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# Development of Animation Learning Media Based on PBL to Improve Thematic Learning Outcomes Students

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**ABSTRACT**

**Objective:** 21st-century learning must prepare generations of Indonesian people to support information and communication technology advances in social life. The rapid development of technology in the current era of globalization provides multiple benefits for the world of education, so education requires students who play an active role and educators who create innovative learning. Learning innovation can be done in various ways, including developing interactive learning media. This aims to create exciting learning to improve students' thematic learning outcomes. **Method:** The research used Borg & Gall's research and development, creating an ecosystem into three stages in the VA and VB classes at 5 Way Serdang Public Elementary School. The sample consisted of 42 students in the experimental and control classes. The data analysis technique uses the Effect Size test. **Results:** The data obtained had an effect size of 1.02, with an extensive interpretation of the effect. **Novelty:** This research presents novelty by designing PBL-based animated learning media containing menus and moving images on the media to attract students' attention and enthusiasm. This aims to improve students' thematic learning outcomes.

## INTRODUCTION

21st-century learning must prepare Indonesian human generations to welcome the advancement of information and communication technology in social life. The 21st century is also known as the age of knowledge. Namely, all alternative efforts to meet life's needs in various contexts are more knowledge-based (Muhali., 2019). The current development of technological life is proof that life is constantly developing and continues to innovate in various aspects (Rahmawati et al., 2021). Education plays a role in creating the nation's next generation ready to face changing times. Education in the 21st century is student-centered learning; students are free to search for learning resources (Afni et al., 2021). The Indonesian government supports 21st-century learning implemented in the 2013 Curriculum, namely 1) critical thinking and problem-solving, 2) creativity and innovation, 3) communication, and 4) collaboration, also known as 4C skills (critical thinking and problem-solving, creativity, and innovation, communication, collaboration) (Aslamiah et al., 2021). The rapid development of technology in the current era of globalization provides multiple benefits for the world of education because it has a crucial role in supporting human life. Humans cannot be separated from education when they run their lives. Based on this, education requires students who play an active role and educators who create innovative learning (Fonna, 2019).

Learning innovations can be developed by educators and applied to students. Learners to be creative, independent, physical and psychological development requires

Learning that uses interactive media in the current era of education, education today, science, and technology is the main center of more exciting learning. The attractiveness of the media can be obtained through various media designs. Science and technology are developed based on the times throughout this country. The development of Science and Technology has resulted in a change in the learning paradigm, characterized by changes in curriculum, media, and technology (Rahayu et al., 2022). Learning media in the form of video is one of the innovative audio-visual media that can support more exciting learning. Learning videos can help teachers deliver learning material by utilizing technology; this also includes teacher professional development in exploring the use of videos in learning (Danish et al., 2021).

One of the applications of learning with technology is the use of learning media. Learning media are objects used to facilitate communication and interaction between educators and students in the learning process in the classroom to achieve specific goals by providing a variety of teaching realities so that students' experiences are more concrete and optimize existing teaching materials. Suitable media can overcome the passivity of students during the learning process. Several factors are considered for learning media to be selected appropriately, including objectivity, effectiveness, and efficiency (Susanti, 2021).

Learning media innovation is developing software educators can use to create learning media. Media is any person, material, tool, or event that makes learners receive knowledge, skills, and attitudes (Batubara, 2020). Learning media can be known as moving image animation, which currently utilizes much computerization in creation (Lestari et al., 2022). It can be applied to thematic learning in the classroom. Learning media has an essential position in the learning system component. Good communication between educators and students will not occur without media, and the learning process will not occur optimally. To optimize this, educators are forced to involve themselves in being innovative educators in developing learning media. This can hone the ability of educators who may have yet to be able to apply correctly. Innovation in making learning media is a top priority in developing the education system. The application of animated video learning media is very suitable to be applied in the current developing era because it is considered capable of improving student quality and advancing in the field of technology, training students' critical thinking processes in paying attention to the learning process (Sakila et al., 2024)

Media is one of the supporting tools in the learning process to achieve success, connecting the giver (educator) and the recipient of student information (Nurfadillah et al., 2021). The definition of media in the teaching and learning process is interpreted as graphic, photographic, or electronic tools for capturing, processing, and compiling—back visual or verbal information. The definition of media in the teaching and learning process tends to be interpreted as graphic, photographic, or electronic tools for capturing, processing, and compiling. Back visual or verbal information (Ibrahim et al., 2022).

Learning media facilitates the delivery of learning material from an educator to students to help educators and facilitate students' understanding of the learning process (Yanto, 2019). Learning media can motivate students to participate in the learning process and encourage students to achieve maximum learning outcomes. In order for learning media to be selected appropriately, several factors are considered in selecting learning media, including objectivity, effectiveness, and efficiency (Susanti, 2021); learning media generally functions to facilitate the delivery of learning material from an

educator to students so that it can help educators and facilitate students' understanding in the learning process (Yanto, 2019). The learning media used must be able to make students more interested and foster curiosity about the learning media used to generate interest in learning following the learning process. There are several types of learning media, one of which is animation.

Animation is a moving image formed from a set of objects arranged in an orderly manner at a certain speed. Animation is formed from a collection of moving images in the form of objects with specific effects to make them look more realistic and exciting. Objects contained in the animation can be living or non-living objects. An animation looks interesting because it is given the right mix of colors and supporting writings, and the animation will be more interesting if given sound or audio (Savitri, 2022). Video animation is a specially arranged moving image media that comes from various objects and combines audio and visual media to attract students' attention and help convey messages or information more quickly (Madhuri, 2020).

Animation video is a combination of audio and visual media intended to attract students' attention, present objects in detail and interestingly, and help them understand difficult lessons (Apriansyah, 2020). Using animated video media can indirectly provide experience for students and make it easier for them to receive concrete explanations (Pramesty et al., 2022). Animated videos are audiovisual-based learning media because this media can present information that can be seen, heard, and acted at once (Rohman et al., 2024). Animation Video is a media in the form of a video where a character is the host or host of the video (Almagofi et al., 2024).

The benefits of using animated videos include (1) attracting students' attention because of the movement and sound; (2) beautifying the media in the teaching and learning process; (3) making it easier for students to absorb material; (4) being able to explain material that is considered difficult; (5) facilitating the learning arrangement. Animated video media is a type of media that is considered capable of providing increased understanding and learning activities for students (Aini et al., 2021). Currently, various types of media can be accessed whenever we want, wherever we want; this is because the media has experienced significant development, and it is beneficial for educators to distribute messages or information instantly wherever they want. Affirming the media, namely "a medium is a channel of communication term refers to anything that carries information between a source and a receiver. Examples include video, television, diagrams, printed materials, computers, and instructors." (Yuniastuti et al., 2021). Animated learning media can be applied to all subjects, including thematic learning.

Thematic learning is an integrated kindergarten or elementary school learning model based on specific themes contextual to the child's world. The purpose of thematic learning is to make it easier for students to center on learning topics, develop subject knowledge and competencies on one theme, and provide more memorable material deepening (Assingkily et al., 2019). In the 2013 Curriculum, the aspects assessed depend on the graduate competency standards (CS), core competencies (CC), and essential competencies (BC) (Emmalia et al., 2022). Thematic learning based on 21st-century skills is an educational innovation in Indonesia designed to optimize the golden generation by fostering creativity and critical thinking in students (Wardhani et al., 2022).

Integrated thematic learning is organized in the form of themes combined with several subjects to thoroughly introduce subject matter concepts to students so that students can actively discover and explore meaningful and accessible concepts and

principles (Merika et al., 2022). Thematic learning is found in the 2013 curriculum, which emphasizes problem-solving by students in learning activities both in groups and individually so that they can communicate the results of problem-solving. Therefore, learning activities are directed to be student-centered. To achieve meaningful learning objectives, a syntax of learning strategies that focuses on each learning objective is needed to improve learning outcomes and students' thinking skills. The 2013 curriculum is designed to improve students' competence (Dewi et al., 2021).

According to Fatmawati (2022), the Thematic curriculum can be interpreted as a learning activity by integrating several subjects and materials into one topic and discussion. Meanwhile, according to Lubis et al. (2020), thematic learning is a combination or combination of several subjects within the scope of madrasah ibtidaiyah/ elementary school, including Pancasila and Citizenship education, Social Sciences, Natural Sciences Mathematics, Indonesian Language Cultural Arts and Crafts, and Physical Education Sports, and Health. From some of the above opinions, thematic learning, also called integrated learning, is a learning approach that involves several subjects to provide meaningful experiences to students. Meaningful in the sense that students will understand the concepts they learn through direct experience. A learning model is needed to implement thematic learning and animated learning media, one of which is Problem-Based Learning.

Problem-based learning involves asking a question or a problem, focusing on inter-disciplinary relationships, authentic investigation, producing and exhibiting work, and collaboration (Masrinah et al., 2019). PBL is a teaching approach that uses real-world problems as a context for students to learn learning outcomes and problem skills and obtain essential knowledge and concepts from the subject matter (Kusmiati, 2019). Problem-based learning focuses on presenting a problem (actual or simulated) to students. Students are asked to find a solution through research and investigations based on theories, concepts, and principles they learn from various sciences. The problem is the learning process's focus, stimulus, and guide. At the same time, the educator becomes a facilitator and guide. Problem-based learning is a form of learning based on the paradigm of constructivism, which is oriented toward the learning process of students (student-centered learning) (Mayasari et al., 2022). The PBL learning model is a learning model that expects students to work on authentic problems to compile their knowledge, develop inquiry and higher thinking skills, and develop independence and self-confidence.

PBL characteristics, namely: (1) learning is student-centered: the PBL learning process focuses more on students as learners; (2) authentic problems form the organizing focus for learning: the problems presented to students are authentic; (3) new information is acquired through self-directed learning: students try to find information through their sources, either from books or other information; (4) learning occurs in small groups: carried out in small groups; (5) teachers act as facilitators: Educators only act as facilitators (Arifudin, 2020).

The material in Curriculum 2013 is presented in the form of themes that connect several subjects. Curriculum 2013 also expects maximum utilization of technology in every lesson. This is due to the rapid development of science and technology, which means that humans must also be faster in taking education in line with current developments. One of the uses of IPTK in education is assessment (evaluation) (Andhani et al., 2023). Learning outcomes are evidence of students' success where each activity can cause a unique change; in this case, learning outcomes include activeness,

process skills, motivation, and learning achievement (Aprilia, 2024). As a basis for knowing the need for thematic learning in the classroom, the researcher conducted a pretest on grade V students in 3 schools; the data results can be seen in Table 1.

**Table 1.** Thematic score data of fifth-grade students at Public Elementary School Way Serdang, Public Elementary School 5 Way Serdang, And Public Elementary School 19 Way Serdang.

| School | Class | Minimum Score | Amount | Criteria | |
|---|---|---|---|---|---|
| | | | | Complete | Incomplete |
| Public Elementary School 5 Way Serdang | VA | 70 | 20 | 8 | 13 |
| | VB | | 22 | 10 | 11 |
| Public Elementary School 3 Way Serdang | VA | 70 | 26 | 9 | 17 |
| Public Elementary School 19 Way Serdang | V | 70 | 14 | 6 | 8 |
| Amount | | | 82 | 33 | 49 |

Table 1 shows the results of complete scores reaching the KKM of thematic learning, which amounted to 44 students, and 62 students needed to be completed. Based on the data obtained in preliminary research, it is concluded that students' ability to learn thematically still needs to improve. The low ability of students to learn thematically is one reason researchers examine students' cognitive aspects. The importance of cognitive abilities for students is so that students can develop their perceptions based on what they see, hear, and feel so that students have a complete understanding and can train their memories of all events or events that have been experienced so that students can understand various symbols in the world, students can perform reasoning that occurs in natural processes or scientific processes, and so that students can solve the life problems they face so that in the end students will become individuals who can help themselves. (Source: preliminary research results). Supporting data is presented in Table 2.

**Table 2.** Educator interview results.

| School | School Needs |
|---|---|
| Public Elementary School 3 Way Serdang | 1. Still need to develop animated learning media.<br>2. Teaching materials used in the form of student/learner books.<br>3. It is not easy to develop a PBL learning model. |
| Public Elementary School 5 Way Serdang | 1. The PBL model still needs to be developed.<br>2. Learning media taken from the internet/YouTube |
| Public Elementary School 19 Way Serdang | 1. Have not developed animated learning media<br>2. The PBL model has yet to be developed. |

Strengthening the preliminary research, the researcher conducted observations of students N = 82 in three schools, namely Public Elementary School 3 Way Serdang, Public Elementary School 5 Way Serdang, and Public Elementary School 19 Way Serdang, presented in Table 3.

**Table 3**. Observation results.

| School | Observation Result |
|---|---|
| Public Elementary School 3 Way Serdang | 1. Some students are not focused on learning<br>2. Educators become the primary source of learning.<br>3. Teaching materials in the form of books |
| Public Elementary School 5 Way Serdang | 1. Learning is not interesting<br>2. teacher-centered learning<br>3. Learn using videos taken from YouTube. |
| Public Elementary School 19 Way Serdang | 1. Educators need to be more expansive in developing animated learning media.<br>2. Students need to focus more on learning because they feel bored.<br>3. The PBL model has not been applied in learning. |

Based on student learning results, interviews, and observations in learning, it is clear that there are still many deficiencies in learning that need to be developed, one of which is the development of PBL-based animated learning media because based on tables 1, 2, and 3 there has been no development of learning media. From the results of observation data, it can be concluded that students from the third school are less interested in thematic learning, students are not satisfied with their learning outcomes, educators still need to use animated video-based learning media, and learning does not activate students in class. The background above is a benchmark for developing animated learning media that can be used to achieve learning goals. Animation is a series of images arranged sequentially or called frames. The frame contains images displayed alternately for a specific time, which will look like moving images. The more images displayed at one time, the smoother the animation will appear. The unit used in this case is called frames per second (fps). This aims to improve students' thematic learning outcomes. Based on the description above, researchers are interested in "Developing PBL-Based Animation Learning Media to Improve Students' Thematic Learning Outcomes."

## RESEARCH METHOD

This research is development research (Research and Development/R&D). This research refers to the design model from Borg and Gall, whose substrate is three steps. Namely 1) the preliminary study stage, 2) the product development stage, and 3) the product testing stage. Product development design uses the ADDIE model (Sumiati et al., 2023). The product testing stage is carried out internally and externally. The flow of research activities is shown in Figure 1. Sampling using purposive sampling because it contains sample characteristics that the researcher has determined, so this sampling technique is called purposive sampling. The research samples were (control class) VA class students and VB students (experimental class) from Public Elementary School 5 Way Serdang. The instruments used in the study were non-tests (questionnaires) and tests (items of questions). Before the test, validation was carried out first to determine the instrument's feasibility, which is made likely in Figure 1.

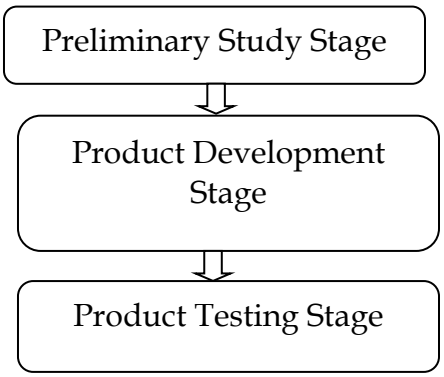


**Figure 1**.Research flowchart.

The data analysis techniques used are instrument prerequisite tests, validity analysis techniques, practicality level analysis, and effectiveness data analysis, one of which is the effect size test. The effect size test can use the formula:

$$\mu^2 = \frac{t^2}{t^2 + df}$$

(Jahjouh, 2014)

Notes:
μ = effect size
t = t-test value
df = Number of degrees of freedom, (n1 - 1, n2 - 1); n1, n2 (number of groups 1 and group 2).

The results of the effect size calculation are interpreted with the criteria in Table 4.

**Table 4.** Effect size interpretation.

| Effect Size | Interpretation of Effect Size |
|---|---|
| μ ≤ 0.15 | Very Small Effect |
| 0.15 < μ ≤ 0.40 | Small Effect |
| 0.40 < μ ≤ 0.75 | Medium Effect |
| 0.75 < μ ≤ 1.10; | Large Effect |
| μ > 1.10 | Very Large Effect |

## RESULTS AND DISCUSSION

### *Results*

This section describes the results of the validity, practicality, and effectiveness tests. The validity test was conducted on three experts: material, media, and language. The results are in Tables 5, 6, and 7.

**Table 5** Assessment results by material expert validators.

| Assessment aspect | Aiken index Per aspect | V Aiken |
|---|---|---|
| Curriculum | 0.87 | |
| Content | 0.91 | 0.87 |
| Presentation | 0.83 | |
| Applicability | 0.85 | |

**Table 6**. Assessment results by media expert validators.

| Assessment aspect | Aiken index Per aspect | V Aiken |
|---|---|---|
| Device | 0.87 | 0.88 |

| Assessment aspect | Aiken index Per aspect | V Aiken |
|---|---|---|
| Visual communication | 0.84 | |
| Characteristics | 0.91 | |

**Table 7.** Assessment results by language expert validators.

| Assessment aspect | Aiken index per-aspect | V Aiken |
|---|---|---|
| Assignment | 0.83 | 0.78 |
| Linguistics | 0.77 | |
| Appropriateness to learner development | 0.79 | |
| Use of terms and symbols | 0.75 | |

After conducting the validity test, the next step is conducting the practicality test. The practicality test aims to determine the use of PBL-based animated learning media. Three educators and 15 students were included in the trial. The results of the practicality test can be seen in Tables 8 and 9.

**Table 8.** Results of practicality test by educators.

| No | Aspect | Percentage (%) | Category |
|---|---|---|---|
| 1 | Media | 87.12 | Very Good |
| 2 | Content | 83.33 | Very Good |
| 3 | Design | 74.28 | Good |
| 4 | Benefits | 90.00 | Very Good |
| **Average** | | 83.68% | |
| **Category** | | Very Good | |

**Table 9.** User test results by learners.

| No | Aspect | Percentage (%) | Category |
|---|---|---|---|
| 1 | Media | 87.16 | Very Good |
| 2 | Content | 88.53 | Very Good |
| 3 | Design | 92.66 | Good |
| 4 | Benefits | 90.00 | Very Good |
| **Average** | | 89.45% | |
| **Category** | | Very Good | |

After the practicality test, the next stage is the effectiveness test using effect size. Effect size aims to determine the magnitude of a variable's influence on other variables. Table 10 presents the following effect size analysis results.

**Table 10.** Effect size test results.

| Effect size | Interpretation |
|---|---|
| 1.02 | Significant effect |

Based on Table 10, it produces 1.02 with the interpretation of a huge effect, so it can be concluded that the PBL-based animated learning media of the experimental class has a significant effect compared to the control class without using learning media.

### *Discussion*

The development of PBL-based animated learning media in this research has a title that corresponds to the class V theme, namely Theme 1, subtheme 1, learning about animal movement organs. The presentation of material on learning media is limited by

subjects, namely Indonesian and Natural Sciences, so that students can learn as a whole, and students are also encouraged to form connections from each material studied as a whole; this is in order to improve the thematic learning outcomes of class V students. Apart from that, the learning media developed includes animated images, which can increase the interest of students' learning. PBL-based animated learning media is a learning media that is validated by several validators so that it is valid for use as learning. Learning media is software that can display large amounts of information in text form to users, and users can explore the information contained in the media to improve learning outcomes. Student learning outcomes are achievements achieved academically through exams and assignments, as well as active asking and answering questions that support acquiring these learning outcomes.

Learning outcomes are action patterns, values, understandings, attitudes, appreciation, and skills. Student learning outcomes obtained through education will be able to compete in various activities of community life. The current competitive situation requires quality human resources, namely skilled human resources. To improve learning outcomes, educators with high competence, practical learning, and the role of parents are needed. Educator competency is the ability possessed by an educator so that it is easy for him to carry out his duties. Therefore, the quality and results of the educator's work can show quality professional actions. This can be supported by using supporting media, namely learning media, which can be used to make it easier to demonstrate knowledge, provide complete appeal, and touch all child modalities with attractive media designs. The presentation of teaching materials in the form of learning media can be designed according to the theme for teaching purposes (Rejeki et al., 2020).

PBL-based animated learning media is developed by compiling essential competencies to learning indicators. The development process requires valid testing to use the product in learning. To prove that the media developed is valid, it is tested by experts, namely material, media, and language, with an average value of 80.00%, 83.50%, and 84.00%, respectively, in the outstanding category. Validation is carried out to get helpful criticism and suggestions as a refinement of the learning media developed. These criticisms and suggestions are helpful for researchers to consider and make improvements before the product is tested. The validity of the product was then tested in small groups by 15 students and three educators, both of which resulted in an average score of 83.68% and 89.45% in the outstanding category. So, the validity test on PBL-based animated learning media is valid. As a follow-up to conducting extensive group testing, we also need to know if the product effectively improves the thematic learning outcomes of students.

Based on research conducted in the control class and experimental class, it was stated that there was an increase in students' thematic learning outcomes in the average pretest and posttest scores. The research was carried out at Elementary School 5 Way Serdang. The increase in thematic learning outcomes of experimental class students was more significant than that of the control class. This increase occurred due to experimental class learning using PBL-based animation learning media. The development of learning media aims to improve students' thematic learning outcomes. This is done by conducting an effectiveness test. The effectiveness of PBL-based animated learning media aims to determine the level of effectiveness of learning media in improving students' thematic learning outcomes in external tests using control classes and experimental classes with data analysis that has been carried out affect Size

test which aims to determine how much learning effect on experimental classes and control classes, after conducting the Effect Size test obtained an average value of 1.02 with an extensive effect interpretation.

The development of PBL-based animated learning media to improve student thematic learning outcomes based on the results of validity, practicality, and effectiveness tests can conclude that learning media can improve student thematic learning outcomes and can be used in further learning at the elementary school level. The research results on the development of PBL-based animation learning media have several limitations, namely that this research is only for class V, theme 1, animal and human locomotion, sub-theme 1, animal locomotion, and learning 1. This research and development has only reached the seventh stage of the ten steps of Borg's research and development. & Gall, the population in this study only focused on class V students in Gugus Way Serdang, Way Serdang District, Mesuji Regency. Testing the effect of using PBL-based learning media was only conducted at one of the Public Elementary Schools, 5 Way Serdang School. Another limitation, the requirement to access animated learning media, is having a computer or laptop.

## CONCLUSION

**Fundamental Findings:** Research and development results show that (1) PBL-based animated learning media products using the ADDIE model developed are valid in terms of content and construct. The results of the material, media, and language validation test analysis prove the validity of the product. Researchers also assessed user responses from students and practitioners, namely educators, which was an outstanding category. (2) Animation-based learning media is efficacious in improving student learning outcomes and student learning outcomes skills with an effect size of 1.02; the effect category is vast, so it can be concluded that there is a difference in student learning outcomes using PBL-based animation learning media and those without. They were used on class V students at Public Elementary School 5 Way Serdang. **Implication:** Teachers can use this animated learning media because it can improve students' thematic learning outcomes. This is based on developing learning media that contains images and sound to attract the audience. **Limitation:** Research and development have drawbacks. Namely, learning media can only be applied with a laptop. **Future research:** Researchers hope that future research can develop products that can be applied to various types of electronics.

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