DEVELOPMENT OF ANIMATED VIDEOS TO ENHANCE STUDENTS MASTERY OF CONCEPTS IN THE SOLAR SYSTEM

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Abstract

The learning outcomes obtained by students are still far below the standard assessment criteria. It turns out that the factor causing this issue is the students' lack of understanding of concepts taught by the teacher. Therefore, concept comprehension is the foundation for achieving learning objectives. The purpose of writing this article is to create the development of animated video learning media to enhance students' concept comprehension abilities. This study adopts a quantitative approach, using the Research & Development (R&D) method with the ADDIE model (Analyze, Design, Development, Implementation, Evaluation). The research subjects consist of 30 sixth-grade students, comprising 16 males and 14 females, from a public elementary school in Bogor Regency, West Java. The research instruments used include observation and questionnaires aimed at assessing the effectiveness of the animated video learning media, as well as tests to measure students' concept comprehension as a benchmark for the success of the animated video. The research findings indicate that 100% of the students experienced an increase in scores when they underwent a pretest-posttest assessment using the validated animated video, which obtained a 100% score from media experts and subject matter experts. This means that the animated video is highly suitable for use as a learning media for the solar system subject. Thus, animated videos are an excellent learning media when used in education, as they capture students' interest and enthusiasm in participating in the learning process.
Keywords: concept mastery; animated videos; learning media; solar system.

Abstrak

Hasil belajar yang diperoleh peserta didik masih jauh dari sebuah standar penilaian yang menjadi acuan. Ternyata hal yang menjadi faktor terjadinya permasalahan tersebut adalah karena peserta didik yang mengalami kurangnya pemahaman sebuah konsep dari suatu materi yang diajarkan oleh guru kepada peserta didik. Maka pemahaman konsep adalah hal yang menjadi sebuah dasar di dalam mencapai sebuah tujuan pembelajaran. Tujuan dari penulisan artikel ini adalah untuk menciptakan sebuah pengembangan media pembelajaran video animasi agar dapat meningkatkan terhadap kemampuan pemahaman konsep yang dimiliki peserta didik. Penelitian ini menggunakan sebuah pendekatan kuantitatif. Dengan metodenya adalah *Research & Development* (R&D) dengan model ADDIE (Analyze, Design, Development, Implementation, Evaluation) dengan subjek penelitian yaitu 30 peserta didik kelas VI yang terdiri dari 16 orang laki-laki dan 14 orang perempuan pada salah satu SD Negeri yang berada di Kabupaten Bogor, Jawa Barat. Instrumen penelitian ini dengan menggunakan observasi, angket yang khususnya bertujuan untuk dapat mengetahui keefektifan sebuah media pembelajaran video animasi tersebut dan tes agar dapat juga mengetahui pemahaman konsep peserta didik sebagai tolak ukur keberhasilan suatu video animasi tersebut. Hasil Penelitian menunjukkan bahwa 100% peserta didik mengalami peningkatan nilai ketika melaksanakan pretest – posttest dalam pembelajarannya menggunakan video animasi yang telah melalui tahap uji validasi kepada ahli media dan ahli materi mendapatkan skor 100% yang artinya video animasi sangat baik untuk digunakan sebagai media pembelajaran materi tata surya. Jadi, video animasi merupakan salah satu media pembelajaran yang sangat baik apabila digunakan pada pembelajaran karena dengan video animasi ini sangat menarik minat peserta didik untuk berantusias dalam mengikuti pembelajaran.
Kata Kunci: penguasaan konsep; video animasi; media pembelajaran; sistem tata surya.

Introduction

Education as one of the processes that must be taken by the Indonesian people in order to educate the life of the nation. Saved a process that is not only limited to prioritizing the time spent in studying, but must always consciously be able to understand every lesson that is done while studying. Education is a learning process in academic, non-academic, and hereditary habits of people and is pursued by means of learning and research (Helda & Syahrani, 2022).

Learning is carried out consciously by teachers and students so that students are able to plan towards high valued directions. Plan in the intended direction is to fully understand the material presented in class. Although intellectual intelligence is expected as a learning outcome that is considered successful. Although in some cases, especially in the world of work that intelligence is not always a priority factor than loyalty (Dewi & Ibrahim, 2019). However, in the field of science, it is important to consider intellectual ability as a result of the desired learning to be able to achieve the success of the learning process followed by students. When referring to the normal distribution, if the ability of students with high ratings lies at the top of the curve, it means that a small number of students are expected to fully understand the material provided by the teacher (Dewi & Ibrahim, 2019). The main thing that becomes the goal of learning is for students to become someone who is independent, able to understand social life, and sharpens independence through the use of efficient and superior educational (Bulkani, Fatchurahman, Adella & Setawan, 2022).

Concept understanding skills are skills in explaining a knowledge or concept that is conveyed through one's own words and being able to interpret or provide a conclusion about an explanation, whether it be numbers, visual illustrations, writing, and so on (Kirani, Septiyaningsih, Yusvinthawati, Ardiyanto & Hajron, 2022). Understanding the concept becomes a basis in achieving a learning goal. In learning, the teacher must be able to associate the material with the conditions of the surrounding environment so that students are able to more easily understand the process and especially in science knowledge. According to the Ministry of National Education in 2008 that the science literacy of students is relatively low even today because of the many causal factors that influence it, such as learning carried out in the field is not yet qualified to be able to develop optimally the skills of students because the learning is carried out still centered on the teacher who teaches (Suryani, Renda & Wibawa, 2019).

In fact, in the world of education, progress is increasing day by day as judged by learning outcomes. The learning outcomes in question are a result of the learning process that has been carried out in the classroom as assessed by an evaluation tool. In the evaluation obtained there are results indicating that the learning outcomes of students are still far from a standard assessment that is used as a reference. It turns out that one of the causal factors for this is because students are still lacking in understanding the concept of a learning material, especially in solar system material which must require students to be able to describe it. Here the role of the teacher is needed to overcome all problems, especially the teaching and learning process (Isrok'atun, Yulianti & Nurfitriyana, 2021).

In learning activities an educator indirectly has to be creative in carrying out learning, especially to use various learning media as a means of conveying material that is in accordance with the objectives of learning, its basic competencies, and achievement indicators. The use of learning media in the classroom in order to assist students in increasing the level of their thinking so that they are more active and creative (Anggraini, Prananda & Hader, 2021).

The solar system has material that is theoretical in nature, which requires students to be able to describe the celestial objects contained in the solar system. As a step to facilitate the process of learning solar system material for students, it is necessary to use learning media that attracts

students' interest and can be interactive (Nurhamidah, Sujana & Karlina, 2022). When the material is taught without using interesting media, students will lose motivation and tend to be inactive in the learning process. As a result, students will quickly get bored, causing commotion in the class. Most of the students did not pay sufficient attention when the teacher explained the material (Putri, Kuswandi & Susilaningsih, 2020).

In a study conducted by Deliany (2019), a result was obtained which said that the increased understanding of concepts in science material in the class studied showed better results compared to the control class when learning was already using this interactive multimedia (Deliany dkk., 2019). Enhancing the quality of elementary science education necessitates innovative approaches to teaching, including the selection of teaching models, methods, or instructional media. Among these components, instructional media stands out as the most critical element that teachers need to prepare (Fika, Ika, & 2Rungchatchadaporn, 2022).

Therefore, it is clear that the level of students' understanding of concepts is likely to increase when a teacher introduces a supporting instrument in the learning process. This supporting instrument is none other than a learning media whose purpose is to effectively package the learning material in an engaging manner, making it easier for learners to comprehend. One of the learning media that can be developed is animated videos.

Animated video learning media is a form of media to communicate messages contained in learning either seen or heard. This animation is a medium that can be witnessed and heard through the pictures contained in it and is able to attract the attention of students (Trianawati, Ardana & Abadi, 2020). With an animation, the interest in learning and understanding a science will increase. With animation, the teacher will also be greatly facilitated in delivering material to students in the learning (Rosmiati, 2019).

The learning video media has benefits in the learning process of students. Some of the benefits are increasing students' interest in learning because it will look more attractive. Then, teaching material will be more clearly seen from its meaning, therefore it can help students achieve learning goals and understand them more easily. Learning methods are also more diverse, not only limited to verbal communication through the words of the teacher, so that the teacher does not feel tired, especially when teaching in every lesson and the students will not feel bored either. In addition, students will also be actively involved in the learning process, because students not only listen to the teacher's explanation but students also involve themselves in other activities such as observation (Patimah, Masnun & Hidayat, 2022). So it can be concluded that learning media is very important because it becomes a component in teaching which becomes a teacher's tool in the delivery of learning and so that learning activities look more interesting (Laksmi, Yasa & Mirayani, 2021).

The research was carried out with the aim of being able to develop an animated video learning media that can improve the understanding abilities of students in class VI. Of the many studies that discuss the development of instructional video media, there is still little research on the development of instructional videos using animated videos (Supriyani, Japa & Margunayasa, 2021). So this study aims to find out the effectiveness of an animated video learning media and to be able to find out students' understanding of concepts when learning has been implemented using animated videos. Therefore, research on the development of animated videos with material on the solar system was carried out for sixth grade elementary school students.

Research Methods

The research was carried out using a Research & Development (R&D) method. This R&D is a method in research that has the goal of being able to create a work, and to test its effectiveness. Of course, in order to create a work, it is necessary to carry out a research that has an analytical nature (Zakariah, Afriani & Zakariah, 2020). Research & Development (R&D) can be interpreted as one of the studies carried out deliberately, neatly arranged, an invention, compiling, correcting, expanding, producing, testing the truth, the effectiveness of an output that is rated better than all (Okra & Novera, 2019). Research and Development is a series of steps or processes in creating an innovative product or improving an existing product and is not always limited to physical objects such as learning aids, modules and books. Then, it can be in the form of non-physical objects such as applications on a computer to process data, libraries, classroom learning, directions, evaluations, and learning models (Mardianto, Matsum & Sarmita, 2022).

This research was conducted on May 5 2023 at one of the elementary schools in Bogor Regency. The research subjects were 30 class VI students consisting of 16 boys and 14 girls, most of whose parents' economic education background was middle to lower. The research instrument is by using observation techniques, questionnaires, and tests. The tests used are in the form of pretest and posttest questions with the aim of knowing the knowledge possessed by students before and after participating in learning activities using animated videos.

The data collection instruments in this study were media and material expert validation questionnaires as well as closed questionnaires which were responses from students used to determine the extent to which the quality of the feasibility of the animated video products made was made. The expert validation questionnaire was carried out to one of the PGSD lecturers, as well as the closed questionnaire used which was also distributed to students to find out how the students' views regarding animated videos when used in learning.

The research was conducted using a development model known as the ADDIE model. This model consists of 5 stages namely, Analysis, Design, Development, Implementation, and Evaluation. Instructional design based on the ADDIE model is a process in producing products in the field of education that can be accounted for by this development research or what is called Research and Development (Rohaeni, 2020).

In maintaining the quality of an instrument, as well as knowing the quality of a product is appropriate or not used in learning and can be in accordance with the valid criteria of a learning media. By giving the suspension of the media feasibility test on this animated video using a Likert scale.

Table 1.
Rating Scale for Product Validation

Score	Criteria
4	Very Good / Very Suitable
3	Good / Appropriate
2	Enough
1	Not enough

In a technique when analyzing data from media experts and this material, percentage intervals are used (Jannah & Julianto, 2018):

Table 2.
Percentage of Product Validity Criteria

Percentage	Criteria
81%-100%	Very good
66%-80%	Good
51%-65%	Enough
35%-50%	Not enough

In analyzing closed questionnaires given to students using percentages.

Table 3.
Percentage of Criteria on Product Validity

Percentage	Criteria
81%-100%	Very good
66%-80%	Good
51%-65%	Enough
35%-50%	Not enough

Results and Discussion

In developing learning media in the form of animated videos. The development of the ADDIE model has 5 stages, namely, Analysis, Design, Development, Implementation, and Evaluation.

In analysis stagehere is an identification stage in order to get an overview of the learning media that will be developed by analyzing learning needs and identifying a learning gap problem that occurs in the class to be studied. In order to be able to fulfill this analysis phase the teacher needs to have the ability to identify instructions that will fill deficiencies or gaps, propose levels that will resolve these deficiencies, then propose strategies to resolve gaps in achievement based on real evidence of ability for successful learning (Hidayat & Nizar, 2021). In this analysis stage it also includes an analysis of the needs, an analysis of the character rights of students, the curriculum, and how good media (Barbara & Bayu, 2021).

In the analysis phase conducted, first by identifying the areas where students lacked knowledge in the learning process. The initial assumption made was that students had a limited understanding of outer space knowledge because this material can only be comprehended effectively if students have a clear visual representation of outer space. Therefore, the topic of the solar system was chosen, utilizing animated video media, so that students could observe outer space conditions and understand the material effectively.

After the analysis phase is carried out, it moves on to the teaching material design stage.The design is in a stage called planning which was originally formed from a flowchart, then creates a design on a storyboard which contains the planning plot, description of the material to be presented, depiction in the assessment and incorporation of things that become the supporting part (Rustandi & Rismayanti, 2021). Storyboard is a series of sketches in a table as material for illustrating a series of stories in video learning media. A flowchart is a process diagram that describes a procedure, series, or flow of a process. This flowchart uses symbols such as squares, arrows, circles, diamonds, and so on. The purpose of making this design is to be able to produce products in the form of learning videos so that they can provide assistance to teachers and students during the teaching and learning process and increase students' learning interest (Carolin, Astra & Suwiwa, 2020).

Figure 1. Title material display

Figure 2. Solar System Material Explanation Display

Figure 3. Solar System Planet Arrangement Display

In the process of developing learning materials, there are two very important objectives to achieve. First, produce or update learning materials that become learning materials in order to achieve a goal in the learning. Second, choose the best learning material to be applied to learning in order to achieve the objectives of the learning (Cahyadi, 2019). In this stage the teaching materials that have been designed are developed by editing the animated video using video editing software, namely CapCut. Before the video editing stage is carried out using the CapCut software, first to take the slide material to be displayed, namely from the Canva application. After that, other animations can be added to the video material to make it look more attractive, then insert text and sound recordings containing the material presented in the animated video. Then after completing entering all the components needed, the animated video is complete. Teaching materials can be said to be valid and appropriate to use if the product has reached a valid category from the scores given by media and material experts.

If learning media has been developed, then a product validation will be carried out by a media and material expert, Dr. Ani Nur Aeni, M.Pd. The results of the media expert validation test and the material below are the results obtained when developing animated videos.

Table 4.
Results of Validation by Media Experts

Aspect	Indicator	Score	Criteria
Design	- Adaptation of animation to the characteristics of children - Animation accuracy with learning materials - The tidiness of the arrangement of learning material content - Accuracy of image size and layout - The attractiveness of learning videos in visual and audiovisual	4 x 5 = 20	very good/very suitable
Material	- Suitability of animated videos with basic competencies, indicators, and learning objectives - The material presented in animated videos is clear and easy to understand - The material that is loaded is sequential from easy to difficult	4 x 3 = 12	very good/very suitable
Legibility	- The text listed can be read by students - Students can understand the concept of material - Students can conclude the material - Learners can analyze questions at the time of evaluation	4 x 4 = 16	very good/very suitable
language	- The language used is communicative - The language used is in accordance with the stage of development of students - The accuracy of the use of grammar	4 x 3 = 12	very good/very suitable
	Score	**60**	
	Final score	**100%**	**Very good**

Based on the results of the final score from the expert validation in the 4 tables above as a whole it can be concluded that it shows the criteria of "Very good" with a score of 100%, which means that the animated video is very good and feasible to use during classroom learning.

The instructional material has certainly obtained validation status from media and content experts who assessed it. The implementation phase involves a trial conducted with 30 sixth grade students. Before the start of the lesson, the teacher administers a pretest to the students. Subsequently, the prepared animated video material is displayed using a screen in front of the class, with the assistance of a projector during the lesson, allowing the students to watch the presentation clearly. After the students have watched the animated video, they proceed to complete a provided posttest. The purpose of administering the pretest and posttest exercises is to measure the level of success of this animated video in improving the students' learning outcomes regarding their grasp of the concepts. In its implementation, students appear highly enthusiastic about the learning process because the video utilizes diverse animations.

The final stage of the learning which is carried out along with the pretest-posttest, students also fill out a response questionnaire regarding the animated video shown during that day's lesson. the results of a closed questionnaire were obtained as a student response to their learning by using learning media animated video material on the solar system.

Table 5.
Student Response Questionnaire Results

Aspect		Indicator	Percentage	Criteria
During the learning activities take place	-	When learning I am active in paying attention to the material that the teacher explains	89%	Strongly agree
	-	When I was studying, I actively expressed my opinion in front of the class	57%	Don't agree
	-	When learning, I am enthusiastic about participating in learning with animated videos	87%	Strongly agree
	-	When learning students feel confident	83%	Agree
After the learning activities take place	-	After learning I was active in giving opinions	73%	Agree
	-	After learning I feel satisfied with learning using animated videos	84%	Strongly agree
	-	After learning I do my assignments on time	73%	Agree
	-	After learning I am optimistic that I can do the task independently	83%	Agree
	-	After learning I experienced an increase in conceptual understanding of the material being taught	84%	Agree
	-	After learning I asked about material that I did not understand	52%	Don't agree

Based on the results of closed questionnaire responses to students from 30 students, there were 17 students (89%) strongly agreed that they were active in paying attention to the material the teacher explained. Then 22 students (57%) stated that they were not active in expressing their opinions in front of the class during the learning process because there were only a few students who dared to express their opinions in front of the class. A total of 17 students (87%)enthusiastic in participating in learning with this animated video. Then as many as 17 students (83%) felt confident in their ability to master the material when participating in learning. After the learning activities, as many as 21 students (73%) felt that they were active in giving opinions after learning by using animated videos. Then 18 students (84%) were satisfied with learning using animated videos because it gave them more enthusiasm to listen to the material provided. As many as 23 students (73%) were able to work on the posttest questions in a timely manner because as many as 18 students (83%) felt that they were optimistic that they could carry out their assignments independently. This was the result of an increase in conceptual understanding by as many as 17 students (84%) based on the material that had been taught through animated videos. Then as many as 22 students (52%) disagreed with the statement that they asked about material that they did not understand because most of them understood the material displayed.

This proves that this animated video learning media is feasible if used as teaching material for learning the solar system in grade VI Elementary School. Learning outcomes that are known after implementing this learning media are used to measure the effectiveness of the animated video learning media. In terms of learning outcomes, if students experience an increase in their scores, this animated video learning media can be said to be effective for learning. To compare student

scores both before learning and after learning the teacher gives pretest and posttest practice questions while learning. The following are the learning outcomes of the pretest-posttest trial using the Wilcoxon Test:

Tabel 6.
Wilcoxon Signed Rank Test Ranks

Ranks

		N	Mean Rank	Sum of Ranks
Post Test - Pre Test	Negative Ranks	0[a]	.00	.00
	Positive Ranks	30[b]	15.50	465.00
	Ties	0[c]		
	Total	30		

a. Post Test < Pre Test

b. Post Test > Pre Test

c. Post Test = Pre Test

Tabel 7.
Wilcoxon Signed Rank Test Output

Test Statistics[a]

	Post Test – Pre Test
Z	-4.786[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Based on the Wilcoxon Signed Rank Test Output, it is known that ***Asymp.Sig. (2-tailed) of 0.000 means less than a critical research limit (0.000 <0.05)*** so that it is concluded that "Hypothesis is accepted". This means that there are differences between the learning outcomes in the solar system material for the pretest and posttest, so we can conclude that there is indeed an influence from the use of animated video learning media on increasing mastery of the concepts of sixth grade elementary school students on the solar system material.

Conclusion

So in the results of a study regarding the development of learning media which was carried out to improve the mastery of the concepts of sixth grade elementary school students on solar system material, it can be concluded that judging from the results of the needs analysis in learning at the school that became a basis and reference for the development of animated video learning media This is because it is considered to be able to help improve students' mastery of concepts. When learning media has been developed and validated by media experts with 100% results it is very good when used for classroom learning. Furthermore, the responses of students who assess their behavior when learning and after learning show good results and experience changes while studying and after learning. With the acquisition of these results, it can be proven by the learning outcomes of students on the value of the pretest - posttest questions, namely obtaining results of 8 out of 30 students have not achieved the minimum criteria results, but 100% of the results

contained in the posttest questions are the scores owned by the students increased than the pretest. Therefore the development of this animated video is proven to be able to improve students' mastery of concepts.

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