

# Development of Video Tutorial–Based Learning Media for Data Analysis Instruction in Senior High School

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## Abstract

The integration of digital technology in education has significantly transformed learning environments and instructional practices. One emerging approach is the use of video-based learning media that combines visual and auditory elements to improve students' understanding and engagement. This study aims to develop and evaluate the feasibility of video tutorial–based learning media for teaching data analysis to Grade X students at SMA Negeri 01 Mempawah Hilir, Indonesia. The research employed a Research and Development (R&D) approach using the ADDIE model, consisting of Analysis, Design, Development, Implementation, and Evaluation stages. Data were collected through interviews, questionnaires, and documentation. Validation involved two media experts and two subject matter experts, while student responses were obtained through field testing involving 70 students. The results indicate that the developed media is highly feasible, with media expert validation reaching 96.74% and material expert validation reaching 92.5%. Implementation results show positive student responses with an average score of 77.35%. These findings suggest that video tutorial–based learning media developed using Canva effectively supports the teaching of data analysis concepts and practical programming skills.

**Keywords:** learning media, video tutorial, digital learning, data analysis, ADDIE model

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## 1. Introduction

The rapid development of digital technology has significantly influenced educational practices and learning environments. Educational institutions are increasingly required to integrate technology into instructional processes to improve learning effectiveness and student engagement. The integration of digital learning resources allows teachers to present learning materials in more interactive and meaningful ways, enabling students to access knowledge beyond traditional classroom settings. Previous studies have demonstrated that technology-enhanced learning environments can improve students' understanding, engagement, and academic performance when implemented appropriately (Mayer, 2021; Schindler et al., 2017; Bond et al., 2020).

Learning media plays an essential role in supporting effective instruction because it acts as a bridge between teachers and students in delivering educational content. Well-designed instructional media can facilitate better comprehension, stimulate learners' motivation, and improve the efficiency of the learning process. Multimedia learning theory suggests that students learn more effectively when information is presented using a combination of visual and auditory elements rather than using text alone (Mayer, 2021). In addition, the use of multimedia-based learning media has been shown to enhance students' cognitive processing and knowledge retention (Moreno & Mayer, 2007; Zhang et al., 2021).

Among the various types of multimedia learning media, video-based learning resources have gained considerable attention in recent years. Video tutorials provide visual demonstrations, narration, and step-by-step explanations that can help learners understand complex concepts and procedures more effectively. In the context of digital education, video-based instruction has been widely adopted in both face-to-face and online learning environments because it allows students to revisit learning materials at their own pace (Kay, 2012; Giannakos et al., 2016; Brame, 2016). Research has also shown that instructional videos can improve student motivation and engagement, particularly when they include interactive and visually appealing elements (Guo et al., 2014; Alwehaibi, 2015).

In informatics education, especially in topics such as data analysis and programming, students often experience difficulties understanding abstract concepts and procedural steps when instruction relies solely on traditional teaching methods. Data analysis learning involves both conceptual understanding and practical skills, including the use of programming tools and data processing techniques. Without appropriate visual demonstrations and guided practice, students may struggle to follow the learning process effectively. Therefore, the development of multimedia-based instructional media, particularly video tutorial-based learning media, is considered an effective strategy to improve students' comprehension and learning outcomes in informatics subjects (Hew & Lo, 2018; Li & Tsai, 2017).

Preliminary observations conducted at SMA Negeri 01 Mempawah Hilir revealed that learning activities in informatics classes still rely heavily on printed textbooks and teacher explanations. As a result, students often experience difficulties in understanding the practical aspects of data analysis, particularly when learning programming concepts such as Python and data processing tools like Google Colaboratory. In addition, the limited use of interactive learning media tends to reduce students' attention and engagement during the learning process. This condition highlights the need for innovative learning media that can present instructional materials in a more engaging and comprehensible manner.

Based on these challenges, this study aims to develop video tutorial-based learning media to support the teaching of data analysis for Grade X students. The research focuses on three main objectives: developing the learning media, evaluating its feasibility through expert validation, and analyzing student responses after the implementation of the media in classroom learning activities.

## 2. Methodology

### Research Design

This study employed a Research and Development (R&D) approach aimed at producing an instructional product in the form of video tutorial-based learning media for teaching data analysis in secondary education. Research and Development is widely used in educational technology studies because it allows researchers to design, develop, validate, and evaluate educational products systematically. The development process in this research followed the

ADDIE instructional design model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation.

The ADDIE model was selected because it provides a structured framework for developing educational media through a systematic and iterative process. Each stage of the model ensures that the instructional product is developed based on real learning needs and evaluated through expert validation and field testing before implementation in the classroom.

### Research Subjects

The research involved several groups of participants who contributed to the validation and testing of the developed learning media. Expert validation was conducted by two media experts and two subject matter experts. The media experts were lecturers from the Information Technology Education program who evaluated the visual design, usability, and technical quality of the learning media. Meanwhile, the subject matter experts consisted of an informatics teacher and an academic lecturer who assessed the accuracy, relevance, and instructional quality of the learning materials presented in the video tutorial.

The implementation stage involved Grade X students from SMA Negeri 01 Mempawah Hilir, Indonesia. A total of 70 students participated in the field testing phase. These students were selected because they were currently studying informatics and learning the topic of data analysis. Their participation was intended to evaluate the practicality and effectiveness of the developed learning media in a real classroom setting.

### Development Procedure

The development procedure in this study followed the five stages of the ADDIE model. The first stage, analysis, focused on identifying problems in the learning process and determining the need for instructional media. This stage involved classroom observations and interviews with the informatics teacher to identify difficulties faced by students in understanding data analysis materials. The analysis also examined the availability of learning resources and technological infrastructure within the school environment.

The second stage, design, involved planning the structure and content of the video tutorial learning media. During this stage, the researcher developed a flowchart and storyboard to organize the instructional sequence. The storyboard described the layout of each scene in the video, including text explanations, visual elements, narration, and demonstrations of programming activities. The design stage also determined the learning objectives and instructional strategies to ensure that the media aligned with the curriculum requirements.

The third stage, development, involved producing the video tutorial learning media using the Canva platform. Multimedia elements such as text, images, animations, audio narration, and screen recordings were integrated to create an engaging instructional video. After the initial product was completed, expert validation was conducted to evaluate the quality and feasibility of the learning media. Suggestions and feedback from the experts were used to revise and improve the product before field testing.

The fourth stage, implementation, involved applying the developed learning media in classroom instruction. The video tutorial was presented to Grade X students during informatics lessons related to data analysis. Students watched the video and participated in learning activities designed to reinforce their understanding of the material.

The final stage, evaluation, aimed to assess the effectiveness and feasibility of the learning media after implementation. Evaluation was conducted by analyzing expert validation results and student responses collected through questionnaires. The evaluation process ensured that the developed instructional media met educational standards and could be effectively used to support learning activities.

### Data Collection Techniques

Data in this study were collected using interviews, questionnaires, and documentation. Interviews were conducted with the informatics teacher to identify learning problems and determine the need for multimedia learning media. The interview process also provided insights into the challenges students faced when learning data analysis concepts.

Questionnaires were used to gather quantitative data regarding the feasibility and effectiveness of the developed learning media. Expert validation questionnaires were distributed to media experts and subject matter experts to evaluate various aspects of the instructional product, including design quality, usability, and instructional content. Student response questionnaires were distributed after the implementation stage to assess students' perceptions of the learning media.

Documentation techniques were also employed to collect supporting data related to the research process. These included photographs of learning activities, copies of instructional materials, and records of the media development process.

### Data Analysis

The data collected in this study were analyzed using descriptive statistical methods. The results of expert validation and student responses were calculated using percentage scores to determine the level of feasibility and effectiveness of the developed learning media.

The feasibility percentage was calculated using the formula:

$$P = \frac{f}{N} \times 100$$

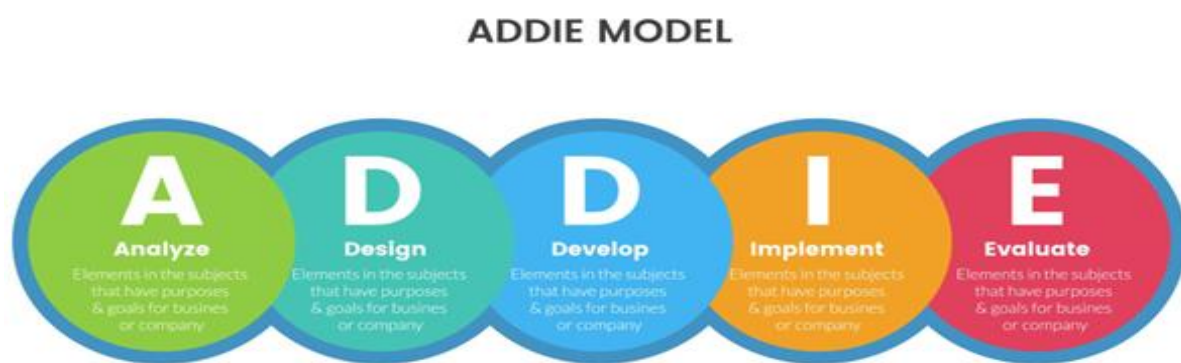
where  $P$  represents the percentage score,  $f$  represents the total score obtained from questionnaire responses, and  $N$  represents the maximum possible score.

The calculated percentages were then interpreted using a four-scale classification ranging from "not feasible" to "very feasible." This classification allowed the researcher to determine whether the developed video tutorial learning media met the criteria for implementation in classroom learning activities.

### 3. Results

#### ADDIE Development Process

The development of the video tutorial learning media followed the ADDIE model. The analysis stage identified the need for multimedia-based learning media to improve students' understanding of data analysis concepts.



**Figure 1. ADDIE instructional development model used in this research**

The design stage involved creating a storyboard and flowchart for the instructional video. The development stage included producing video tutorials using Canva and integrating multimedia elements such as narration, animation, and screen recordings of Python programming.

#### Expert Validation Results

Two media experts and two material experts evaluated the developed learning media. Their assessments focused on usability, visual design, content accuracy, and instructional quality.

**Table 1. Expert Validation Results**

Validator	Score (%)	Category
Media Expert 1	95.65	Very Feasible
Media Expert 2	97.82	Very Feasible
Material Expert 1	95.00	Very Feasible
Material Expert 2	90.00	Very Feasible

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Validator	Score (%)	Category
Average Score	94.87	Very Feasible

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The results indicate that the developed video tutorial learning media meets the criteria for instructional feasibility and quality.

### Student Response Results

After validation and revision, the learning media was implemented in classroom instruction involving 70 students. Students watched the video tutorial and completed questionnaires to evaluate their learning experience.

**Table 2. Student Response Results**

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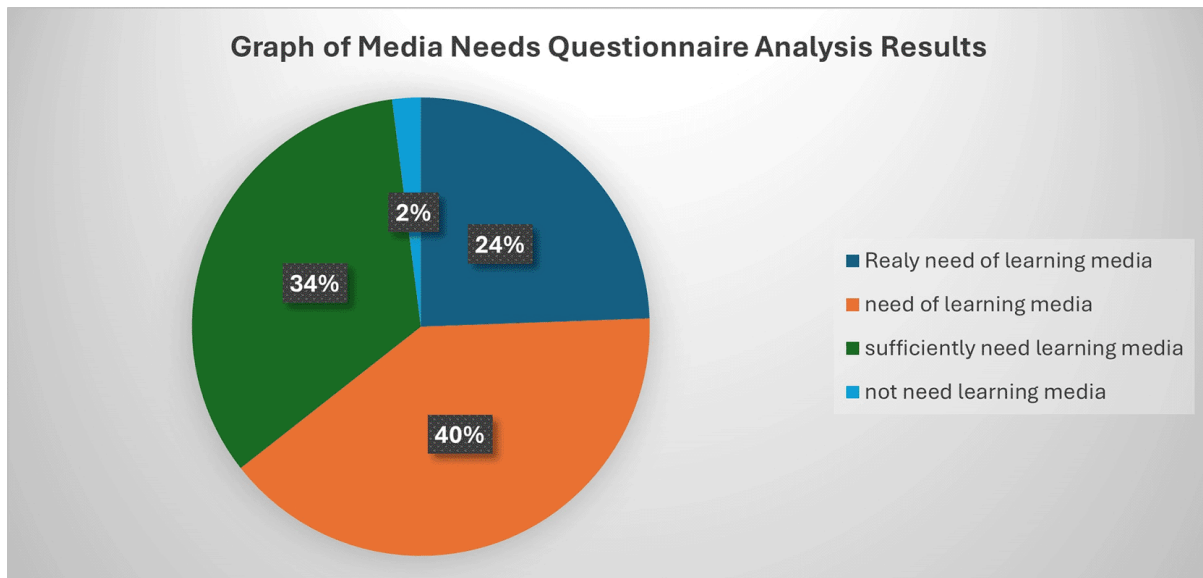
Response Category	Frequency
Very Good	307
Good	932
Fair	152
Poor	4

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The overall student response score reached **77.35%**, which falls into the **good category**, indicating positive acceptance of the developed learning media.

### Visualization of Student Responses

The visualization shows that the majority of students rated the learning media positively, demonstrating its effectiveness in supporting learning activities.



**Figure 2. Visualization of student responses to video tutorial learning media**

#### 4. Discussion

The results of this study demonstrate that the development of video tutorial-based learning media for data analysis instruction has produced a feasible instructional product that can support the learning process in informatics education. The high validation scores obtained from media experts and material experts indicate that the developed learning media meets instructional quality standards in terms of design, usability, and content accuracy. This finding supports previous research showing that multimedia-based learning media can enhance the effectiveness of instructional delivery by presenting information through multiple sensory channels (Mayer, 2021; Moreno & Mayer, 2007). When learning materials are delivered through a combination of visual and auditory elements, students are able to process information more efficiently and develop deeper conceptual understanding.

The use of video tutorial learning media also contributes to improving students' engagement and motivation during the learning process. The student response results in this study indicate that learners perceived the video tutorial as helpful in understanding data analysis concepts and programming procedures. This finding is consistent with previous studies suggesting that instructional videos provide flexible and accessible learning resources that allow students to revisit explanations and demonstrations according to their individual learning pace (Brame, 2016; Kay, 2012). Furthermore, research conducted by Guo et al. (2014) shows that well-designed educational videos can significantly increase student engagement and attention during learning activities.

Another important aspect highlighted in this study is the effectiveness of video tutorials in supporting procedural learning. Data analysis and programming subjects require students to follow step-by-step processes, including writing code, executing commands, and interpreting

outputs. Traditional teaching methods that rely primarily on verbal explanations and textbooks often fail to provide sufficient guidance for these processes. Video tutorials address this challenge by presenting clear visual demonstrations that enable students to observe and replicate each step in the procedure. Previous research has also emphasized that video-based instruction is particularly effective for teaching procedural and technical skills because learners can observe real demonstrations of tasks being performed (Giannakos et al., 2016; Zhang et al., 2021).

The findings of this study also highlight the role of multimedia technology in creating more student-centered learning environments. Multimedia learning environments allow students to interact with learning materials independently and actively construct knowledge through observation and practice. According to constructivist learning theory, students learn more effectively when they actively engage with learning resources and participate in the learning process rather than passively receiving information (Schindler et al., 2017). The use of video tutorial media therefore supports active learning by providing opportunities for students to explore and practice data analysis procedures independently.

In addition, the development of learning media using the Canva platform demonstrates the potential of accessible digital tools for instructional design. Canva provides various templates, design elements, and multimedia features that enable educators to create visually appealing learning materials without requiring advanced technical expertise. The use of user-friendly digital tools in media development can encourage teachers to integrate technology into their instructional practices more frequently. Previous studies have also reported that digital design platforms can facilitate the development of engaging learning materials and improve instructional creativity among educators (Bond et al., 2020; Li & Tsai, 2017).

Despite the positive results obtained in this study, several limitations should be acknowledged. The implementation of the developed learning media was conducted within a limited educational context involving a single school and a specific group of students. Therefore, the generalizability of the findings may be limited. In addition, the evaluation of the learning media focused primarily on feasibility and student responses rather than measuring its direct impact on students' academic achievement. Future studies should therefore examine the effectiveness of video tutorial-based learning media in improving students' learning outcomes, computational thinking skills, and long-term retention of knowledge.

Overall, the findings of this study confirm that the integration of video tutorial learning media into informatics education can enhance instructional quality and student engagement. By providing clear visual demonstrations and structured explanations, video tutorials can help students understand complex concepts and procedural tasks more effectively. These results highlight the importance of incorporating multimedia technology into classroom learning to support modern educational practices and improve the overall learning experience.

## 5. Conclusion

This study developed video tutorial–based learning media for data analysis instruction using the ADDIE model. The development process involved five stages: analysis, design, development, implementation, and evaluation. Expert validation results indicate that the learning media is highly feasible, with an average validation score of 94.87%. The implementation stage also demonstrated positive student responses with an average score of 77.35%, categorized as good.

These findings suggest that video tutorial–based learning media can effectively support the teaching of data analysis and programming concepts in secondary education. The integration of multimedia technology into classroom instruction has the potential to enhance student engagement, understanding, and learning outcomes. Future research should examine the impact of video tutorial learning media on students’ academic achievement and computational thinking skills in broader educational contexts.

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