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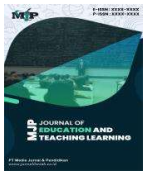

Improving Science Learning Outcomes on Energy and its Changes through Audio Visual Media Assisted Problem-Based Learning (PBL) Model for Fourth-Grade Elementary School Students

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ABSTRACT

This research was motivated by the low learning outcomes of fourth-grade students at SDN 7 Dungaliyo in Natural Sciences (IPA), specifically on Energy and Its Changes material. This issue was driven by the abstract nature of the topic and a teacher-centered learning environment that lacked varied learning media. This study aimed to improve the learning outcomes of fourth-grade students at SDN 7 Dungaliyo through the application of the Problem-Based Learning (PBL) model assisted by audio-visual media. The research design employed a Classroom Action Research (CAR) based on the Hopkins model, conducted in two cycles. Each cycle encompassed four major phases: planning, acting, observing, and reflecting. The subjects of this research were all 18 fourth-grade students at SDN 7 Dungaliyo, Gorontalo Regency, during the 2025/2026 academic year, consisting of 12 male and 6 female students. Data collection techniques included observation of teacher and student activities, multiple-choice written evaluation tests, and classroom documentation. The gathered data were analyzed descriptively using percentage techniques. The results demonstrated a significant improvement in student learning outcomes across the cycles. In the pre-action baseline condition, the classical mastery reached only 34% (6 students) meeting the Minimum Mastery Criteria (KKM 70). Following the implementation of Cycle I, the student learning mastery percentage increased slightly to 39% (7 students), which still fell short of the targeted classical success indicator. Reflective improvements were made in Cycle II by enhancing the interactivity of audio-visual media and group engagement. The evaluation in Cycle II revealed a substantial surge in classical mastery, reaching 83% (15 students) who successfully met the Learning Objectives Achievement Criteria (KKTP). The mastery growth from Cycle I to Cycle II was recorded at 44%. Based on these findings, it can be concluded that the application of the Problem-Based Learning (PBL) model assisted by audio-visual media is highly effective in improving science learning outcomes on Energy and Its Changes for fourth-grade students at SDN 7 Dungaliyo, Gorontalo Regency.

Informasi Artikel

Kata Kunci:
Energi dan Perubahannya, HasilBelajar, MediaAudio Visual, Problem Based Learning (PBL).

ABSTRAK

Penelitian ini dilatarbelakangi oleh rendahnya hasil belajar murid kelas IV di SDN 7 Dungaliyo pada mata pelajaran Ilmu Pengetahuan Alam (IPA), khususnya pada materi Energi dan Perubahannya. Hal ini disebabkan oleh karakteristik materi yang bersifat abstrak serta proses pembelajaran yang masih berpusat pada guru dan kurang memanfaatkan media yang bervariasi. Penelitian ini bertujuan untuk meningkatkan hasil belajar murid kelas IV SDN 7 Dungaliyo melalui penerapan model pembelajaran *Problem Based Learning* (PBL) berbantuan media audio visual. Metode penelitian yang digunakan adalah Penelitian Tindakan Kelas (PTK) model Hopkins yang dilaksanakan dalam dua siklus. Setiap siklus terdiri dari empat tahapan utama, yaitu perencanaan, pelaksanaan tindakan, observasi, dan refleksi. Subjek penelitian ini adalah seluruh murid kelas IV SDN 7 Dungaliyo Kabupaten Gorontalo pada tahun ajaran 2025/2026 yang berjumlah 18 orang, terdiri atas 12 murid laki-laki dan 6 murid perempuan. Teknik pengumpulan data yang digunakan meliputi observasi aktivitas guru dan murid, tes evaluasi tertulis pilihan ganda, serta dokumentasi kegiatan pembelajaran. Data yang terkumpul kemudian dianalisis secara deskriptif dengan teknik persentase. Hasil penelitian menunjukkan adanya peningkatan hasil belajar murid yang signifikan di setiap siklusnya. Pada kondisi awal sebelum tindakan, ketuntasan klasikal murid hanya mencapai 34% (6 murid) dengan nilai di atas Kriteria Ketuntasan Minimal (KKM 70). Setelah diimplementasikan tindakan pada Siklus I, persentase ketuntasan belajar murid mengalami peningkatan menjadi 39% (7 murid), namun capaian ini belum memenuhi target indikator keberhasilan klasikal yang ditetapkan. Perbaikan strategi pembelajaran dilakukan pada Siklus II dengan mengoptimalkan interaktivitas media audio visual dan keterlibatan kelompok. Hasil evaluasi pada Siklus II menunjukkan lonjakan ketuntasan belajar murid yang sangat signifikan, mencapai 83% (15 murid) yang berhasil memenuhi Kriteria Ketercapaian Tujuan Pembelajaran (KKTP). Peningkatan ketuntasan dari Siklus I ke Siklus II tercatat sebesar 44%. Berdasarkan hasil tersebut, dapat disimpulkan bahwa penerapan model pembelajaran *Problem Based Learning* (PBL) berbantuan media audio visual terbukti efektif dalam meningkatkan hasil belajar IPA materi Energi dan Perubahannya pada murid kelas IV SDN 7 Dungaliyo Kabupaten Gorontalo.

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1. Introduction

Natural Science (IPA) is one of the essential subjects in elementary school. Natural Science education at the elementary level aims to develop students' logical, critical, and systematic thinking skills in understanding the surrounding environment through observation, experimentation, and scientific reasoning. Through science learning, students are expected not only to master concepts but also to understand natural phenomena occurring in their surroundings through direct learning experiences. Science education emphasizes not only conceptual mastery but also process skills and scientific attitudes. Through this subject, students are expected to comprehend natural phenomena and relate them to daily life.

One of the science topics taught in the second semester of the fourth grade is energy and its transformations. The concept of energy possesses quite abstract characteristics for elementary school students (Energi et al., 2015). Energy cannot be observed directly; however, it can be perceived through its impacts in daily life, such as a glowing light bulb, a spinning fan, or a moving object. Therefore, students require the assistance of appropriate learning media to comprehend the concept of energy effectively.

The implementation of science learning to address the low learning outcomes in the energy topic among fourth-grade elementary students is carried out by utilizing audiovisual media as a learning solution (Kurniawan, 2020). The primary issues in teaching the topic of energy are its abstract nature, teacher-centered instruction, and the lack of engaging media, which leads to passive student participation and suboptimal learning outcomes. Through the application of audiovisual media, the concept of energy and its transformations is presented in the form of moving images and sound.

The use of this media is capable of increasing students' attention, interest, and active participation in the learning process, whether through observation, discussion, or answering questions. With increased student engagement and conceptual understanding, the learning process becomes more effective and directly impacts the improvement of student learning outcomes in the science topic of energy.

Based on the documentation of student learning outcomes in the Energy and Its Transformations topic collected by the researcher, a factual condition was identified: out of 18 students, only 6 students (34%) passed the Minimum Completeness Criteria (KKM), while the remaining 12 students (66%) had not yet achieved mastery under the established KKM. This condition was also reflected in the teacher's classroom experience. The fourth-grade teacher shared that when teaching energy and its transformations, instruction was still predominantly conducted through direct lecturing in front of the class. This method was chosen because it was deemed more practical and accommodated limited instructional time. The teacher also explained that they were not accustomed to using specific learning models in a structured manner, meaning that lessons often strictly followed the textbook. Furthermore, the integration of learning media was not yet optimal due to limited preparation time and a lack of experience in utilizing varied media.

An alternative solution to overcome these issues is the implementation of Problem-Based Learning (PBL) assisted by audiovisual media. Problem-Based Learning is a student-centered learning model that engages learners through the resolution of real-world problems. This model provides opportunities for students to identify problems, gather information, conduct discussions, formulate solutions, and present the results of their investigations. Consequently, students do not only acquire knowledge but also develop critical thinking, communication, collaboration, and problem-solving skills.

The integration of audiovisual media in science learning further strengthens the effectiveness of the Problem-Based Learning model. Audiovisual media can present learning materials through motion pictures and sound, rendering abstract

concepts more concrete and easier to comprehend. Through videos, animations, or simulations, students can directly observe the process of energy transformation in daily life. This approach enhances students' attention, motivation, and interest in learning, making the instructional process more meaningful.

Based on the context outlined above, this Classroom Action Research (CAR) was conducted to improve science learning outcomes in the topic of energy and its transformations through the implementation of the Problem-Based Learning model assisted by audiovisual media for fourth-grade students at SDN 7 Dungaliyo, Gorontalo Regency.

2. Method

This study employs a Classroom Action Research (CAR) approach, conducted collaboratively between the researcher and the classroom teacher. Classroom Action Research was selected because it aims to improve the quality of the learning process through concrete actions implemented systematically and continuously until optimal results are achieved.

The research was conducted at SDN 7 Dungaliyo, Gorontalo Regency, focusing on fourth-grade students. The research subjects consisted of all fourth-grade students, adjusted to the actual class enrollment. The subject matter taught was energy and its transformations within the Natural Science (IPA) curriculum.

The research design refers to the Kemmis and McTaggart model, which consists of four recurring phases: planning, action, observation, and reflection. The study was conducted in two cycles. Each cycle comprised one instructional session followed by an evaluation of student learning outcomes. If the success indicators were not achieved in the first cycle, corrective actions were implemented in the subsequent cycle based on the results of the reflection phase.

During the planning phase, the researcher prepared instructional materials, including lesson plans (teaching modules), student worksheets (LKPD), audiovisual media, observation sheets for teacher and student activities, and learning achievement tests. The action phase was executed by implementing the Problem-Based Learning (PBL) model, which consists of five syntax steps: orienting students to the problem, organizing students for study, guiding individual and group investigations, developing and presenting artifacts (work results), and analyzing and evaluating the problem-solving process.

Simultaneously with the implementation of the action, observations of teacher and student activities were conducted using pre-designed observation sheets. The observation aimed to determine the implementation of the lessons in accordance with the Problem-Based Learning syntax and to assess the level of student engagement throughout the learning process.

The research data were gathered through observation, learning achievement tests, documentation, and field notes. Observation data were analyzed descriptively to determine improvements in teacher and student activities. Meanwhile, student learning outcomes were analyzed using the percentage of classical learning mastery based on the Minimum Completeness Criteria (KKM) established by the school.

The success of this study was determined by the improvement in both teacher and student activities during the learning process, as well as the increase in student learning outcomes. The research is declared successful if the majority of the students score above the KKM, and the percentage of learning mastery meets the predefined success indicators.

3. Resultand Discission

The implementation of the Problem-Based Learning (PBL) model assisted by audiovisual media in science learning—specifically on the topic of energy and its transformations—was conducted through classroom action research spanning two cycles. Each cycle comprised the

phases of planning, action, observation, and reflection. The primary focus of this study was to improve student learning outcomes through student-centered learning while utilizing audiovisual media to support the delivery of the instructional material.

Prior to implementing the action, the researcher conducted a preliminary observation of the fourth-grade science learning process at SDN 7 Dungaliyo. The observation results indicated that the learning process was heavily dominated by the lecture method, leaving students to play a passive role as mere listeners. The teacher had not yet utilized learning models that encourage students to think critically and collaborate in problem-solving. Furthermore, the use of learning media remained limited to standard textbooks, causing students to struggle with comprehending the abstract nature of energy and its transformations. This current state directly resulted in low student learning outcomes. The majority of the students were unable to explain various forms of energy, energy sources, or energy transformations in daily life. When given evaluation questions, many students still made errors in identifying energy transformations in various events. These low learning outcomes demonstrated that the instructional process had not yet successfully built an optimal understanding of the concepts.

Based on these predefined conditions, the researcher implemented the Problem-Based Learning model assisted by audiovisual media in an effort to improve the quality of instruction. This model was selected because it provides opportunities for students to learn through real-world problems, allowing them to construct knowledge independently through the processes of investigation, discussion, and the presentation of results.

Cycle I

The implementation of the action in Cycle I began with the development of instructional materials, which included teaching modules (lesson plans), audiovisual media, student worksheets, teacher and student activity observation sheets, and learning outcome evaluation instruments. The learning process was conducted in accordance with the syntax of Problem-Based Learning, namely: orienting students to the problem, organizing students for study, guiding investigations, developing and presenting work, and evaluating the problem-solving process.

In the orientation phase, the teacher presented a video depicting various energy sources and transformations commonly encountered in daily life. This presentation aimed to foster students' curiosity while connecting the material to their real-world experiences. Following this, the teacher posed several questions related to the video's content to prompt students to identify the problems to be studied.

The subsequent phase involved organizing the students into learning groups. Each group was given a worksheet containing problems regarding energy sources and transformations. Students were asked to collaborate in discussions to find answers based on their observations of the video and other learning resources.

During the investigation process, the teacher acted as a facilitator by providing guidance to groups facing difficulties. Students began to participate actively in discussions, ask questions, and express their opinions. However, some students still lacked the confidence to share their ideas and continued to rely heavily on their more active peers.

Upon completing the discussions, each group presented their work in front of the class. Other groups were given the opportunity to provide feedback, creating a more interactive dynamic compared to previous lessons. The presentation activities also trained students in communication skills and built their courage in expressing opinions.

Observation results indicated that teacher activities during instruction improved, as all phases of Problem-Based Learning were successfully executed. The teacher was able to manage the classroom effectively, utilize audiovisual media efficiently, and motivate students to engage actively in the learning process.

Student activities also showed improvement compared to the baseline conditions. Students began to exhibit enthusiasm when watching the video presentations, discussed actively, and collaborated well in their groups. Nevertheless, several obstacles persisted, such as uneven participation among group members, a lack of courage to ask questions, and a few students who still struggled to comprehend the concept of energy transformation.

The learning outcome evaluation at the end of Cycle I showed an increase compared to the initial state. Nonetheless, the classical mastery learning rate had not yet met the research success indicators. These results indicated that while the implementation of Problem-Based Learning assisted by audiovisual media had generated a positive impact, further refinements in the subsequent cycle were still required.

Based on the reflection phase, several weaknesses identified in Cycle I included: the teacher still needed to provide more intensive guidance to students experiencing learning difficulties, improve instructional time management, offer broader opportunities for all students to voice their opinions, and clarify instructions for group discussions. Additionally, the use of audiovisual media needed to be further optimized so that all students could grasp the material more deeply.

These reflections served as the basis for corrective actions in Cycle II, with the expectation of facilitating a more effective learning process and yielding better student learning outcomes.

Cycle II

The implementation of the action in Cycle II served as a follow-up to the reflection phase in Cycle I. Various shortcomings identified during the previous cycle provided a foundation for designing more effective learning strategies. Corrective actions focused on increasing student engagement, optimizing the use of audiovisual media, providing more intensive guidance to struggling students, and improving instructional time management so that all phases of Problem-Based Learning could be executed to their fullest potential.

In the planning phase, the researcher refined the instructional materials by improving the teaching modules, student worksheets, and the selected audiovisual resources. The learning videos chosen were more engaging and closer to the students' daily lives, helping them comprehend the concept of energy and its transformations more concretely. The teacher also prepared a wider variety of stimulus questions to prompt critical thinking right from the beginning of the lesson.

The lesson began with an apperception activity by screening a video showing various forms of energy in daily life, such as electrical, thermal, light, kinetic, and sound energy. The presentation illustrated common examples of energy transformations, allowing students to connect the material to their own lived experiences. Through this activity, students' attention immediately focused on the subject matter, and the classroom atmosphere became noticeably more active than in the previous cycle.

The teacher then presented several problems for the students to solve in groups. These problems were formulated around real-life situations to encourage students to analyze, identify causes, and determine the types of energy transformation taking place. Each group discussed the task by

distributing duties among all members, ensuring that every student had an equal opportunity to participate.

During the investigation process, the teacher actively circulated around the room to offer guidance to groups experiencing difficulties. Students who had previously been passive began to courageously express their opinions, ask questions, and offer feedback on other groups' discussion results. Interactions among students improved significantly as they became more accustomed to working collaboratively to solve the assigned problems.

In the presentation phase, all groups presented their discussion findings in front of the class. Every group successfully explained various forms of energy, energy sources, and energy transformations based on their observations of the audiovisual media and their group discussions. Other students posed questions and provided feedback, creating a two-way communication channel that reflected an increase in both critical thinking and communication skills.

Observation results indicated that teacher performance improved compared to Cycle I. The teacher managed the learning process more systematically in accordance with the Problem-Based Learning syntax. All instructional phases from problem orientation, group formation, and investigation to the presentation of results and evaluation were executed successfully. Furthermore, the teacher became increasingly skilled at utilizing audiovisual media to clarify abstract concepts, making it easier for students to comprehend the material.

Student activities also showed significant improvement. Most students eagerly participated in the lesson, discussed actively, collaborated effectively in their groups, and boldly shared their opinions during presentations. Students' confidence in asking questions and answering the teacher's prompts increased compared to the previous cycle. This demonstrates that the implementation of Problem-Based Learning assisted by audiovisual media succeeded in creating a more interactive, student-centered learning environment.

This increase in learning activities directly impacted student learning outcomes. Based on the evaluation at the end of Cycle II, the number of students who achieved learning mastery increased significantly compared to Cycle I.

The percentage of classical learning mastery met the research success indicators, and the implemented action was declared successful. This improvement indicates that students were able to better understand the concept of energy and its transformations after participating in lessons utilizing the Problem-Based Learning model assisted by audiovisual media.

The success of the action in Cycle II was closely linked to the increased involvement of the students throughout all phases of learning. Students were no longer passive recipients of information from the teacher; instead, they gained active learning experiences through observing, discussing, investigating, solving problems, and presenting their findings. This practical learning experience made conceptual understanding more meaningful, resulting in optimal learning outcomes.

Overall, the execution of Cycle II showed that the refinements made based on the Cycle I reflection successfully improved both the quality of the learning process and student learning outcomes. Consequently, because the success indicators of the research had been met, this Classroom Action Research was concluded at Cycle II.

The improvement in student learning outcomes achieved in this study demonstrates that the implementation of the Problem-Based Learning

(PBL) model assisted by audiovisual media has a positive impact on both the process and results of science learning. This success is evident from the increased student activity during lessons, the enhanced quality of interactions between the teacher and students, and the growing number of students achieving learning mastery in each cycle.

At the baseline condition, the majority of students struggled to understand the concept of energy and its transformations. This difficulty arose because instruction was heavily reliant on the lecture method, where students merely received information without being given the opportunity to construct their own knowledge. Because the concept of energy is abstract, it becomes difficult to comprehend when explained only verbally without appropriate learning media. As a result, students were less active during lessons, and their learning outcomes remained below the Minimum Completeness Criteria (KKM).

Following the implementation of the Problem-Based Learning model assisted by audiovisual media, the learning environment underwent a significant transformation. Students became accustomed to identifying problems, discussing, exchanging ideas, searching for information, and presenting their investigation results in front of the class. This process positioned students as the main subjects of learning, allowing them to construct concepts through direct learning experiences rather than merely memorizing facts.

Audiovisual media contributed immensely to enhancing student comprehension of energy and its transformations. Video screenings depicting everyday energy transformations helped students bridge science concepts with real-world experiences such as the transformation of electrical energy into light energy in a lamp, electrical energy into kinetic energy in a fan, and chemical energy into thermal energy on a gas stove. Presenting the material through moving images and sound made previously difficult concepts much easier to understand.

In addition to improving conceptual understanding, audiovisual media also boosted student learning motivation. During the learning process, students focused more closely on the material when instructional videos were shown. Their curiosity was heightened, leading them to be more active in asking questions, sharing opinions, and answering the teacher's prompts. This condition demonstrates that audiovisual media can create a more enjoyable and engaging learning atmosphere.

The Problem-Based Learning model also provided students with opportunities to develop critical thinking skills. Every problem presented by the teacher challenged students to analyze information, seek alternative solutions, and draw conclusions based on the evidence they found. This critical thinking capacity developed progressively over the course of the research, increasing students' confidence in presenting their ideas.

Furthermore, collaborative learning in groups had a positive impact on students' social skills. Through discussion, students learned to collaborate, respect others' opinions, share tasks, and take responsibility for their group's work. These social skills represent an important objective of Problem-Based Learning, as the model targets not only cognitive outcomes but also the development of students' affective domains and interpersonal skills.

The improvement of learning outcomes in this study indicates that students acquired a more meaningful learning experience compared to traditional instruction. Meaningful learning occurs because students actively construct knowledge through direct experience rather than passively receiving information from the teacher. The concept of energy, which was previously deemed

difficult, became easier to grasp because it was presented in concrete visual formats and linked to problems relevant to their daily lives.

The findings of this study align with the constructivist theory that underlies the implementation of Problem-Based Learning. Constructivism posits that knowledge is more easily understood when learners actively build their own understanding through concrete learning experiences. In this study, students did not merely listen to teacher explanations; they were given the opportunity to discover the concept of energy firsthand through watching videos, discussing, conducting investigations, and presenting their work.

The results also support previous studies which state that the application of Problem-Based Learning can improve student learning outcomes in science. Problem-based learning provides an active learning experience that encourages students to think critically and creatively while solving various problems. Similarly, the use of audiovisual media has been proven to increase learning motivation, clarify material delivery, and make abstract concepts in science education easier for students to grasp.

Thus, it is understood that the improvement in learning outcomes was not driven solely by the independent use of either the Problem-Based Learning model or audiovisual media, but rather by the integration of both in creating an active, innovative, and student-centered learning environment. The combination of these two components successfully fostered a highly effective learning experience, allowing the instructional goals to be achieved optimally.

The success of this study implies that elementary school teachers need to be more creative in selecting instructional models and media that suit both the characteristics of the material and the developmental stage of the students. Science education should not merely focus on delivering content, but should also provide students with opportunities to experience the process of discovering knowledge through problem-solving. In this way, the learning outcomes achieved by students will not only be reflected in higher test scores, but also in the development of critical thinking, collaboration, communication, and scientific attitudes necessary for daily life.

4. Conclusion

Based on the results of the conducted research, it can be concluded that the Problem-Based Learning (PBL) model supported by audiovisual media in the science subject, specifically on the topic of energy and its transformations, successfully improves the learning outcomes of fourth-grade students at SDN 7 Dungaliyo. This is evidenced by a significant increase in learning achievement from Cycle I to Cycle II. In Cycle I, the number of students who met the Learning Objective Achievement Criteria (KKTP ≥ 70) was 7 students, representing 38.8% of the class.

Following instructional improvements in Cycle II based on the reflections from Cycle I, the number of students achieving the KKTP increased to 15 students, reaching 83.3%. This increase indicates that the minimum classical mastery indicator of 70% has been successfully achieved. This success was driven by improvements and the optimization of the PBL model syntax in Cycle II, which was implemented in a more targeted and equitable manner. This was particularly evident in the somatic aspect through the direct involvement of all students, increased intellectual engagement during group discussions, and the integration of more interactive and participatory audiovisual media.

These refinements rendered the learning process more active, meaningful, and aligned with the

characteristics of science instruction, which demands concrete experiences. Consequently, the research hypothesis stating that the PBL model assisted by audiovisual media can improve the learning outcomes of fourth-grade students at SDN 7 Dungaliyo is proven to be true and accepted.

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