



Problem-Based Learning-Oriented Animated Learning Videos in Fifth-Grade Elementary School Science Content

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ABSTRAK

Kurangnya kemampuan guru dalam memfasilitasi media pembelajaran inovatif kepada siswa kemudian berdampak pada rendahnya hasil belajar siswa, sehingga untuk mengatasi permasalahan tersebut diperlukan penggunaan media yang inovatif dalam proses pembelajaran. Penelitian ini dilaksanakan dengan tujuan untuk mendeskripsikan rancang bangun serta mengetahui validitas video animasi pembelajaran berorientasi problem based learning pada muatan pelajaran IPA kelas V SD. Penelitian ini tergolong kedalam jenis penelitian pengembangan, yang dikembangkan dengan menggunakan model ADDIE. Subjek yang terlibat dalam penelitian ini yakni ahli teknologi pendidikan, ahli isi, ahli desain, ahli media, dan uji coba pada peserta didik. Pengumpulan data dalam penelitian ini dilaksanakan menggunakan metode kuesioner dan metode tes, dengan instrument penelitian berupa lembar validitas produk, serta tes hasil belajar siswa. Data yang diperoleh dalam penelitian kemudian dianalisis dengan teknik analisis deskriptif kualitatif, deskriptif kuantitatif, dan analisis statistika inferensial uji-t. Hasil analisis penelitian menunjukkan bahwa hasil review ahli isi berkualifikasi sangat baik (90,9%), ahli desain berkualifikasi sangat baik (92,3%), ahli media berkualifikasi sangat baik (92,3%), hasil uji coba perorangan berkualifikasi sangat baik (96,1%), dan hasil coba kelompok kecil berkualifikasi sangat baik (91,4%). Berdasarkan hasil tersebut, maka dapat disimpulkan bahwa media video animasi yang dikembangkan berada pada kualifikasi sangat baik, serta mampu meningkatkan hasil belajar siswa kelas V SD.

ABSTRAK

The lack of teacher ability to facilitate innovative learning media for students then impacts low student learning outcomes, so to overcome these problems, it is necessary to use innovative media in the learning process. This research aimed to describe the design and know the validity of problem-based learning-oriented animation videos in the science content of class V SD. This research belongs to the type of development research which was developed using the ADDIE model. The subjects involved in this study were educational technology experts, content experts, design experts, media experts, and trial students. Data collection in this study was carried out using the questionnaire method and the test method, with research instruments in the form of product validity sheets and tests of student learning outcomes. The data obtained in the study were then analyzed using qualitative descriptive analysis techniques, quantitative descriptive analysis, and t-test inferential statistical analysis. The results of the research analysis show that the review results of content experts are very well qualified (90.9%), design experts are very well qualified (92.3%), media experts are very well qualified (92.3%), individual test results are very well qualified (96.1%), and the results of the small group trials were very well qualified (91.4%). Based on these results, the animated video media developed are very good qualifications and can improve the learning outcomes of fifth-grade elementary school students.

1. INTRODUCTION

Natural science is one of the fields of science that must be taught to elementary school students. It is because science is a field of science that plays an important role in human life, especially in the process of introducing humans to themselves and introducing humans to their environment (Widiana & Ardana,

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2020; Yuniar & Hadi, 2023). Science learning contains various clusters of theories that are systematically arranged and generally applied limited to natural phenomena, born and developed through scientific methods such as observation and experimentation, and require scientific attitudes such as curiosity, openness, honesty, and so on (Dwiqi et al., 2020; Muttaqin et al., 2021; Rahmawati & Atmojo, 2021). The implementation of science learning in elementary schools is carried out to increase students' understanding of living things and the natural surroundings, improve thinking skills through scientific processes and methods, and develop scientific attitudes of students so that later students can solve various problems they face (Ayu et al., 2021; Masturah et al., 2018; Suryantari et al., 2019). Students who can understand science learning well, of course, will be able to have a critical, creative, and systematic mindset, where this mindset will help students to solve various existing problems (Laksmi & Suniasih, 2021; Lutfiyah & Mansur, 2018).

The reality shows that not all students can understand science material well, with many still having science scores below the minimum completeness criteria. It aligns with the observations and initial interviews with fifth-grade students and teachers. The observations and interviews showed that the average midterm exam result for fifth-grade students in science content was 48.9 and that 2.8% of students were declared complete. In comparison, 98.2% of students were declared incomplete because the scores obtained were below the minimum completeness criteria. The minimum completeness criterion that students must meet is 75. It shows that the average student score is still in the low category.

Furthermore, the results of observations and interviews show that the low student learning outcomes are due to the need for more ability of teachers to use technology to support the learning process. Teachers focus on textbooks, lecture methods, and learning media that cannot attract students' attention in class. So, it can affect the learning motivation and learning outcomes of students. In addition, it was found that some students needed to be more careful in reading and had difficulty understanding the learning material. If allowed to continue, this will certainly have an impact on not achieving the goals of learning science.

One effort that can be made to overcome these problems is to apply the media in the learning process. It is because learning media is one of the teaching tools teachers use to convey teaching materials and increase student creativity and attention in teaching and learning activities (Primadewi & Agustika, 2022; Tafonao, 2018). Using media in the learning process will increase student learning motivation and encourage students to write, speak and imagine (Didik et al., 2021; Fanni et al., 2022). In addition, through media, the learning process will become more effective and efficient because the media can establish good relationships between teachers and students (Cahyani et al., 2021; Ponza et al., 2018). One of the lessons that can be used to improve science learning is animated video media. Video learning is a media that can be felt through hearing and sight because it is presented through a series of films that can be added to sound to form an organized unit as a flow of messages contained in the media to achieve learning goals (Ario, 2019; Maranatha & Putri, 2021; Sukarini & Manuaba, 2021). Animated learning videos will help teachers present elements of images, sounds, atmosphere, and activities (Miranda, 2019; Valentina & Sujana, 2021). Images with simple motion also make students pay more attention to moving images than those not moving (Hulqi & Arifin, 2022; Ponza et al., 2018). So that the use of learning animation video media can facilitate students in understanding the material and attract students' attention (Alexander et al., 2020).

Animated video is supported by moving pictures to make it more attractive to students (Dewi & Handayani, 2021). Animation is a moving image consisting of a series of objects (images) arranged sequentially following the flow of movement, determined for each subsequent time (Lukman et al., 2019; Risnaldi, 2021). Instructional animated video media will be more effective if accompanied by problem-based learning models. It is because the PBL model can place students at the center of the learning process (Shofiyah & Wulandari, 2018; Syawaly, 2020). Problem-based learning uses problems as an initial stage in collecting and integrating new information (Safithri et al., 2021; Wulandari & Koeswanti, 2021). In the PBL learning process, all student activities must be systematic. This is needed to solve problems or face challenges that will be needed in work and everyday life (Nismawati et al., 2019; Shofiyah & Wulandari, 2018). With the help of the problem-based learning model, students must acquire more skills than just memorized knowledge (Styowati & Utami, 2022; Utaminingsih et al., 2018). Starting with problem-solving, critical thinking, teamwork, interpersonal, communication, and information handling and processing skills (Siddiq et al., 2020).

Several previous studies revealed that problem-based learning-oriented animated video media on fractional material for fourth-grade elementary school students is feasible for learning activities (Primadewi & Agustika, 2022). The results of other studies reveal that the animated video media developed based on the Canva application is very feasible because it can increase student motivation and achievement (Hapsari & Zulherman, 2021). The results of further research revealed that animated videos

are very suitable for use in learning science, especially in the material of changes in temperature and the shape of objects in elementary schools (Priyantini et al., 2021). Based on some of these research results, it can be said that animated video media or PBL learning models are very feasible to develop to support the success of the learning process. In previous research, no study specifically discusses the development of problem-based learning-oriented animation videos in fifth-grade elementary school science content. So this research is focused on this study to describe the design and know the validity of problem-based learning-oriented animation videos in the fifth-grade science content of SD Negeri 1 Selat.

2. METHOD

This research belongs to the type of development research that was developed using the ADDIE model. The ADDIE development model comprises five research stages: analysis, design, development, implementation, and evaluation. The ADDIE development model is a model that shows the basic stages in which the learning system is easy to implement. The selection of this model is based on the consideration that this model is easy to understand, and this model is developed systematically, and is based on the theoretical foundation of the learning design that will be developed. Applying the ADDIE development model can minimize errors and deficiencies because all stages are covered through the evaluation stage. The test subjects of this learning animation video development research were one learning content expert, one learning design expert, one learning media expert, three students for individual trials, and nine students for small group trials. Data collection methods used are questionnaires and tests. Questionnaires or questionnaires are a way of obtaining or collecting information by sending a list of questions/statements to research subjects to be answered in writing. The test method is a data collection method that is carried out by giving students questions regarding the learning material contained in the product that has been developed. It was done to measure the effectiveness of the developed learning animation video product.

Before implementing a learning animation video product for students, it is necessary to conduct a validity test to determine the feasibility of the product, which is carried out by experts (learning content experts, learning design experts, learning media experts) and product trials on students (individual trials and small group trials). The instrument grids are listed in Table 1, Table 2, Table 3, and Table 4.

Table 1. Instruments for Learning Content Experts

No.	Aspect	Indicator	Total Item
1	Video Compatibility	a. Compatibility of learning objectives with basic competence b. Learning objectives according to the ABCD format c. The suitability of the material in the video with learning objectives	3
2	Clarity of Message/Material	a. The clarity of the material presented b. The systematics of the material presented	2
3	Content Representation	a. Able to attract students' interest and motivation to learn b. Suitability of examples with HOTS learning c. According to the level of maturity of students d. Good vocabulary	4
4	User Friendly	a. Ease of users accessing the media b. The right combination of visuals and writing	2

Table 2. Learning Design Expert Instruments

No.	Aspect	Indicator	Total Item
1	Video Compatibility	a. Compatibility of learning objectives with basic competence b. Learning objectives according to the ABCD format c. The suitability of the material in the video with learning objectives d. The material in the learning videos is packaged coherently	4
2	Media Visualization	a. The accuracy of the colors presented b. The accuracy of the type and size of the font on the video c. The accuracy of writing spelling on the material d. Accurate illustrations with descriptions	4
3	Content Representation	a. Able to attract students' interest and motivation to learn b. According to the level of maturity of students c. Good vocabulary	3

4	Clarity of Message	a. Can provide a more meaningful understanding of learning messages b. Learning is easier to understand properly	2
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Table 3. Instruments for Learning Design Experts

No.	Aspect	Indicator	Total Item
1	Media Visualization	a. The attractiveness of the animated presentation that is displayed b. The attractiveness of the displayed image c. The attractiveness of the displayed text menu d. Can increase the motivation of students to learn	4
2	Time Duration	a. Video duration for learning b. Precise duration of video and audio	4
3	Use of Narration, Music, and Sound Effects	a. The clarity of the narrator's voice b. Background music regularity c. The accuracy of the sound effects used to add to the atmosphere and complete the visual presentation	3
4	User Friendly	a. Ease of using the media b. The right combination of visuals and writing	2
5	Stand Alone	a. The use of media does not depend on other teaching materials b. Media can be used independently	2

Table 4. Instruments of Learning Design Experts

No.	Aspect	Indicator	Total Item
1	User Friendly	a. Ease of using the media	1
2	Stand Alone	a. The use of media does not depend on other teaching materials	1
3	Content Representation	a. Instructions for learning on the video are clear b. Clarity of the material presented c. Clarity on the text presented d. Using images in the video makes it easier to understand the video e. The material presented is easy to understand f. The examples presented can motivate students g. Visual attractiveness presented h. Learning videos can increase learning motivation i. According to the level of maturity of students j. Media developed according to the characteristics of students	10

After the instrument preparation stage, the next step is to review the instrument expert and whether the items are relevant to the learning animation video being developed. Furthermore, the data analysis techniques used in this development research are descriptive qualitative analysis techniques, quantitative descriptive analysis, and t-test inferential statistics. The qualitative descriptive analysis technique systematically processes data in sentences, words, and categories related to an object so that the final result is a general conclusion. This data analysis technique is used on data in the form of suggestions, responses, and comments by learning content experts, learning design experts, and learning media experts, students in individual and small group trials. The quantitative descriptive analysis technique is a data processing technique carried out systematically in the form of numbers to obtain general conclusions. The references for determining the meaning and decision-making decisions to be used are presented in Table 5.

To find out the effectiveness of the developed interactive learning multimedia, it is necessary to test the effectiveness. The effectiveness test was carried out through the pretest and posttest. The pretest and posttest results will be processed using the t-test inferential statistical analysis technique. The pretest and posttest instrument grids are presented in Table 6.

Table 5. Conversion of Achievement Levels with a Scale of 5

Achievement Level (%)	Qualification	Description
90-100	Very good	No need to revise

Achievement Level (%)	Qualification	Description
80-89	Good	Slightly revised
65-79	Enough	Revised to taste
40-64	Less	Many things were revised
0-39	Very less	Re-product

Table 6. Pretest and Posttest Instruments

Basic competencies	Indicator	Cognitive Level
Apply the Concept of Heat Transfer in Everyday Life	a. Applying the concept of heat transfer in daily life	C3
	b. Identify the types of heat energy	C4
	c. Associate changes in temperature with existing heat energy	C4
	d. Associate changes in temperature with existing heat energy	C3
	e. Explain the ways of heat transfer in everyday life precisely	C5
	f. Summarize objects that can accelerate and inhibit heat transfer appropriately	C6
	g. List the types of objects that experience heat transfer	C5
	h. Summarize objects that can change shape due to expansion	C5
	i. Summarize objects that can be deformed due to shrinkage	C4
	j. Compare temperature and heat in everyday life	C4

3. RESULT AND DISCUSSION

Results

The design and development of this learning animation video use the ADDIE development model. The ADDIE development model has five stages: analysis, design/design, development, implementation, and evaluation. In the first stage, namely the analysis of the implementation of needs analysis, analysis of student characteristics, and analysis of school facilities. The needs analysis found that teachers and students needed learning media that could motivate student learning and improve student learning outcomes because it was found that as many as 98.2% of students had learning outcomes below the minimum completeness criteria. Then, an analysis of the characteristics of students is carried out to find out which products are developed by the characteristics of the students and make lesson plans that adapt to students. Meanwhile, in the analysis of school facilities, it was found that there was support for the learning process that could be utilized, with proper and adequate conditions, such as LCD projectors, Wifi, speakers, laptops, and adequate power sources.

The second stage is the design stage. At the design stage, the media development process begins to enter the stage of determining basic competencies and indicators in science content, collecting materials and reference materials, preparing materials, making storyboards, and preparing instruments for experts. The third stage is development. At the development stage the developer has entered the development stage of learning animation video production. The development of this learning animation video product uses several applications, namely, Adobe After Effects and Adobe Premiere Pro CC 2019, as the main software, with the help of several other applications, namely, Microsoft Office and Adobe Illustrator. The results of the learning animation video development process can be seen in [Figure 1](#).

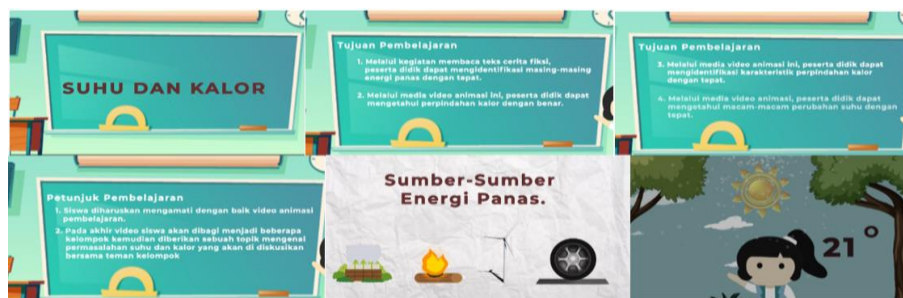


Figure 1. Problem-based Learning-Oriented Animation Video on the fifth-Grade Science Content at SD Negeri 1 Selat

The fourth stage is implementation. At the implementation stage, an assessment is carried out to find out the learning animation video and the student's responses regarding the attractiveness and feasibility of the product being developed. Several things are done in implementing the product, namely, making instruments and validating them by experts (Testing content experts, design experts, and media experts) and conducting individual trials and small group tests conducted by students. The fifth stage is evaluation. At this stage, the implemented product will be evaluated and reviewed by content experts, design experts, and learning media experts. Students also provide assessments and evaluations on learning animation video products in individual and small group tests. At this stage, the aim is to determine the feasibility and be able to evaluate the products that have been developed. The validity of learning animation video products is carried out through expert tests and product trials to determine the validity and feasibility of these products for use in the learning process in the classroom on science content. The validity results are presented in [Table 7](#).

Table 7. Results of the Validity of Interactive Learning Multimedia

No.	Trial Subjects	Validity Results (%)	Description
1	Learning Content Expert Test	90,9%	Very good
2	Learning Design Expert Test	92,3%	Very good
3	Learning Media Expert Test	92,3%	Very good
4	Individual Trial	96,1%	Very good
5	Small Group Trial	91,4%	Very good

The validity of the development results was determined by learning environment expert trials, learning design expert trials, learning content expert trials, individual trials, and small group trials using the survey method. The media expert test validation results were considered very good, with a score of 90.9%. The design expert test results were considered very good, with a value of 92.3%. The validation test results for content experts received a very good qualification with a score of 92.3%. Individual test validation results obtained a score of 96.1% with very good competence. Finally, the small group test validation results obtained a score of 91.4% with very good competence. Based on the results of testing the effectiveness of this learning animation video on students through the pretest and posttest, the count = 40.260 and table = 2.000. So it can be concluded that the value of count > table so that H0 is rejected and H1 is accepted. That is, there is a significant difference in the learning outcomes of students in the content of science lessons before and after using learning animated video products. So, this learning animation video is effective because it can improve student learning outcomes. The results of the t-test data analysis are presented in [Table 8](#).

Table 8. Results of T-Test Data Analysis

Data	N	Average	S ² (variance)	Db (n ₁ +n ₂ -2)	T _{count}	t _{table}
Pretest	28	48.25	70.60	54	40.260	2.000
Posttest		90	49.77	54		

Discussion

In this study, the product produced was a problem-based learning-oriented animation video using the ADDIE development model, which had passed the review stage from experts and students. The use of the ADDIE development model to develop products becomes more practical. Because this learning animation video uses the ADDIE development model so that in the development process, it can minimize any errors or deficiencies. Learning animation video media is appropriate to be applied in the learning process because it can make it easier for students to understand the material, increase student motivation, and improve student learning outcomes ([Dewi & Handayani, 2021](#); [Lukman et al., 2019](#); [Risnaldi, 2021](#)). This learning animation video media was chosen by adjusting students' learning needs and characteristics to optimize the knowledge possessed by students. Characteristics of elementary school children usually like interesting pictures and sounds, like to play, and want to try or do something ([Nurfadhillah et al., 2021](#); [Sukarini & Manuaba, 2021](#)). Furthermore, based on the results of the research analysis that has been carried out, several findings were obtained in this study, including:

The first finding shows that from the aspect of learning content, problem-based learning-oriented animation video media get very good qualifications. This learning animation video contains heat material and its transfer. It is studied by basic competencies, indicators, and learning objectives so that the material delivered to students meets their needs ([Cahyani et al., 2021](#); [Ponza et al., 2018](#)). Basic competencies,

indicators, and learning objectives are related to material that can facilitate teachers and students' learning processes to increase learning motivation and improve student learning outcomes (Didik et al., 2021; Fanni et al., 2022). Animated video on fifth-grade science content on heat material and its displacement that has been produced has been adapted to the basic competencies and indicators used as a reference, as well as to measure the breadth of the material delivered in learning animation video products so that the material delivered is not general which can make it difficult for students to understand the subject matter because it is not by the basic competencies and indicators that serve as a reference (Alfiyah et al., 2021; Febriyanti & Ain, 2021).

The second finding shows that from the aspect of learning design, problem-based learning-oriented animation video products have very good qualifications. This product is designed using syntax in one of the learning models, namely problem-based learning. Submission of material on products using this model students can increase student understanding and impact increased learning outcomes. In addition, the products developed can support the learning process in the classroom, can help students more easily understand the subject matter, especially in science content, and train students to think critically by solving problems that exist in everyday life (Pramana et al., 2020). By using the problem-based learning model, it can make students more active because this model is centered on students in the way of learning that presents problems that are designed in contexts that are relevant to the material being studied (Nismawati et al., 2019; Shofiyah & Wulandari, 2018). Effective learning planning can facilitate learning activities, and learning evaluations can be useful to determine the extent to which students understand the material provided in learning animated video products.

The third finding shows that from the aspect of learning media, problem-based learning-oriented animation video products have very good qualifications. The animation presentation in this learning animation video is already interesting and can provide an overview of the material being studied properly (Shofiyah & Wulandari, 2018; Syawaly, 2020). Through the animation displayed, moving images, video and audio duration, a sound that sounds clear, visual combination, and ease of use can attract students' attention and motivate students in learning to use learning animation videos so that this learning animation video is used as a supporting tool in the learning process (Alexander et al., 2020; Miranda, 2019; Valentina & Sujana, 2021). Very good qualifications in the media aspect can also be achieved because the harmony of the background music, the accuracy of the sound effects, and the narrator's voice in the animated video can add to the visual presentation well and have been adapted to the characteristics of the students. If it matches the characteristics of elementary school students, music, pictures, sound, and other supporting components can support more comfortable learning conditions and atmosphere, as well as increase students' absorption and memory (Ario, 2019; Maranatha & Putri, 2021; Sukarini & Manuaba, 2021).

The fourth finding shows that problem-based learning-oriented animation video trials have very good qualifications. It is because the learning animation videos for fifth-grade elementary school students use animation and pictures/illustrations that can attract students' attention. It can increase students' motivation to learn. The higher motivation of students in learning will certainly impact increasing student learning outcomes. It shows that if students' interest in learning is high in learning, then the delivery of material in learning is easy to understand, which has an impact on increasing student learning outcomes, and learning objectives can be achieved as desired (Apriyani et al., 2018; Erni & Fariyah, 2021).

The results obtained in this study are in line with the results of previous research, which also revealed that problem-based learning-oriented animated video media on fraction material in fourth-grade elementary school students is feasible to use in learning activities (Primadewi & Agustika, 2022). The results of other studies reveal that the animated video media developed based on the Canva application is very feasible because it can increase student motivation and achievement (Hapsari & Zulherman, 2021). The results of further research revealed that animated videos are very suitable for use in learning science, especially in the material of changes in temperature and the shape of objects in elementary schools (Priyantini et al., 2021). So based on some of the results of these studies, it can be said that animated video media or PBL learning models are very feasible to develop to support the success of the learning process.

4. CONCLUSION

Based on the results of data analysis and discussion, it can be seen that problem-based learning-oriented animation video media obtains very good qualifications. So based on these results, it can be concluded that the product developed is declared fit for use in learning activities as a support for learning activities in class, especially in science content in grade five, and can be applied as an animated learning video medium to improve learning outcomes and students' learning motivation.

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