos are instrumental in achieving the educational goal of enhancing students' learning outcomes.

Based on the above explanation, this research aims to develop video-based learning media on the System of Linear Equations with Two Variables (SLETV) material to improve mathematics learning outcomes.

METHODS

This research used research and development (R&D) as a methodical process used to validate and enhance products, encompassing both tangible items and educational methodologies. This study utilizes the ADDIE development model consisting of five sequential stages: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model is designed to systematically tackle educational challenges by aligning instructional media with the specific needs and characteristics of students.

The type of research utilized is R&D, focusing on the development of video-based learning media. The subject matter covered is SLETV, and the study participants are eighth-grade students. The learning objectives are for students to understand the concept of solving SLETV problems, actively participate in learning activities, and improve their learning outcomes. The instruction is delivered in a concise and clear video format.

Fig. 1 shows the research process. It involves several stages:

1. Competency and Objective Determination: Identify the competencies or objectives to be achieved and understand the students' characteristics.

2. Media Selection: Choose the appropriate media, in this case, animated video learning using the Renderforest application.

3. Distribution: Distribute the learning materials through platforms such as WhatsApp and YouTube.

4. Analysis and Description: Analyze and describe the outcomes of these stages.
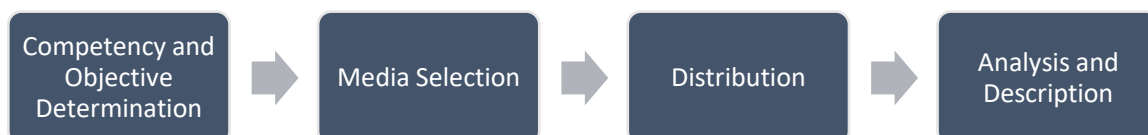

Fig. 1. The research process stages

The instruments used include learning videos created with the Renderforest application, evaluated on a scale from 1 to 4 (1 being Strongly Disagree and 4 being Strongly Agree). The aspects measured using the ARCS (Attention, Relevance, Confidence, Satisfaction) model

include student attention to the product, product relevance, student confidence in using the product, and student satisfaction with the product.

The data collection instruments used in this study consist of:

1. Interviews: Conduct interviews with a mathematics teacher in Yogyakarta to gather information about the learning process, strategies, and media.

2. Questionnaires: Utilize validation sheets for material and media expert validation, product attractiveness and effectiveness questionnaires, and learning outcome tests to measure student learning outcomes before and after using the learning media through pretests and posttests.

The data analysis technique employed is descriptive quantitative analysis. This involves quantifying questionnaire responses to obtain numerical results. The effectiveness analysis of the product includes two indicators: student learning outcome tests and student responses to the learning video. To assess product effectiveness, pretest, and post-test scores are compared, and the N-gain is calculated to provide an overview of the improvement in learning scores before and after using the media.

RESULTS AND DISCUSSION

The development of video-based learning media on SLETV material using the Renderforest application has resulted in highly effective learning videos aimed at improving students' learning outcomes. The video content is well-structured, including a cover, learning objectives, a general form of SLETV, and real-life examples, which collectively contribute to a comprehensive and engaging learning experience. See Fig. 2a to 2d.
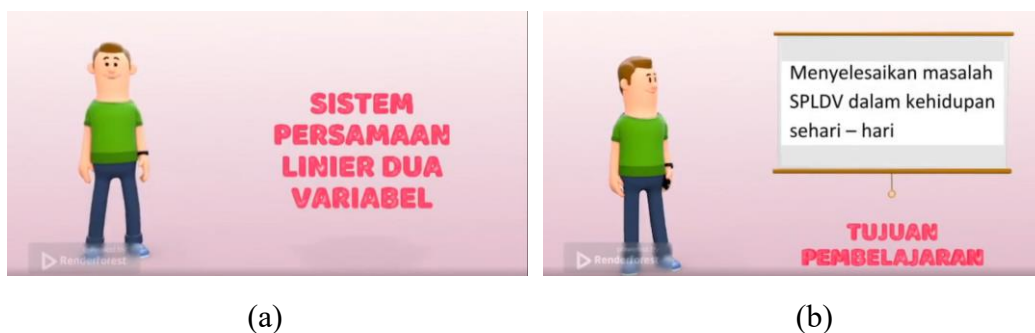

(a)   (b)

(c)   (d)

Fig. 2. The learning video using Renderforest. (a) the media cover, (b) the learning objectives, (c) a description of the SLETV, and (d) the daily life problems in the market.
Source: https://youtu.be/JnkyWq-c-3Y

Data obtained from product testing by material and media experts indicate that the learning videos are both valid and highly feasible for use in mathematics education. Material expert validation yielded a percentage of 90.67% from material expert I and 85.33% from material expert II, averaging 88% and categorizing the product as highly feasible. Similarly, testing by media experts showed a validation percentage of 92.73% from media expert I and 87.27% from media expert II, averaging 90%, further reinforcing the high feasibility of the product. Based on product attractiveness testing, the learning videos were found to be suitable and attractive (See Fig. 3), with average percentages of 85.5% for material, 80.6% for language, 86% for presentation, and 82.9% for appearance, resulting in an overall average of 83.75%. These results demonstrate that the video-based learning media is not only effective but also appealing, making it an excellent tool for enhancing mathematics learning outcomes.
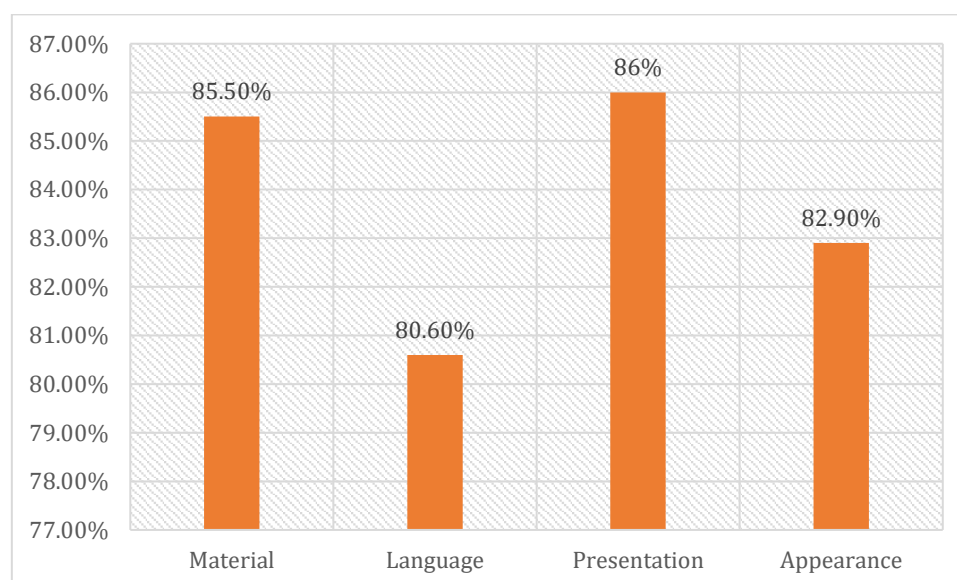

Fig. 3. The response result of the media

The learning videos have several notable advantages, such as attracting students' interest through their visual and interactive nature [18], aiding in the ease of understanding complex concepts through clear and concise presentation [19], preventing monotony with dynamic content [20], and enhancing student participation by encouraging active engagement [21].

The effectiveness of these learning videos can be understood through several learning theories. According to the Cognitive Theory of Multimedia Learning, students learn more deeply from words and pictures combined than from words alone [22]. The video format leverages this theory by integrating visual and auditory information, facilitating better comprehension and retention of SLETV concepts. Additionally, Vygotsky's Social Constructivist Theory emphasizes the importance of social interaction and collaboration in learning. By using videos, students can engage in discussions and collaborative activities, reinforcing their understanding through peer interaction [23].

CONCLUSION

The evaluations by material experts and media experts consistently rated the video as highly feasible for further development and educational use. These assessments underscore the video's potential effectiveness and suitability in enhancing mathematics learning outcomes. The student response questionnaire indicated that the video was well-received and perceived as engaging and user-friendly. It successfully captured student interest, making learning more accessible and enjoyable. Overall, the effectiveness analysis showed notable improvements in student performance after using the video-based learning media. This suggests that the developed video can significantly enhance students' understanding and application of mathematics concepts, highlighting its value as an effective educational resource.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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