



# Problem Based Learning Video on Force Material for Fourth Grade of Elementary School

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## ABSTRAK

Fakta di lapangan menunjukkan, guru kurang menggunakan media pembelajaran berbasis masalah saat mengajar. Hal tersebut berdampak pada rendahnya kemampuan pemecahan masalah siswa. Penelitian ini bertujuan untuk menganalisis efektivitas media video pembelajaran berbasis masalah mata pelajaran IPAS materi gaya di sekitar kita kelas IV sekolah dasar. Jenis penelitian yang dilakukan adalah penelitian pengembangan dengan menggunakan model ADDIE (Analyze, Design, Development, Implementation, Evaluation). Subjek penelitian ini ialah siswa kelas IV sejumlah 33 siswa. Metode dan instrumen pengumpulan data menggunakan kuesioner dan tes. Data dianalisis menggunakan teknik analisis deskriptif kuantitatif dan statistik inferensial. Hasil uji coba oleh ahli dan praktisi menunjukkan bahwa, media pembelajaran termasuk dalam kategori bagus dan dinyatakan sangat layak digunakan dalam proses pembelajaran. Hasil uji efektivitas media terhadap hasil belajar siswa menyatakan  $H_0$  ditolak dan  $H_1$  diterima. Dengan demikian dapat disimpulkan bahwa, inovasi media berupa video pembelajaran berbasis masalah pada mata pelajaran IPAS materi gaya di sekitar kita kelas IV sekolah dasar terbukti efektif diterapkan. Penelitian ini berimplikasi pada peningkatan partisipasi guru dalam menggunakan media video pembelajaran berbasis masalah guna mengembangkan kemampuan siswa dalam memecahkan masalah.

## ABSTRACT

Facts in the field show that teachers do not use enough problem-based learning media when teaching. This has an impact on students' low problem-solving abilities. This study aims to analyze the effectiveness of problem-based learning video media for the subject of science, the material of the forces around us, grade IV elementary school. The type of research conducted is development research using the ADDIE model (Analyze, Design, Development, Implementation, Evaluation). The subjects of this study were 33 grade IV students. The method and instrument for data collection used questionnaires and tests. Data were analyzed using quantitative descriptive analysis techniques and inferential statistics. The results of trials by experts and practitioners showed that the learning media were included in the good category and were declared very suitable for use in the learning process. The results of the media effectiveness test on student learning outcomes stated that  $H_0$  was rejected and  $H_1$  was accepted. Thus, it can be concluded that media innovation in the form of problem-based learning videos for the subject of science, the material of the forces around us, grade IV elementary school has proven to be effective in its application. This study has implications for increasing teacher participation in using problem-based learning video media to develop students' ability to solve problems.

## 1. INTRODUCTION

Learning media is a source of learning that can help teachers in enriching students' insights. Various types of learning media by teachers can help students in improving their knowledge (Prasetya & Harjanto, 2020; Wedyawati & Lisa, 2019). Learning media that is interesting for students can be a stimulus for students in the learning process. The use of learning media that is right on target and contains the right explanation of the material can support the success of the learning that is carried out (Ali, 2022; Dwistia et al., 2022). But in reality, teachers in elementary schools have not utilized learning media to support learning optimally. This is influenced by teacher competence and facilities and infrastructure in schools (Imawati et al., 2022; Fitri & Ardipal, 2021).

Teachers as the main actors in the education process are one of the determinants of creating quality education. Teachers play a key role in the learning process, which is the center of the entire education process (Sari et al., 2022; Darman, 2017). Some of the roles of teachers are as educators, teachers, facilitators, and innovators. In carrying out their roles, teachers are required to be able to choose methods and design learning activities that activate students, provide varied learning resources, and choose learning media that allow students to easily absorb information and are able to foster student learning motivation (Nailufar et al., 2022; Novera et al., 2022). The success of teachers in delivering material depends on the smooth communication between the teacher and the students. When teachers are unable to communicate smoothly, the message they want to convey may not be well understood by the students (Rahmi et al., 2023; Octavyanti & Wulandari, 2021). In this regard, teachers are required to master technology to facilitate students in the learning process. Teachers can use audio-visual media that can be used easily when delivering material. This type of audio-visual media can be in the form of learning videos. The object taken in the video can be adjusted to the character of the student (Sihotang & Simorangkir, 2020; Yuanta, 2020). Learning videos have many advantages, one of which is that they can improve students' language skills. Increased language proficiency can help students understand the material being taught.

Based on an initial interview with one of the fourth grade teachers at SD 8 Dauh Puri, it was stated that learning in class sometimes uses learning media. However, the teacher revealed that they still face difficulties in developing learning media even though computers or laptops are available. Facilities have been available in almost every school, but have not been utilized optimally. Laptops and Liquid Crystal Displays (LCDs) are still rarely used during learning. In the interview, it was also said that some students have difficulty in understanding science learning, especially in the material on force. This is evident from the results of student learning in the science subject, there are several students who are below the KKM standard, which is 75. There are 46% who have achieved KKM, while 54% of students have not achieved KKM. In the science subject, teachers sometimes invite students to do direct practice. However, from the observations made, some students enjoy learning more using media in the form of videos. Learning videos are media or tools in the teaching and learning process that contain learning materials. Videos are a series of moving images accompanied by sound elements that have a flow and are useful for conveying messages (Nainggolan, 2024; Wicaksono & Iswan, 2019). The use of videos in learning can be more effective in delivering material to students, so that the teacher's role is not only as a presenter of information, but also functions as a learning facilitator.

Natural and Social Sciences (IPAS) is a science that studies living things and non-living things in the universe and their interactions, and studies human life as individuals as well as social beings who interact with their environment. IPAS helps students grow their curiosity about the phenomena that occur around them (Dewi & Agung, 2023; Komara et al., 2022). This curiosity can trigger students to understand how the universe works and interacts with human life on earth. This study emphasizes the development of science content on the material of force. In order to maximize the use of media in science learning that requires direct learning, media development is carried out using the ADDIE model. The success of this problem-based media can be supported by providing problems that are easy for students to understand according to real events. One of them is by providing real problems to students. The use of problem-based video media will be very appropriate for the implementation of science learning.

Based on the description above, the urgency of this research is lack of use of problem-based learning media when teaching which has an impact on low student problem-solving abilities. This study aims to analyze the effectiveness of problem-based learning video media for the subject of science, the material of the forces around us in grade IV elementary school. Innovation of problem-based learning media on the subject of style is expected to be an example or reference for teachers in implementing problem-based learning activities using learning videos. This research is also expected to be able to increase teacher participation in using problem-based learning video media to develop students' problem-solving abilities.

## 2. METHOD

This research is a type of Research and Development (R&D) research with the ADDIE model. The stages of the ADDIE model consist of, the first stage of analysis or analysis is the stage of identifying problems and student needs and defining what is being developed. The analysis carried out in this study is analyzing learning needs, analyzing learning facilities and determining achievements, goals, learning, analyzing problems faced by schools related to what learning media are needed by schools to improve the quality of learning in the classroom, and analyzing the selection of materials related to the products that have been developed. The second stage is design, at this stage the design is carried out on product development. The activities carried out are designing learning media in the form of learning videos which

are reviewed from the subject matter, learning achievements, learning objectives, and indicators of achievement of learning objectives.

The third stage is development, which is carried out with several steps to realize the design in product development. The fourth stage is implementation which is carried out by testing the product of the development of learning video media applied by students according to the material that has been determined in the development of this learning video media. The last stage is evaluation. At this evaluation stage, it is a process to see how far the development of this learning video media is running and determine whether this learning media is successful according to initial expectations or not.

The subjects involved in the effectiveness test of this research development product were all 33 students of class IV A at SD Negeri 8 Dauh Puri, who were in one class including students with high, medium and low achievements. In this study, the researcher used data collection methods in the form of interviews, questionnaires, and tests. The instruments used in this study were questionnaires and tests. The material expert grid can be seen in Table 1, the expert grid of learning design on Table 2, learning media expert grid on Table 3, individual and group test grids on Table 4, and the effectiveness test grid on Table 5.

**Table 1.**The Content Expert Instrument Grid

No	Aspect	Indicator
1.	Curriculum	Suitability of material with basic competencies Suitability of material with learning indicators Suitability of materials to learning objectives
2.	Material	Truth of the material Material breakdown Completeness of materials Depth of material Suitability of materials to student characteristics The material is supported by appropriate media Easy to understand material The concepts presented can be clearly explained logically.
3.	Grammar	Appropriate and consistent use of language The language used is appropriate to the characteristics of the students

Source: [Suarthama \(2016\)](#) with modification

**Table 2.**The Learning Design Expert Instrument Grid

No	Aspect	Indicator
1.	Objective	Clarity of learning objectives Consistency between objectives, materials, and evaluation
2.	Strategy	Delivery of material in logical steps Learning activities can motivate students Provide examples for conceptual understanding Helps to remember previous skills and knowledge Giving students the opportunity to learn on their own
3.	Evaluation	Provide practice questions for conceptual understanding The questions presented are in accordance with the learning indicators Clarity of instructions for completing the questions

Source: [Suarthama \(2016\)](#) with modification

**Table 3.**The Learning Media Expert Instrument Grid

No	Aspect	Indicator
1.	Technical	Ease of using media Media can help students in understanding the material Media can generate motivation in learning Video can be replayed Video time duration
2.	Appearance	Text readability Use of images to support learning materials Proper use of font type, font size, and spacing The right and harmonious composition and combination

No	Aspect	Indicator
		Proper use of animation Proper accompanying music support Proper use of sound effects Use of appropriate narrative Appropriate layer display

Source: [Suarthama \(2016\)](#) with modification

**Table 4.**The Individual, Small Group, and Field Test Instrument Grid

No	Aspect	Indicator
1.	Appearance	The attraction of color Text readability Use appropriate type and size of letters Clarity of voice Image clarity
2.	Motivation	Media can motivate students
3.	Material	Easy to understand material Clarity of material description
4.	Operation	Ease of use Videos can be played multiple times

Source: [Suarthama \(2016\)](#) with modification

**Table 5.** The Grid for Compiling Multiple Choice Test Questions

No	Learning Outcomes	Learning objectives	Question Indicator
1	Students identify the benefits of style in everyday life. Students identify the types of style and the application of style in life.	Understand the basic concept of style  Identifying various types of force and changes in force form  Identifying the benefits and applications of style in everyday life	Given several statements, students can analyze the basic concept of force. Given several questions, students can determine the concept of force. Given several questions, students can determine the various styles related to daily activities. Given a question, students can determine the change in the form of force. Several statements are presented so that students can analyze changes in the form of force. Given several questions, students can determine the benefits of style. Given several statements, students can analyze the benefits of style. Given a question, students can determine the application of force in everyday life. Given several statements, students can analyze the application of force in everyday life.

Before use, multiple-choice questions are examined first for their content quality. The multiple-choice test instrument is subjected to expert judgment by experts in the field of science and science, then a trial of the instrument is conducted to determine its validity and reliability. The quality of the instrument must meet important requirements, namely the validity of the test items, the reliability of the test, the differentiating power of the test, and the level of difficulty of the test items. Furthermore, the data analysis techniques used in this study are qualitative descriptive analysis techniques, quantitative descriptive analysis techniques, and inferential statistical analysis techniques.

Qualitative data analysis techniques are carried out by grouping qualitative data in the form of interview results, media eligibility criteria, comments, responses, criticisms, and suggestions for improvement. The results of the data analysis are then used to revise the developed product. The quantitative descriptive analysis method is a method of processing data that is carried out systematically in the form of numbers or percentages regarding the object being studied in order to obtain general conclusions. The purpose of quantitative analysis is to process data obtained through questionnaires into

score form. Inferential statistical analysis techniques are used to determine the effectiveness of the developed product on student learning outcomes after using video learning media. The results of individual, small group, and field test data were collected using a post-test. After that, a prerequisite test (normality) was carried out before the hypothesis test (1 sample t-test) was carried out.

### 3. RESULT AND DISCUSSION

#### Result

This research was conducted on students of grade IV at SD Negeri 8 Dauh Puri. This study involved one grade IV consisting of 33 students of SD Negeri 8 Dauh Puri. The Development of Problem-Based Learning Videos was carried out by implementing the ADDIE development model which includes 5 stages, namely analysis, design, development, implementation and evaluation. The activities that have been carried out at each stage of the study can be presented as follows.

The first stage is the analysis stage which aims to determine the needs of research on the development of problem-based learning videos. At this stage, an analysis of learning outcomes and learning objectives is carried out so that the design and production of problem-based learning videos produced are truly effective for teaching students according to the demands of learning outcomes. Based on the results of the analysis, it is known that students are less enthusiastic about learning and tend to feel bored in the learning process because students are accustomed to using smartphones in online learning, so that when offline learning is carried out again, students are less interested.

The variety of digital media owned by teachers for learning science content at SD Negeri 8 Dauh Puri during the learning process is still limited. In addition, the learning resources used still use printed books obtained from the school so that they are less attractive to students. Judging from the facilities available at the school, the development of electronic media is also possible to be developed because there are computer devices, LCDs, projectors, Wi-Fi that make it possible to use media in the classroom.

The second stage is design, carried out based on information obtained from the previous needs analysis stage. At this design stage, data collection is carried out such as compiling an outline of the contents of the style material around us that was previously determined at the analysis stage. After compiling the material, it is continued by determining the software, hardware and school facilities that can be used in product development. The next activity is to create a design for learning video media (storyboard and flowchart) as the initial stage of the description of the development of learning videos and teaching modules. The product is designed with an attractive design that is equipped with images and presents material with clear and easy-to-understand letters. The use of color is also very important in the development of learning videos.

The third stage is the development stage, which is implementing what has been designed at the design stage to produce a product. Product development is adjusted to the flowchart and storyboard that have been designed. At this stage, the learning video is made in such a way that it becomes an interesting learning video and each scene of the video contains style material around us. After the learning video is finished, the video is uploaded to YouTube for easier access. Then continued with the stage of making a questionnaire to assess the feasibility of the product.

After the product was completed, an evaluation was conducted involving content/subject matter experts, instructional design experts, learning media experts, as well as individual testing with 3 students and small group testing involving 9 fourth grade students of SD Negeri 8 Dauh Puri. Then continued with the creation of post-test questions to test the effectiveness of using learning videos and conducting instrument trials in classes one level higher. The results of the media that have been developed can be presented at [Figure 1](#).



Figure 1. The Learning Video Media Display

The fourth stage is the implementation stage. This stage was carried out in class IV of SD Negeri 8 Dauh Puri with 33 students. This stage aims to apply or implement problem-based learning video products in the learning process to determine their effectiveness in learning. In this implementation stage, treatment was given using learning videos in 1 meeting with a time allocation of 2 x 35 minutes (2 JP) and learning syntax according to the teaching module. The last stage in this implementation is to provide a post-test to determine the knowledge competency in the material of forces around us in the science content after using learning videos. In the analysis of the feasibility data for the development of this Learning video, it discusses the results of product trials from expert content/subject matter tests, instructional design expert tests, learning media expert tests, individual trials and small group trials. The five data can be presented in Table 6.

**Table 6.**The Percentage of Results of Learning Video Product Trials

No	Test Subject	Results (%)	Qualification	Information
1.	Content Expert/Subject Matter	94.23	Very worthy	Revised as necessary
2.	Instructional Design Expert	92.5	Very worthy	Revised as necessary
3.	Learning Media Expert	92.85	Very worthy	Revised as necessary
4.	Individual Trial	95	Very worthy	No need to revise
5.	Small Group Trial	90.27	Very worthy	No need to revise

The average percentage of the overall score shows that the product with the qualification is very feasible. Therefore, the problem-based learning video developed is very feasible to be used in learning. At the trial stage of the learning video product, there were comments or suggestions from experts that were intended to revise the product being developed. Although the product was declared very feasible to be used, improvements need to be made according to the comments or suggestions from the experts, so that the product being developed becomes more perfect.

The effectiveness of developing problem-based learning videos was analyzed using inferential statistical analysis techniques. The instrument used to collect data was a test instrument. Before conducting the hypothesis test (1-sample t-test), a prerequisite test was first carried out in the form of a normality test. The data normality test was carried out using the Chi-Square technique. As for the chi-square table or for (0.05) (6) = 12.591 or can be written as = 12.59. < can be interpreted that the data is normally distributed. Based on the results of the calculation of the normality test of data distribution, the results obtained were = 4.75 and = 12.59, this means < so it can be concluded that the student learning outcome data is normally distributed.  $\chi^2_{count} < \chi^2_{table}$

After the normality test is carried out, it is continued with hypothesis testing. Hypothesis testing is carried out using the 1-sample t-test formula, the test criteria are to reject if with  $\alpha$  5%. Based on the results of the t-test obtained = 5.43 then compared at a significant level of 5% ( $\alpha = 0.05$ ) with known dk = (n-1) = (33-1) = 32. for dk 32 with a significant level of 5% ( $\alpha = 0.05$ ) is 2.03. The results show that = 2.03. Thus, the one that states there is no significant difference in learning outcomes between before and after the implementation of problem-based learning videos at SD Negeri 8 Dauh Puri is rejected and the one that states there is a significant difference in learning outcomes between before and after the implementation of problem-based learning videos at SD Negeri 8 Dauh Puri is accepted. It can be concluded that, problem-based learning video products are effectively used in the content of science subjects on the material of forces around us.  $t_{count} > t_{table}$

The fifth stage is the evaluation stage. The evaluation stage is carried out by analyzing the product at the implementation stage, whether the product made still has shortcomings or weaknesses or not. If there is no further improvement in the product, then the product is considered suitable for use as a learning medium. The evaluation used in this study is formative and summative evaluation. Formative evaluation is carried out to assess the product based on the results of expert assessments and the results of student responses to the developed product. Summative evaluation is carried out to measure the effectiveness of the developed product by giving a post-test to students at the implementation stage. The post-test data were then analyzed using a 1-sample t-test to determine the effectiveness of learning using learning video products.

**Discussion**

Learning is said to be successful if students are able to master and understand the material presented by the teacher. The teacher acts as an educator and guide in the learning process, a teacher can carry out his duties well if he masters and is able to teach in front of the class using methods and media that are appropriate to the subject (Firman & Anhusadar, 2022; Amala & Kaltsum, 2021). An educator who is less responsive to the development of education related to the availability of learning media in schools and

the use of existing facilities is still not optimal, so it is necessary to optimize its use. One important factor in the learning process is the use of learning media. The role of learning media is very necessary in the direct learning process (Pratama et al., 2022; Tafonao, 2018). An effective and efficient learning process can be seen from the use of learning media used in the learning process.

Learning media makes abstract things seem more concrete. Interesting learning media can increase students' interest in learning. In order for the learning process in schools to attract students' interest, teachers must use various models, methods or learning media, so that learning objectives can be achieved (Fitrianiingsih et al., 2022; Palupi, 2020). Problem-based learning videos on the science material on force content were chosen because in the learning process, the teacher connects and displays the learning material provided with the surrounding environmental situation, thus encouraging students to connect the knowledge they have with its application in real life (Fitriani & Yudiana, 2022; Mu'minah, 2021). The development of this learning media is able to create media that is appropriate to needs and can increase students' sense of learning in class.

The term learning video itself refers to videos that are designed or used for learning activities, such as stimulating attitudes, showing a place virtually and realistically, increasing knowledge, training skills, and so on. Thus, videos can be said to be able to teach various types of lesson topics, both cognitive, affective, and psychomotor. Learning is a combination that is composed of human elements, facilities, equipment, and procedures that influence each other to achieve the goals of learning itself (Prasetya & Harjanto, 2020; Wedyawati & Lisa, 2019). Learning videos are one type of media that emphasizes the power of sound and images. Learning videos can explain concepts and trigger discussions between students. Therefore, learning that utilizes videos can create interactions between students and students, students and teachers, and students and learning resources.

Based on several opinions, it can be concluded that learning videos are an audio-visual media that has an important role when used as a learning medium because it can help teachers in delivering material and visualizing the material in real terms so that students can see the concept of the material directly through the learning video (Putra et al., 2023; Nurwahidah et al., 2021). Video media is a set of components that can display an image and sound simultaneously. By utilizing learning videos, students tend to understand and remember the material more easily because it involves the senses of hearing and sight.

Learning videos are media that contain audio-visuals that are used in delivering learning messages that contain materials, concepts, and theories that can help in understanding the material being taught. The messages presented in the video can be facts (events, important events, news) or fiction (such as stories), can be informative, educational or instructional (Nainggolan, 2024; Rahmawati & Atmojo, 2021). Video media used in the teaching and learning process has many benefits and advantages, including; videos can be a substitute for the natural environment and can show objects that students cannot normally see, can describe a process accurately and can be viewed repeatedly, and encourage students to increase student motivation to keep watching it (Fitrianiingsih et al., 2022; Putra et al., 2023).

In this problem-based learning video, the problems associated are real problems and are related to students' daily lives. Problem is a word that we often hear in everyday life. A problem is an obstacle or issue that must be solved, in other words, a problem is a gap between reality and something good. The problem here is a real problem faced by students in everyday life, not a scientific problem. In addition, the problem chosen should be a problem that is useful for students, then the problem is formulated clearly so that it is easy to understand. Teachers can formulate the problem themselves, but teachers are also allowed to involve students in formulating it. So the problem can come from the teacher, can come from students and can also come from both.

Problem-based learning is a learning method that uses real-world problems as a context for students to learn about critical thinking and problem-solving skills and to acquire the essential knowledge and concepts of the subject matter (Rahmi et al., 2023; Sihotang & Simorangkir, 2020). This learning will create critical individuals with a very high level of creativity and a higher level of thinking skills.

This research is in line with previous research which states that the learning videos developed are valid, practical and effective for use in grade V of elementary schools (Fitriani & Yudiana, 2022; Pratama et al., 2022). The similarity of the research with the research developed is in the development of learning videos. The research shows that the learning videos developed meet the criteria of validity, practicality, and effectiveness. Previous research also stated that the learning video on the material on the human digestive system that was developed met the criteria of being valid, practical, and effective in improving the science literacy of fifth grade elementary school students (Imawati et al., 2022; Fitri & Ardipal, 2021).

The innovation of problem-based learning videos in this study has proven to be effective in being applied to the content of the natural sciences lesson on the material of forces around us for grade IV in the odd semester at SD Negeri 8 Dauh Puri. This study has implications for increasing teacher participation in using problem-based learning video media to develop students' problem-solving abilities. The limitation of

this research is that the development product only discusses the material of style intended for elementary school students, especially in the subject of science and science for grade IV. This research only makes a product in the form of a problem-based learning video. Based on this, it is expected that other researchers can conduct similar research with a wider scope of material and more innovative media development in the future.

#### 4. CONCLUSION

Based on the results of the research conducted, it can be concluded that, the innovation of problem-based learning videos is effectively applied to the content of the science subject matter of the forces around us for grade IV of the odd semester at SD Negeri 8 Dauh Puri. Problem-based learning videos are suitable for use during the learning process because they are very suitable based on the assessment results by the trial subjects and receive positive comments or suggestions regarding the development of learning videos. Students are guided to actively develop knowledge through problem-based learning experiences, so that they can improve students' ability to think critically and improve digital literacy according to 21st century learning.

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