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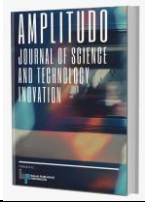

Implementation of Problem-Based Learning Model with Three-Dimensional Media and Interactive Games to Improve 3 Domains of Student Learning Outcomes

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Abstract: This study aims to describe the profile of student learning outcomes in the affective, cognitive, and psychomotor domains through the application of the Problem Based Learning (PBL) model supported by three-dimensional media and interactive games in grades V and VI of SD Negeri 29 Ampenan. This type of research is a case study with a descriptive approach. Data collection was carried out using observation sheets to assess the affective domain, a final learning test to assess the cognitive domain, and a performance sheet to assess the psychomotor domain. The learning topics include 4 topics, namely Listening to folk tales., Pancasila in my life, Diseases affecting the musculoskeletal system, and Hearing because of sound. The learning implementation was carried out on July 23, 24, 25, and 26, 2024, respectively. The results showed that the application of PBL with three-dimensional media and interactive games had a positive effect on the three domains of learning outcomes. In the affective domain, students showed increased cooperation, responsibility, and discipline. The cognitive domain recorded a good understanding of the learning concept according to the topic. In the psychomotor domain, students were able to complete practice-based tasks with satisfactory results. These findings support the constructivism theory, which emphasizes the importance of hands-on and interactive experiential learning to enhance deep conceptual understanding. This study recommends the use of innovative media such as three-dimensional and interactive games in the PBL model to enhance students' learning outcomes holistically.

Keywords: Problem-Based Learning; Three-dimensional media; Interactive games.

Introduction

Elementary education has a strategic role in building the foundation of character, knowledge, and skills of students. At this level, the learning process is expected to create a fun and challenging learning experience, so that students are motivated to learn actively and creatively (Khoiri et al., 2020). However, the reality in the field shows that many learning processes in elementary schools are still oriented towards passive knowledge transfer, which does not support the development of attitudes, knowledge, and skills holistically (Hikmawati Hikmawati et al., 2023).

In the context of the Merdeka curriculum, there is a demand to present learning that is not only centered on teachers, but also provides space for students to develop critical reasoning skills, creativity, independence, mutual cooperation, global diversity, and of course faith and devotion to God Almighty (Widiyono et al., 2021). One of the relevant models to realize the Pancasila Student Profile as expected from the implementation of the Merdeka Curriculum is the Problem-Based Learning (PBL) model. This model encourages students to learn

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through solving real contextual problems, so that they are able to integrate theory with practice (Astalini et al., 2023).

The operational steps of the PBL model in the learning process are as follows. 1. Basic Concept: The teacher provides basic concepts, instructions, references, or links and skills needed in the learning. This is intended so that students can enter the learning atmosphere more quickly and get an accurate 'map' of the direction and purpose of learning; 2. Defining the Problem: In this step, the teacher conveys a scenario or problem and students carry out various brainstorming activities and all group members express their opinions, ideas, and responses to the scenario freely, so that various alternative opinions are possible. 3. Self-Learning: Students look for various sources that can clarify the issue being investigated. The sources in question can be in the form of written articles stored in the library, web pages, or even experts in relevant fields; 4. Exchange knowledge: After obtaining sources for the purpose of deepening the material in the independent learning step, then at the next meeting students discuss in their groups to clarify their achievements and formulate solutions to group problems. This exchange of knowledge can be done by students gathering according to their groups and teachers; 5. Assessment: Assessment is carried out by combining three aspects, namely knowledge, skills, and attitudes (Hikmawati Hikmawati et al., 2021; Pratiwi & Wuryandani, 2020).

Before starting the teaching and learning process in the classroom, students are first asked to observe a phenomenon first. Then students are asked to record the problems that arise. After that, the teacher's job is to stimulate students to think critically in solving existing problems (Suparman et al., 2021). The teacher's job is to direct students to ask questions, prove assumptions, and listen to opinions that differ from theirs. Utilizing the student's environment to gain learning experiences (Palupi et al., 2020). The teacher gives assignments that can be done in various contexts of the student's environment, including at school, family and community (Uliyandari et al., 2021). Assignments given by the teacher provide opportunities for students to learn outside the classroom. Students are expected to be able to gain direct experience of what is being learned. Learning experiences are learning activities that must be carried out by students in order to achieve mastery of competency standards, basic skills and learning materials (Suhirman et al., 2021).

The use of innovative learning media is an important element in supporting the success of PBL (Kurniasari & Purwanta, 2019). Three-dimensional media, for example, provides visual and kinesthetic experiences that can facilitate understanding of abstract concepts. When combined with interactive games, students not only get visual and physical stimulation, but also gain additional motivation to be actively involved in the learning process (Hikmawati Hikmawati, Kosim, et al., 2019).

Interactive games also have great potential to increase student participation in learning. As a fun tool, games can change the learning atmosphere to be more interesting. In addition, the competitive elements contained in games can encourage students to excel while learning to solve problems creatively and collaboratively (Simanjuntak et al., 2021).

However, the application of the PBL model with three-dimensional media and interactive games requires careful planning and adaptation to student needs. Not all students have the same background in terms of access to technology or independent learning abilities. Therefore, research is needed to evaluate the effectiveness of this media combination in various educational contexts, including in elementary schools (Devy Alvionita et al., 2020).

This study aims to examine how the application of the PBL model with three-dimensional media and interactive games can develop three domains of learning outcomes, namely the affective, cognitive, and psychomotor domains of elementary school students. In this case, affective includes cooperation, responsibility, and discipline; cognitive includes understanding of lesson concepts; while psychomotor includes problem-solving abilities and motor skills (Bonafide et al., 2021).

Previous studies have shown that the PBL model is effective in improving students' critical and collaborative thinking skills. However, there has not been much research integrating PBL with three-dimensional media and interactive games in elementary school learning. Therefore, this study is expected to contribute to the development of innovative and contextual learning models. In addition, this study is relevant to the needs of 21st-century education that requires students to have critical, creative, and effective collaborative thinking skills. The implementation of PBL supported by modern media (digital-based) not only supports mastery of subject matter, but also equips students with the competencies needed to face future challenges (Rachman et al., 2020).

Method

This research is a case study research that aims to describe the learning outcomes of grade V and grade VI students at SD Negeri 29 Ampenan in terms of attitudes, knowledge and skills through the application of problem-based learning (PBL) models with three-dimensional media and interactive games (Creswell, 2012). The stages of the PBL model include 5 phases. Phase 1: Orienting students to the problem. Teacher

behavior, namely: Explaining learning objectives, explaining the logistics needed; Motivating students to be actively involved in solving the selected problem. Phase 2: Organizing students. Teacher behavior, namely: Helping students define and organize learning tasks related to the problem. Phase 3: Guiding individual and group investigations. Teacher behavior, namely: Encouraging students to collect appropriate information, conducting experiments to obtain explanations and solutions to problems. Phase 4: Developing and presenting work results. Teacher behavior, namely: Helping students plan and prepare appropriate work such as reports, models and sharing assignments with friends. Phase 5: Analyzing and evaluating the problem-solving process. Teacher behavior, namely: Evaluating learning outcomes on the material that has been studied/asking groups to present their work results (Arif et al., 2024).

This research was conducted at SD Negeri 29 Ampenan in the odd semester of 2024. The subjects of the research were grade V and grade VI students who participated in learning with different topics. Descriptions of topics and learning implementation schedules can be seen in Table 1. The instruments used to collect data include: First, Attitude Observation Sheet: Used to assess student attitudes based on indicators of cooperation, responsibility, and discipline during learning. Second, Final Test: Used to measure students' understanding of the material in each learning topic. Third, Performance Sheet: Used to assess students' skills in carrying out practice-based tasks that are in accordance with the learning topic.

Table 1. Topics and learning implementation schedules

Topic	Learning Implementation
Grade VI: Listening to Folk Tales (the Origin of Bau Nyale) in Lombok	July 23, 2024
Grade V: Pancasila in My Life	July 24, 2024
Grade VI: Diseases Affecting the Musculoskeletal System	July 25, 2024
Grade V: Hearing Because of Sound	July 26, 2024

The research procedures carried out are as follows. Preparation Stage: 1) Compiling learning devices according to the problem-based learning model, including Teaching Modules, three-dimensional media, and interactive games; 2) Compiling data collection instruments for aspects of attitude, knowledge, and skills. Implementation Stage: Classroom learning uses the PBL model with three-dimensional media and interactive games. Data Collection Stage: 1) Students' attitudes are observed using observation sheets during the learning process; 2) Student learning outcome data in the cognitive domain is measured through formative and summative tests; 3) Students' skills are assessed using a performance sheet based on their ability to complete practical tasks relevant to the learning topic. Data Analysis Stage: Learning outcome data is analyzed descriptively to describe student achievement in aspects of attitude, knowledge, and skills. The analysis is carried out for each learning topic separately, then compared to see variations in learning outcomes between topics.

Result and Discussion

Learning media for Topic 1 can be seen in Figure 1. Presentation activities of group discussion results can be seen in Figure 2. Student work can be seen in Figure 3. Utilization of Power Point, learning videos, and interactive games can be seen in Figure 4.

Figure 1. Learning media

Figure 2. Presentation activities

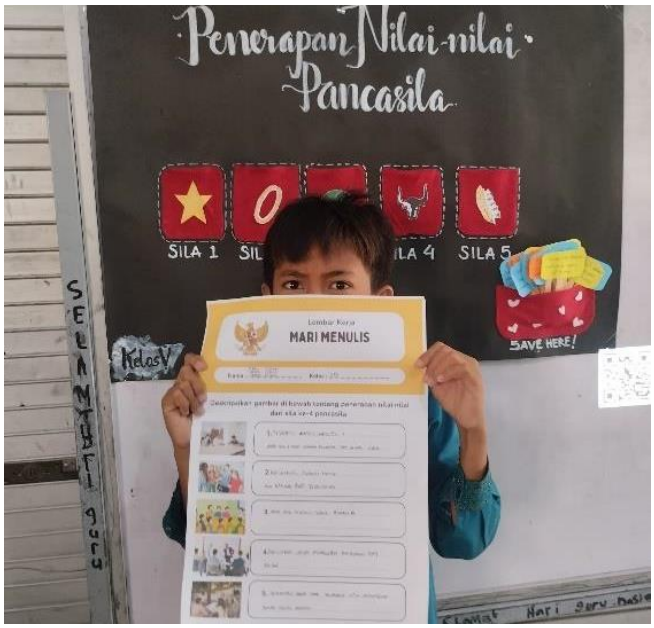

Figure 3. Student Artifacts

Figure 4. Utilization of Power Point, learning videos, and interactive games.

Data information for 3 domains of learning outcomes, namely affective, cognitive, and psychomotor of students for 4 topics using the PBL model with innovative learning media and interactive games can be seen in Figure 5.

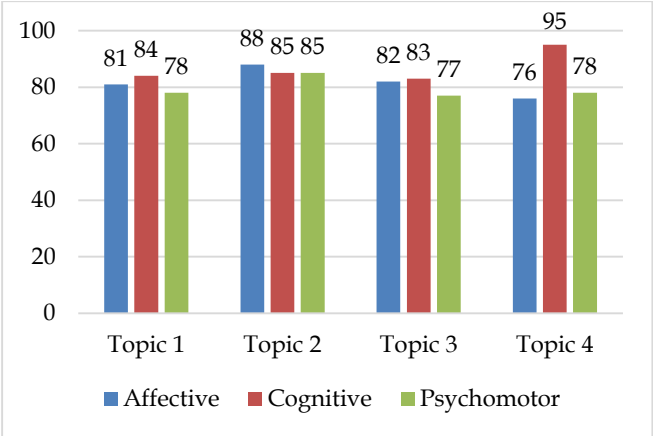

Figure 5. Student Learning Outcomes

The implementation of the PBL model with the support of innovative learning media and interactive games has been carried out in four different classes. The innovative learning media and interactive games used are Power point, learning videos that can be accessed on the Youtube page, concrete media in the form of a model of the Application of Pancasila Values, wordwall, Crossword Puzzles, and Quizziz. The focus of learning includes various contextual themes that are in accordance with the needs of the curriculum and class level.

First, Grade VI: Listening to Folk Tales (the Origin of Bau Nyale) in Lombok (July 23, 2024). Learning on the theme " Listening to Folk Tales " in class VI produced the following average scores: affective (81), cognitive (84), and psychomotor (78). The affective aspect shows student involvement in group work and a high curiosity about the material. In the cognitive aspect, students are able to understand basic concepts related to the learning theme well. However, in the psychomotor aspect, lower scores indicate the need for improvement in students' practical skills in project-based activities.

Second, Grade V: Pancasila in My Life (July 24, 2024). This theme gave very good results in all aspects of learning outcomes: affective (88), cognitive (85), and psychomotor (85). Students showed a deep understanding of the values of Pancasila that are associated with everyday life. Cooperation, responsibility, and the ability to practice these values are reflected in balanced scores in all aspects.

Third, Grade VI: Diseases Affecting the Musculoskeletal System (July 25, 2024). Learning in grade VI with this theme produces an average score: affective (82), cognitive (83), and psychomotor (77). Students show a good understanding of the concept of diseases affecting the musculoskeletal system. The affective aspect is seen in students' interest in exploring this material, but practical skills in the psychomotor aspect still need improvement.

Fourth, Grade V: Hearing Because of Sound (July 26, 2024). The theme "Hearing Because of Sound" produces scores: affective (76), cognitive (95), and psychomotor (78). This learning stands out in the cognitive aspect, where students show very good mastery of the material related to the concept of sound and hearing. However, low scores in the affective aspect indicate that students' emotional involvement in this theme is relatively low, although practical skills in the psychomotor aspect are quite good.

The implementation of the PBL model with innovative learning media and interactive games showed positive results in improving student learning outcomes in the affective, cognitive, and psychomotor aspects. However, there are still variations in results between classes and topics. Some classes show a need to

improve practical skills (psychomotor), while others require increased student emotional involvement (affective). More targeted learning strategies and integration of relevant media can improve achievement in all aspects of learning outcomes.

Problem-based learning is a learning model that presents contextual problems so as to stimulate students to learn. In classes that implement problem-based learning, students work in teams to solve real-world problems (Irwandi et al., 2024). Advantages of the PBL model: First, with PBL there will be meaningful learning. Students who learn to solve a problem will apply the knowledge they have or try to find out the knowledge needed. Learning can be more meaningful and can be expanded when students are faced with situations of applying concepts; Second, in PBL situations, students integrate knowledge and skills simultaneously and apply them in relevant contexts; Third, PBL can improve critical thinking skills, foster student initiative in working, internal motivation to learn, and can develop interpersonal relationships in working in groups (Sulaiman et al., 2017).

The problem-based learning (PBL) model using three-dimensional media and interactive games has succeeded in creating a fun and meaningful learning experience for fifth grade students of SD Negeri 29 Ampenan. This can be seen from student involvement during learning, both on the topic " Pancasila in My Life" and " Hearing Because of Sound." The application of three-dimensional media facilitates the visualization of abstract concepts, while interactive games motivate students to actively explore knowledge through simulations (Ahmad et al., 2024; Wisanti et al., 2024).

In the affective aspect, the results of observations showed an increase in indicators of cooperation, responsibility, and discipline. The PBL model encourages students to work in groups to solve the given problems (Hashim et al., 2021). The PBL model places students in a collaborative learning situation that requires them to share ideas and be responsible for group assignments (Sholahuddin et al., 2021). In this case, three-dimensional media plays an important role as a tool to facilitate group discussions, so that students can understand the concept concretely (Jamaluddin et al., 2022).

In the Cognitive aspect, the final test showed that students were able to understand the material presented. PBL model is effective in improving conceptual understanding because it provides a real context in the learning process. For example, in the topic "Pancasila in my life," students are invited to complete a case study related to the application of Pancasila values in everyday life. The use of three-dimensional media helps students understand abstract concepts, such as the symbols of Pancasila, in a more concrete and interesting way (Ilma et al., 2022).

Interactive games used in the topic "Hearing because of sound" make a major contribution to learning. By involving students in a simulation of the mechanism of hearing, interactive games allow students to learn through direct experience. According to Piaget's constructivism theory, learning that involves concrete experiences and independent exploration helps students build a deeper understanding (Jihannita et al., 2023).

The psychomotor aspect of students also showed positive results. The performance sheet records students' abilities in carrying out practical tasks and applying concepts that have been learned (Setiawan & Sugiyanto, 2020). This is in line with Vygotsky's learning theory which emphasizes the importance of scaffolding in learning (Bodner, 1986). Three-dimensional media and interactive games act as scaffolding that helps student complete tasks in a more structured manner (H. Hikmawati et al., 2017).

In addition, the PBL model improves students' critical thinking skills. During the learning process, students are invited to identify problems, find solutions, and evaluate the results. This process is in line with Bloom's view, which places critical thinking skills as an important element in project-based and problem-based learning (Krathwohl & Anderson, 2010). Interactive games serve as reinforcement in the evaluation stage, where students can immediately see the results and consequences of the decisions they make in the simulation (Rubach & Lazarides, 2021).

However, the learning outcomes also revealed several challenges. On the topic "Hearing because of sound," some students had difficulty understanding the mechanism of hearing due to the lack of adequate exploration time. This indicates that interactive games require sufficient duration so that students can optimize their learning experience (Saputri et al., 2023).

The main advantage of the combination of three-dimensional media and interactive games lies in the ability of both to support different learning styles of students (Liesa-Orús et al., 2020). Students with visual learning styles are greatly helped by three-dimensional media visualization, while students with kinesthetic learning styles enjoy direct experiences through interactive games. Learning style theory supports these findings, where learning that utilizes various media can reach various student needs (Hikmawati Hikmawati, Kusmiyati, et al., 2019).

This study also shows that the integration of technology and innovative learning models such as PBL can improve students' learning motivation (Chai et al., 2020). Three-dimensional media and interactive games provide an interesting experience, so that students feel more challenged and enthusiastic to learn. This supports

the theory of learning motivation which emphasizes the importance of intrinsic elements in motivating students to learn independently (Schmid et al., 2021).

Overall, the application of the PBL model with three-dimensional media and interactive games has a positive impact on the development of students' affective, cognitive, and psychomotor (van Laar et al., 2020). This model not only improves learning outcomes, but also creates a more collaborative, interactive, and relevant learning atmosphere to the needs of students in the digital era (Urooj & Farooq, Muhammad, 2023).

Conclusion

This study shows that the application of the Problem Based Learning (PBL) model supported by three-dimensional media and interactive games can have a positive impact on the development of attitudes, knowledge, and skills of grade V and grade VI students at SD Negeri 29 Ampenan. In the affective aspect, students showed good cooperation, responsibility, and discipline, although there were still variations in the results on several topics. In the cognitive aspect, problem-based learning was able to improve students' understanding through a contextual approach and direct experience. Meanwhile, in the psychomotor aspect, three-dimensional media and interactive games supported students' skills in carrying out practical tasks that were in accordance with learning objectives. These results support the constructivist learning theory which states that student-centered, interactive, and contextual learning can create deep understanding. Three-dimensional media plays a role in visualizing abstract concepts, while interactive games motivate students to learn through direct experience. Thus, the integration of the PBL model and innovative learning media can improve student learning outcomes comprehensively. The implementation of the PBL model with the support of three-dimensional media and interactive games can be one of the innovative solutions in improving the quality of learning in elementary schools, while equipping students with 21st century skills.

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