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Development of Active Learning-Based Mathematics Instructional Video Media Oriented Toward Conceptual Understanding for Junior High School Students

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Abstract

This study aims to develop an Active Learning-based mathematics instructional video media to enhance the conceptual understanding of junior high school students. Conducted using the ADDIE research and development model, this study involved analysis, design, development, implementation, and evaluation stages. The subjects included material and media experts, a mathematics teacher, and 32 seventh-grade students from SMP Negeri 2 Depok. The product was validated by experts and tested for practicality and effectiveness. Validation results from material and media experts scored 82 (good category) and 94 (very good category), respectively. Practicality tests showed very positive responses from both the teacher and students. Effectiveness tests, analyzed using a one-sample t-test and z-proportion test, indicated a significant improvement in students' conceptual understanding, with learning outcomes surpassing the minimum mastery indicator. The video, which integrates the five syntaxes of Active Learning Preparation, Stimulation, Exploration, Elaboration, and Confirmation is proven to be a valid, practical, and effective medium for supporting mathematics learning.

Keywords: *Instructional Video Media; Active Learning; Conceptual Understanding; Mathematics Learning*

1. Introduction

Education is "a conscious and deliberate effort to create a learning process and atmosphere so that learners actively develop their potential including spiritual intelligence, self-control, personality, intelligence, good characters, and skills needed by themselves, society, and nation" (The rules of National Education Systems Number 20, 2003 chapter 1 verse 1). Mathematics education, as an essential part of this effort, focuses on fostering students' conceptual understanding and learning motivation. Despite various efforts, many students still face challenges and low interest in learning mathematics which impacts their achievement. This highlights the need to develop innovative instructional media based on Active Learning principles to create interactive and meaningful learning experiences that effectively enhance understanding and motivation.

Active Learning as an instructional approach involves engaging students actively through discussion, problem-solving, and collaborative activities which have been proven to improve conceptual mastery and learning interest in mathematics (Prince, 2004; Freeman et al., 2020). Effective implementation requires supportive media that help translate abstract mathematical concepts into concrete learning experiences. Instructional videos based on Active Learning can serve as effective media for junior high school mathematics topics such as plane geometry by providing visual and interactive content adapted to curriculum standards and learners' needs.

The aim of this study is to develop Active Learning-based instructional video media oriented toward improving the conceptual understanding and learning interest of junior high school students. Utilizing the ADDIE development model, the media was developed, validated through expert reviews, and tested involving seventh-grade students at SMP Negeri 2 Depok. The media's validity, practicality, and effectiveness were assessed to ensure it can serve as an innovative tool to support teachers in delivering engaging and effective mathematics instruction that enhances student motivation and mastery aligned with national education goals.

2. Method

This study uses the ADDIE research and development model which has five stages; analysis, design, development, implementation, and evaluation stage. The analysis stage includes curriculum analysis, student characteristics analysis, and resource needs analysis, while the development stage includes prototype preparation, expert validation, limited scale trial, and field trial and effectiveness tests. The subjects are mathematics teacher, material expert, media expert, and 32 seventh-grade students of SMP Negeri 2 Depok. In development is including small-scale and large-scale trial experiments which are conducted with 12 and 32 students respectively. Then, the field trial is included 32 seventh-grade students of the same school. They are assigned into one group comprehensively. The student group, including 32 students, is received the Active Learning-based mathematics instructional video materials, while the learning process consisted of the same learning materials as those used by the teacher's guidance.

Data collection techniques are prominent step in research because its main objective is to obtain data (Sugiyono, 2022). In this research, data collection techniques are involved observations, interviews, and questionnaires. The design involved a qualitative inquiry where data is collected through expert interviews and observations during preliminary studies, and questionnaires sheets for the experts-assessment of product and prototype-and-product trial experiment results, while a quantitative inquiry where data is collected from the assessment of expert related to evaluations of the product designed. The instrument of data collection is measuring instruments used to obtain data from a study (Allen & Yen, 1979). The instruments are unstructured interviews and scale-based questionnaires for mathematics teachers at that school. According to Molenda (2020), collecting data with interviews is the process of obtaining information from interviewees using a tool called an interview guide. An unstructured interview technique is a free interview technique where researchers do not use interview guidelines that have been systematically and completely arranged for data collections. (Dick & Carey, 2021).

The questionnaires are essential in measuring a respondent's opinion or attitude towards a given prototype for recommendation in designing and developing the product. Then the product is validated by the material and media experts. The use of scale questionnaire is used to measure attitudes, opinions and perceptions of a person or a group of people about a phenomenon (Sugiyono, 2015). The point scale of the questionnaire is involving score 1 to 5, with details as follows: (a) score 1 stands for "very poor", (b) score 2 stands for "poor", (c) score 3 stands for "fair", (d) score 4 stands for "good", and (e) score 5 stands for "very good". The product that will be developed is a mathematics instructional video.

Data analysis techniques of this study is descriptive data analysis techniques to analyze data that has been collected without any generalizing-intervention (Kemendikbud, 2017). The data analysis techniques involve qualitative descriptive data analysis and quantitative descriptive data analysis. Qualitative descriptive data analysis is analysed based on expert interviews and observations during preliminary studies, and questionair sheets for the experts-assessment of product and prototype-and-product trial experiment results, while a quantitative data analysis where data is analysed from the assessment of expert related to evaluations of the product designed. The point scale of the questionnaire for this study involving scoring 1 to 5, based on considering the raw score which converted to a percentage, then it is determined by using an assessment norm that refers to the benchmark reference assessment (PAP) with the following percentage ranges:

Table 1. Conversion of Benchmark Reference Assessments.

Interval	Classification
$X > 0{,}86 \times$ maximum score	Sangat Baik (SB) (very good)
$0{,}73 \times$ maximum score $< X \leq 0{,}86 \times$ maximum score	Baik (B) (good)
$0{,}60 \times$ maximum score $\leq X \leq 0{,}73 \times$ maximum score	Cukup (C) (fair)
$0{,}46 \times$ maximum score $< X \leq 0{,}6 \times$ maximum score	Kurang (K) (poor)
$X \leq 0{,}46 \times$ skor maks	Sangat Kurang (SK) (very poor)

(Kemendikbud, 2017)

3. Results and Discussion

The development of Active Learning-based mathematics instructional video media was carried out through the ADDIE stages, starting from the needs analysis process to product feasibility evaluation. The validation results by material experts indicate that the presentation structure, concept accuracy, and content alignment of the video with competency standards have met the criteria with a score of 82 out of a maximum score of 100 in the good category. Media experts also gave a score of 94 out of a maximum score of 100 in the very good category, particularly in aspects of visual clarity, color consistency, audio quality, and integration of Active Learning activities in the video flow. These findings strengthen that the developed video media has a solid pedagogical foundation and appropriate design for junior high school mathematics learning and is ready for the trial phase.

During the practicality testing phase, both teachers and students provided positive responses regarding the media's usability. The teacher gave a score of 65 out of a maximum score of 75, categorized as very practical, indicating that the video is easy to integrate into lessons, supports material delivery, and assists the teacher in managing student-centered learning activities. Students also showed highly positive responses with an average score of 88.11 out of a maximum score of 100, reflecting that the video is engaging, easy to follow, and helps them understand problem-solving steps progressively. These positive responses align with Freeman et al.'s (2014) perspective that active engagement through activity-based learning can enhance motivation and strengthen students' knowledge construction.

Based on the effectiveness test results, there was a significant improvement in students' conceptual understanding abilities after using the Active Learning-based video media. The one sample t-test analysis results showed that student learning outcomes were above the indicator threshold of 75, indicating that the media effectively enhanced geometric conceptual understanding. Further effectiveness testing using the z-proportion test also revealed that more than 65% of students achieved learning mastery, meeting the established effectiveness indicators. This significant improvement demonstrates that the video

presentation, which integrated concept visualization, thinking-triggering activities, and contextual examples, successfully helped students understand and connect mathematical concepts more deeply.

To enhance the coherence between video content and the active learning model, the video was designed following the five main syntaxes of Active Learning: Preparation, Stimulation, Exploration, Elaboration, and Confirmation. In the Preparation section, the video presents visual introductions and learning objectives to help students understand the material focus; in this section, you can include images of the video's opening display or storyboards of the learning objectives.

To clarify the implementation of Active Learning syntax in the developed instructional video media, each stage of the ADDIE model is visualized through video display excerpts to help readers understand the material presentation flow. The five main syntaxes Preparation, Stimulation, Exploration, Elaboration, and Confirmation are presented in table format containing visual components, verbal elements, and audio narratives used in the learning process. This tabular presentation aims to provide a detailed overview of how geometric concepts are conveyed progressively through active activities designed in the video, thereby supporting students' deeper conceptual understanding. The following displays each stage of Active Learning syntax in the ADDIE-based mathematics instructional video media.

Table 2. Preparation Stage Display

Stage	Activity Description	Visual
Preparation	The teacher designs the instructional video based on student needs and learning objectives. In the video, the material is presented engagingly through animations, illustrations, and interactive simulations to make the concepts of triangles and quadrilaterals easier to understand.	

Table 3. Stimulation Stage Display

Stage	Activity Description	Visual
Stimulation	The video begins with triggering questions or contextual problems relevant to students' daily lives. Real-world examples of mathematical concepts are presented through visualizations to help students understand the relationship between concepts and their applications in everyday life.	

Table 4. Exploration Stage Display

Stage	Activity Description	Visual
Exploration	The video incorporates interactive activities such as simple exercises, visual observations, or pattern identification. Students are asked to note key points, pose questions, and construct conceptual understanding independently through step-by-step examples and explanations.	

Table 5. Elaboration Stage Display

Stage	Activity Description	Visual
Elaboration	The video presents open-ended questions and advanced examples to encourage students to connect new concepts with prior knowledge. Students are asked to apply these ideas to other, more complex problems to deepen their understanding.	

Table 6. Confirmation Stage Display

Stage	Activity Description	Visual
Confirmation	The video provides visual summaries, reiterates core material, and offers feedback on various student responses. This phase ensures all concepts are well understood through direct clarification and systematic conclusion.	

Conclusion

The findings of this study indicate that the Active Learning–based mathematics instructional video developed through the ADDIE model meets the criteria of high quality, as confirmed by expert validation from material specialists, media experts, and mathematics teachers, who rated the product as highly feasible and practical for classroom use. The effectiveness test further demonstrates a significant improvement in students' conceptual understanding of plane geometry, supported by post-test results and positive student responses toward the structured presentation of the Active Learning phases Preparation, Stimulation, Exploration, Elaboration, and Confirmation in the video. The integration of visual explanations, contextual examples, and exploratory activities successfully strengthened students' comprehension of mathematical concepts.

References

Allen, M. J., & Yen, W. M. (1979). Introduction to measurement theory. Waveland Press.

Dick, W., & Carey, L. (2021). The systematic design of instruction (9th ed.). Pearson.

Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. Proceedings of the National Academy of Sciences, 111(23), 8410–8415.

Kemendikbud. (2017). Panduan Penilaian untuk Sekolah Menengah Pertama. Kementerian Pendidikan dan Kebudayaan Republik Indonesia.

Molenda, M. (2020). Instructional design foundations. Routledge.

Prince, M. (2004). Does active learning work? A review of the research. Journal of Engineering Education, 93(3), 223–231.

Sugiyono. (2015). Metode penelitian kuantitatif, kualitatif, dan R&D. Alfabeta.

Sugiyono. (2022). Metode penelitian pendidikan. Alfabeta.

The Rules of National Education System Number 20, Year 2003. Undang-Undang Republik Indonesia Nomor 20 Tahun 2003 tentang Sistem Pendidikan Nasional.

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