DEVELOPMENT INTERACTIVE ANIMATION VIDEO FOR TEACHING THE HUMAN RESPIRATORY SYSTEM IN ELEMENTARY SCHOOLS

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Abstract. The use of limited and monotonous learning media can reduce students' motivation to learn, while inappropriate media utilization may also affect learning outcomes. This challenge is more prominent in subjects that cannot be directly observed, such as the human respiratory organs. This study aims to develop an interactive animation video introducing the human respiratory system for fifth-grade elementary students. Furthermore, the media was tested to determine its validity and feasibility as an IPAS learning resource. The development process followed the ADDIE model, employing both qualitative and quantitative approaches. Expert validation results show that the media achieved a score of 93% from material experts and 95% from media experts, both categorized as "Highly Valid," with an overall validity rate of 94%. Feasibility testing on a limited scale yielded an average response of 98% from students and 95% from teachers, classified as "Highly Feasible." In a wider-scale trial, students' responses averaged 93%, while teachers' responses reached 97%, maintaining the "Highly Feasible" category. Overall, the combined feasibility score from teachers and students across both trials was 95%. These findings indicate that the interactive animation video is both highly valid and highly feasible for use in IPAS learning for fifth-grade students.

Keywords: Video, Interactive Animation, Human Respiratory System, Elementary Education

I. INTRODUCTION

"The teaching of Natural and Social Sciences (IPAS) in the Merdeka Curriculum aims to foster students' interest and curiosity, encourage active participation, strengthen inquiry skills, promote self-awareness and understanding of the surrounding environment, as well as broaden knowledge and comprehension of IPAS concepts [1]. The delivery of abstract IPAS material without the use of instructional media can be difficult for students to comprehend [2]. Instructional media serves as a means of communication between teachers and students, as well as a learning resource that supports the achievement of learning objectives [3]. In the present era, instructional media has evolved through the integration of digital technology. The utilization of digital technology in education serves as a key factor in supporting teaching and learning activities to become more effective, efficient, and engaging [4]. One type of instructional media that can be utilized is interactive animation or video. As part of audio-visual media, instructional videos have been proven to enhance learning effectiveness by combining visual and auditory elements that reinforce conceptual understanding. In the context of Natural and Social Sciences (IPAS), particularly in the topic of the human respiratory system, instructional videos are highly beneficial in helping students comprehend abstract concepts that are difficult to perceive directly, such as human respiratory organs [5]. Engaging videos can enhance learning motivation, increase student involvement in the learning process, and assist in visualizing complex concepts.

Based on observations conducted at an elementary school in Tulungagung, the researcher identified several challenges in the use of instructional media for the IPAS subject, particularly in the topic of the human respiratory system. Furthermore, it was found that many teachers are still not proficient in developing digital media and innovating in media creation. As a result, students rely solely on government-issued textbooks. This condition

leads to students becoming more easily bored and less engaged in classroom learning.

A literature review conducted by the researcher also indicates that interactive videos can significantly enhance student participation [6]. In addition, interactive animated videos are able to motivate students and further improve the quality of the learning process [7]. Moreover, the main advantages of animated videos lie in their engaging visualization, integration of multimodal elements, and flexibility, all of which contribute to enhancing students' focus [8]. The use of animated video media provides students with opportunities to be more active during the learning process, enhances their motivation, and improves their learning outcomes [9].

Based on this background, the researcher developed an interactive animated video for IPAS learning on the topic of the human respiratory system. This video was designed to support the learning process by presenting content enriched with informative visuals and audio, thereby facilitating teachers in delivering the material while also helping students to better understand the concepts. The objective of this study is to develop an interactive animated video as an instructional medium for IPAS learning among elementary school students.

II. RESEARCH METHODS

This study employed a Research and Development (R&D) approach using the ADDIE development models [10]. DDIE is one of the instructional design models considered useful in every stage of development by following a well-structured sequence of fundamental phases. These phases consist of: Analysis, Design, Development, Implementation, and Evaluation.
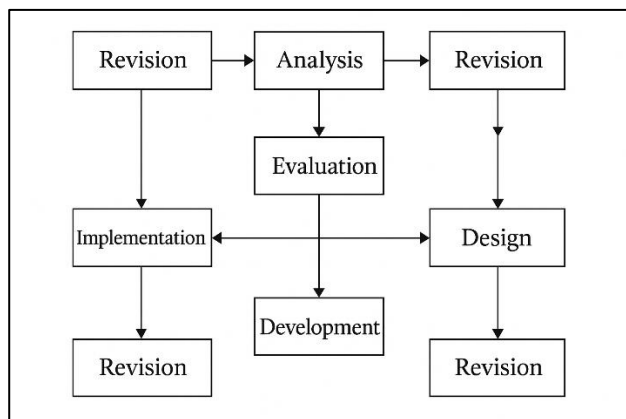

Figure 1. ADDIE Models [11]

The trial subjects in this study were 10 fifth-grade students from a public elementary school in Tulungagung, consisting of 6 female students and 4 male students. Data collection was conducted through questionnaires distributed to instructional media experts and subject matter experts for validity testing. Expert validation analysis was obtained from evaluations by media experts and content experts, while feasibility was assessed based on the responses of students and teachers in both small- and large-scale trials. The data analysis techniques employed in this development study included qualitative descriptive analysis and quantitative descriptive analysis. Once the validity and feasibility data were collected, they were further analyzed using specific formulas.

$$Va = \frac{Obtained\ Score}{Maximum\ Score} X\ 100\%$$

Resource : [12]

Table 1. Percentage of Validity and Feasiblelity

| No	Persentase (%)	Keterangan
1.	0%-20%	Very Invalid / Very Feasible
2.	21%-40%	Less Valid and Less Feasible
3.	41%-60%	Fairly Valid and Fairly Feasible
4.	61%-80%	Valid and Feasible
5.	81-100%	Highly Valid and Highly Feasible

Resource: [13]

III. RESULTS AND DISCUSSION

The research and development process employed the ADDIE model, with the results outlined as follows. First, at the analysis stage, a needs assessment was conducted in the learning process to identify problems, determine appropriate solutions, and select media suitable to students' needs. Several issues were identified during classroom activities, such as teachers delivering lessons through lectures and relying solely on textbooks as the primary learning resource, without the support of engaging instructional media. Technological facilities at the school were limited, with the projector damaged due to teachers' lack of operational skills. The absence of instructional media resulted in students being less focused, less engaged, and inattentive during the learning process. Observations and interviews revealed that the lack of instructional media made it difficult for students to understand IPAS material, particularly abstract topics such as the respiratory and digestive systems. These subjects require concrete media as learning aids to help students grasp the concepts more easily. In the Merdeka

Curriculum, the topic of the human respiratory system is included in the IPAS (Natural and Social Sciences) Learning Outcomes (Capaian Pembelajaran/CP) and is typically studied in Phase C, which corresponds to fifth and sixth grade. The fifth-grade students involved in this study had an average age of 8–9 years [14]. At this stage, students can be categorized into the concrete operational stage, in which they are already able to think logically [15]. Therefore, interactive video media is needed to meet the learning needs of the students.

The second stage in the ADDIE model is the design phase. In this phase, the researcher planned the development of interactive video media with the following storyboard design.
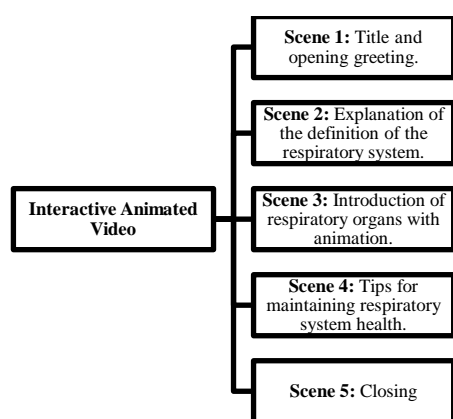
The learning objectives designed for this video are that students will be able to identify the respiratory organs and their functions, as well as mention ways to maintain the health of the respiratory system. The media and tools used in this study include Canva, Pictory.ai, InVideo AI, and DALL·E for images. The third stage of the ADDIE model is development. This stage is divided into two parts: the creation of media and the validation by experts. The details are as follows:

Media Development

The first step was to determine the concept of the video. The selected material was the human respiratory organs, with a duration of three to five minutes. The presentation style was designed to be educational, simple, and visually appealing to ensure that it could be easily understood by fifth-grade students. The language used was Indonesian, adapted to the comprehension level of elementary students.

The second step was to prepare a simple script. The script began with an engaging introduction, for example: *"Today we are going to learn about the human respiratory organs."* The main body of the script focused on introducing the names of respiratory organs, their functions, and the breathing process. The closing section provided tips for maintaining respiratory health.

The third step was to select artificial intelligence (AI)-based tools to be used in video production. Several

platforms were utilized, including Canva (with Text-to-Video and animation features), Pictory.ai (to generate videos from text), InVideo AI, Lumen5, and HeyGen.

The fourth step was to prepare supporting visuals. These included images of human respiratory organs sourced from platforms such as Freepik, Canva Elements, or generated with AI technology such as DALL·E. Icons and illustrations were chosen to be simple and age-appropriate for elementary students.

The fifth step was to upload the script into an AI Video Maker. This was done by copying and pasting the script into the selected platform, such as Pictory or InVideo. An educational template was then selected, with narration (AI-generated voice) in Indonesian and the insertion of organ images for each scene based on the script.

The sixth step was to add supporting audio and effects. Background music with a soft tone and subtitles were included to facilitate students' comprehension.

The final step was rendering and downloading the video. Before exporting, the video was reviewed to ensure accuracy and consistency of content and design. The export was carried out in HD resolution (720p or 1080p) and saved in MP4 format for easy distribution to students.

Expert Validation

Validation in the development stage was conducted after the media was completed. This process allowed for feedback and constructive suggestions to improve the instructional media [16]. It is expected that the developed media will be well-targeted and aligned with students' learning needs. The validation was carried out by two experts in their respective fields: an instructional media expert and a subject matter expert. Both experts possessed qualifications in accordance with their academic backgrounds. The validation results provided by these experts served as the basis for determining the validity of the interactive animated video media. The expert validation outcomes can be described as follows.

Table 2. Expert Validation Results for Video Animasi Interactive

No.	Expert	Score	Category
1.	Media Expert	93%	Highly Valid
2.	Material Expert	95%	Highly Valid
	Total	**188**	
	Average	**94%**	**Highly Valid**

The validity of the media was determined through validation by both the instructional media expert and the subject matter expert. The results showed that the media expert provided a score of 94%, categorized as "Highly Valid" while the subject matter expert gave a score of 94.5%, also categorized as "Highly Valid". Neither expert

suggested any revisions to the interactive animated video media. Based on these results, it can be concluded that the development of the interactive animated video as an instructional medium for IPAS learning in elementary schools is "Highly Valid".

Following the media development and validation process, the next stage was the implementation of the product. Implementation refers to the application of the developed instructional media in real classroom conditions. Once the media was validated and deemed feasible by the experts, it was tested with teachers and students at a public elementary school in Tulungagung. The outcomes of this implementation served as the basis for assessing the feasibility of the interactive animated video.

The feasibility of the video media was evaluated through responses collected from students and teachers using questionnaires: limited-scale student responses, limited-scale teacher responses, large-scale student responses, and large-scale teacher responses. Students completed questionnaires based on the Guttman scale, while teachers responded using the Likert scale. The limited-scale implementation involved two students, whereas the large-scale implementation involved eight students. The implementation process proceeded smoothly without any obstacles, and the completion of questionnaires by both students and teachers was carried out successfully. The results of teacher and student responses, both on a limited and large scale, are presented and analyzed as follows.

Table 3. Feasiblelity of the Video Animasi Interactive

No.	Questionnaire	Score	Category
1	Students (Small Scale)	98%	Highly Feasible
2	Teachers (Small Scale)	95%	Highly Feasible
3	Students (Large Scale)	93%	Highly Feasible
4	Teachers (Large Scale)	97%	Highly Feasible
	Total	**383**	

Based on the data presented above, the interactive video media demonstrated a high level of feasibility. In the limited-scale trial, student responses yielded a score of 98% with the criterion "Highly Feasible", while teacher responses resulted in a score of 95%, also categorized as "Highly Feasible". These findings indicate positive responses from both students and teachers at the limited scale, thereby justifying continuation to the large-scale trial.

In the large-scale trial, student responses achieved a score of 93% with the criterion "Highly Feasible" and teacher responses reached 97% with the same criterion. The average score across both limited- and large-scale trials

was 96%, which falls under the category of "Highly Feasible". These results indicate that the interactive animated video media is highly effective for use in learning activities.

The final stage of the ADDIE model is evaluation, which serves to generalize findings and make decisions based on the collected data. At this stage, the interactive animated video media was successfully developed, receiving highly positive responses without any notable obstacles during the development process. Based on the results of validity and feasibility testing, the interactive video media can be considered a viable alternative instructional tool. Moreover, it effectively supports teachers in the learning process.

IV. CONCLUSIONS

This study successfully developed interactive animated video learning media through the systematic stages of the ADDIE model, namely Analysis, Design, Development, Implementation, and Evaluation. The validation results indicated that the media expert (94%) and the subject matter expert (94.5%) both rated the product as *Highly Valid*. Furthermore, the limited-scale trial showed positive responses from students (98%) and teachers (95%), while the large-scale trial also demonstrated strong feasibility with student responses (93%) and teacher responses (97%). The overall average score of 96% across both trials confirmed that the developed media is categorized as *Highly Feasible*.

Therefore, the interactive animated video can be considered an effective alternative instructional medium for IPAS learning, particularly in teaching abstract concepts such as the human respiratory system. The media not only enhances student engagement and motivation but also supports teachers in delivering more effective and engaging lessons.

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