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The Effect Of Using Edpuzzle Learning Media On Learning Outcomes In The Subject Of Energy Transformation Around Us In Grade Iv Of Paninggaran Public Elementary School

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ABSTRACT

This study aims to determine the effect of using Edpuzzle learning media on student learning outcomes in the subject of energy transformation around us. The method used is quantitative with a quasi-experimental Nonequivalent Control Group Design. The research subjects are fourth-grade students at Paninggaran State Elementary School. Data were collected through pretest and posttest assessments, which were analyzed using a t-test. The results of the study indicate that the use of Edpuzzle learning media significantly impacts improvements in student learning outcomes. This media makes learning more interactive, engaging, and easier to understand, thereby helping students remain focused and motivated in their studies.

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INTRODUCTION

Education is an important foundation in the development of a nation. Through quality education, it is hoped that a generation of intelligent, characterful individuals who are able to compete in the era of globalization will emerge. In facing the challenges of the 21st century, education must be able to develop critical, collaborative, creative, and communicative thinking skills in students. Elementary school, as the initial level of formal education, plays an important role in shaping the foundations of these competencies (Taib, 2021). Therefore, learning at the elementary school level must be designed comprehensively and relevant to the times.

Natural Sciences (IPA) as one of the core subjects in elementary school aims to foster curiosity and develop students' scientific thinking skills. Through science learning, students are expected to

understand basic concepts related to natural phenomena and apply them in daily life (Aprina et al., 2024). One of the topics in fourth-grade science is "Energy Transformation Around Us." This topic explains how energy can change form and be used in various activities, such as the conversion of electrical energy into light or kinetic energy into heat.

However, in practice, science learning, especially the topic of energy transformation, is often considered difficult by students. This is due to the abstract presentation of the material and the lack of media that can help students visualize the concepts being taught. Based on observations at SD Negeri Paninggaran, the learning process is still conventional, teacher-centered, and lacks the use of interactive learning media. Students only listen to explanations and take notes, without being given meaningful and enjoyable learning experiences.

The lack of learning media causes students to have difficulty understanding the concept of energy transformation as a whole. They cannot imagine how one form of energy can change into another. This condition results in low learning interest and learning outcomes for students in science subjects. Therefore, a learning approach is needed that can accommodate students' learning needs and utilize the rapid development of digital technology in the world of education.

One digital medium that can be used to improve the quality of science learning is Edpuzzle. Edpuzzle is an interactive video-based learning platform that allows teachers to insert questions, comments, or instructions into learning videos (Dewi, 2024). With Edpuzzle, students are not just passive viewers but are actively involved in the process of understanding the video content. Each important part of the video can be interspersed with questions to test students' understanding directly. This is very much in line with the principles of active and meaningful learning (Saparudin et al., 2025).

Edpuzzle's strengths lie not only in its interactive features, but also in its ability to save students' work and provide real-time learning progress reports to teachers. Teachers can monitor which students have watched the video, how they answered the questions, and which parts of the video were frequently replayed (Jayantika & Andini, 2022). This data is very useful for evaluating learning and designing appropriate follow-up interventions. In addition, Edpuzzle's user-friendly interface allows teachers and students from various backgrounds to access and use it easily.

In the context of the Merdeka Curriculum currently being implemented in elementary schools, the use of digital media such as Edpuzzle is highly relevant. The Merdeka Curriculum emphasizes differentiated learning that is student-centered and tailored to the needs and characteristics of learners. Edpuzzle provides space for students to learn independently and at their own pace (Nirmala et al., 2023). Students can repeat material they have not understood, pause the video to take notes, and answer questions at the right time without pressure.

Several studies have shown that the use of Edpuzzle has a positive impact on student learning outcomes. According to (Agustin et al., 2024), the use of Edpuzzle in science learning in fourth grade can increase student active participation, strengthen concept understanding, and significantly improve their final grades compared to classes that only use lecture methods. This finding reinforces the importance of integrating technology into the science learning process in elementary schools, especially in conceptual material such as energy transformation.

The use of Edpuzzle media is not only beneficial in improving student learning outcomes but also helps teachers in building contextual learning. Teachers can select or create videos that align with the "Energy Transformation Around Us" material and then insert questions that prompt students' understanding and reflection. For example, after showing a video of the transformation of electrical energy into light, teachers can ask questions such as, "What other examples have you encountered at home that undergo this kind of energy transformation?" Such questions encourage students to think critically and connect the material to real life.

Science education should not only focus on mastering concepts but also on developing scientific process skills. Students need to be guided to observe, reason, and conclude. The Edpuzzle platform provides space for students to learn through a multimodal approach: viewing visuals, listening to explanations, reading questions, and writing answers. This accommodates various learning styles, whether students are more visually, auditorily, or kinesthetically dominant.

Based on initial observations conducted by researchers at SD Negeri Paninggaran, it was found that students' average scores on energy transformation material were still low. Many students were unable to name forms of energy or explain the energy changes occurring around them. Teachers also acknowledged that they had not utilized technology-based media such as Edpuzzle due to limitations in knowledge and access. This presents both a challenge and an opportunity to innovate more creative and adaptive learning methods suited to the times.

Most teachers still use the lecture method to deliver science lessons. While this method is efficient for explaining theories, it is less effective in building deep conceptual understanding. Students become passive, merely receiving information without being encouraged to explore or construct their own understanding. This leads to low interest in learning, superficial understanding, and rapid forgetting of the material that has been presented. Therefore, an innovative approach based on digital media is urgently needed.

These conditions encouraged researchers to apply Edpuzzle media as an alternative in delivering energy transformation material. Through this approach, students are encouraged to become active and independent learners. Researchers designed an intervention using Edpuzzle videos embedded with questions aligned with competency achievement indicators. The aim was to determine whether this interactive video-based learning approach could improve student learning outcomes compared to traditional lecture methods.

The integration of questions within the video makes the learning process more reflective. Students do not just “watch until the end,” but must listen carefully because there will be questions that require them to think. By answering the questions immediately, the information they receive from the video is absorbed and understood more quickly. This is different from watching a regular video or listening to a teacher's explanation without interruption and active involvement.

Additionally, the use of Edpuzzle is also considered efficient in terms of time and monitoring. Teachers no longer need to distribute questions separately since everything is already integrated into the video. Students' answers are automatically recorded and can be analyzed immediately. This makes it easier for teachers to evaluate learning outcomes quickly and objectively. Teachers can immediately provide reinforcement or remediation based on students' answers within the Edpuzzle system.

One of Edpuzzle's strengths is its ability to facilitate differentiated learning. Students with varying abilities can adjust their learning pace. If they don't understand, they can rewatch the video. If they do understand, they can immediately complete the questions. This creates learning that is not uniform in pace but remains equitable in terms of competency achievement. In this context, Edpuzzle is not merely a medium but an adaptive technology-based learning system.

It is also important to note that the use of Edpuzzle does not mean that teachers are replaced by technology. The role of teachers remains crucial as learning designers, facilitators, and evaluators. Through Edpuzzle, teachers have a tool to reach students more effectively and accurately. Teachers can analyze which parts of the material students have not understood and design follow-up interventions with a more targeted approach.

In facing the challenges of the 4.0 industrial revolution and the 5.0 society era, students must be equipped with digital literacy from an early age. One of these skills is the ability to utilize technology for learning. Edpuzzle trains students not only to consume digital content but also to actively

understand, analyze, and respond to information. This is an essential part of 21st-century learning skills that elementary school students must master.

Energy transformation is a science subject that is highly relevant to students' daily lives. They encounter it in household activities, the school environment, and even during play. By presenting this material through Edpuzzle videos, students can observe the actual process of energy transformation in concrete visualizations. For example, a video showing a fan converting electrical energy into kinetic energy, or an electric stove converting energy into heat.

Interactive video media like Edpuzzle allows the learning process to be more contextual. This helps students connect scientific concepts with their real-life experiences. As a result, the material is no longer memorized but understood through deeper and more practical comprehension. Students also find it easier to explain the material because they understand the cause-and-effect relationships of the phenomena observed in the video.

The use of Edpuzzle-based learning media is very suitable for elementary school students, who tend to get bored easily if they only receive one-way information. Children in the digital age are more interested in visual displays, animations, and interactions. Therefore, the use of engaging videos accompanied by questions can be an effective strategy to maintain their focus during the learning process.

Considering the urgency and relevance of this issue, this study was conducted to empirically test the effect of using Edpuzzle learning media on the learning outcomes of fourth-grade students at Paninggaran State Elementary School on the subject of “Energy Transformation Around Us.” This study is expected to contribute significantly to the development of more engaging and effective science learning in elementary schools through the use of technology.

METHODS

This research used a quantitative approach with a quasi-experimental method. The quantitative approach was chosen because the study aimed to determine the effect of using Edpuzzle as a learning medium on student learning outcomes through numerical data that could be analyzed statistically. The quasi-experimental method was chosen because the researcher lacked full control over the random selection of subjects, but still allowed for comparisons between two groups given different treatments.

The research design used was a Nonequivalent Control Group Design. In this design, two groups were divided: an experimental group, which received treatment in the form of learning using Edpuzzle as a medium, and a control group, which received learning using conventional methods (lectures and textbooks). Both groups were given a pretest to determine students' initial abilities and a posttest to determine learning outcomes after the treatment.

This research was conducted at Paninggaran Public Elementary School in the even semester of the 2023/2024 academic year. The subjects were fourth-grade students from two classes. Class IV A was designated as the experimental class, and class IV B as the control class. Class selection was purposive based on consultations with the homeroom teachers and consideration of each class' readiness to participate in the treatment.

The instrument used in this study was a 20-item multiple-choice objective test. These questions were developed based on the core competency indicators of the "Energy Transformation Around Us" material. The questions were tested for validity using the Pearson Product Moment correlation technique, reliability using the Cronbach's Alpha formula, and difficulty and discriminatory power were tested to ensure the questions were suitable for use.

The research procedure consisted of three stages: preparation, implementation, and evaluation. In the preparation stage, the researchers developed learning materials, created an Edpuzzle account, and developed interactive learning videos tailored to the material being taught. The implementation stage

consisted of administering a pretest, administering the learning process during two meetings for each group, and administering a posttest after the treatment. In the evaluation stage, data from the pretest and posttest were analyzed to determine the effect of the treatment.

Data analysis was conducted through prerequisite tests and hypothesis testing. The prerequisite tests consisted of a normality test using the Kolmogorov-Smirnov method and a homogeneity test using Levene's test to ensure that the data from both groups had a normal distribution and equal variance. After that, an independent sample t-test was conducted to test the differences in learning outcomes between the experimental and control groups.

Furthermore, researchers also calculated N-Gain to determine the improvement in learning outcomes in each group. The N-Gain formula is used to measure the effectiveness of the treatment by comparing pretest and posttest scores as a percentage. The results of the N-Gain calculation are categorized into low, medium, and high based on interpretation standards commonly used in educational research.

Through this method, researchers hope to obtain objective data regarding the effectiveness of using Edpuzzle learning media in improving elementary school students' science learning outcomes. The results of this study are expected to not only answer the research questions posed but also serve as a basis for developing more interactive and contextual technology-based science learning strategies.

FINDINGS AND DISCUSSION

Findings

This study aimed to determine the effect of using Edpuzzle learning media on the learning outcomes of fourth-grade students at Paninggaran Public Elementary School on the topic "Energy Transformation Around Us." To obtain accurate data, learning outcomes were measured using pretests and posttests in two groups: the experimental group and the control group. The experimental group received treatment using Edpuzzle learning media, while the control group received a conventional lecture method.

Before the treatment was administered, a pretest was administered to both groups to determine the students' initial abilities. Based on the pretest results, the average score for the experimental group was 55, while the control group obtained an average of 56.67. The small difference in average scores indicates that the two groups had relatively equal initial abilities, making comparisons valid after the treatment.

After two sessions of treatment, a posttest was administered to measure student learning outcomes. The posttest results showed significant improvement in both groups. The experimental group obtained an average posttest score of 84, while the control group obtained an average of 70.83. This indicates that there was an improvement in learning outcomes in both groups, but the improvement in the experimental group was greater than in the control group.

To ensure that the learning outcome data could be analyzed validly, a normality test was conducted using the Kolmogorov-Smirnov method. The test results showed that the pretest and posttest data for both groups were normally distributed, as the significance value for each group was >0.05. Therefore, the data met the requirements for parametric statistical analysis. Next, a homogeneity of variance test was conducted using Levene's test to determine whether the two groups had equal variances. The homogeneity test results showed a significance value >0.05, indicating that the data from both groups were homogeneous. This test is crucial before proceeding to the t-test, as one of the prerequisites for the t-test is that the data must be homogeneous.

After determining that the data were normal and homogeneous, an independent sample t-test was conducted to determine whether there was a significant difference in learning outcomes between the experimental and control groups. The t-test results showed a significance value (Sig. 2-tailed) of 0.000, meaning <0.05. This indicates a significant difference between the learning outcomes of students using Edpuzzle and those using conventional methods

This significant difference in learning outcomes indicates that the use of Edpuzzle has a positive impact on student learning outcomes. To determine the extent of this improvement, an N-Gain calculation was performed. N-Gain is the difference between posttest and pretest scores normalized by the maximum and minimum range. This formula is used to determine the effectiveness of the treatment in improving learning outcomes.

The average N-Gain score obtained by the experimental group was 0.64, which falls into the moderate category. Meanwhile, the control group achieved an N-Gain score of 0.33, which falls into the low category. These results further confirm that the use of Edpuzzle is more effective in improving student learning outcomes than conventional learning methods. Furthermore, when looking at the distribution of scores, students in the experimental group showed a more even increase in individual scores compared to the control group. This indicates that Edpuzzle helped almost all students better understand the material, regardless of their initial ability. Even students who were initially in the low category experienced significant improvements in learning outcomes.

The use of Edpuzzle allows students to learn more flexibly and independently. During the learning process, students appeared more focused while watching videos due to questions that automatically appeared mid-video. Students were required to listen actively and think critically to answer each question correctly. This was one factor contributing to the improved learning outcomes in the experimental group. Edpuzzle also helped students review parts of the material they didn't understand. Students could replay the video and re-understand difficult concepts. This was not observed in the control group, which only received a single explanation from the teacher. Edpuzzle's superiority as a learning medium that adapts to students' learning pace is a crucial factor in successful learning.

Student engagement during learning using Edpuzzle was also higher. Based on the researchers' observations, students in the experimental group appeared more active in asking questions, discussing topics, and engaging with the material. This demonstrates that engaging and interactive media can increase student motivation. This increased motivation directly contributes to improved learning outcomes. Teachers, as facilitators in learning, also benefit from the use of Edpuzzle. They can directly monitor students' learning progress through the available dashboard. They can see which students have completed the video, which questions were answered correctly or incorrectly, and which sections were replayed most frequently. This data serves as a reflection in designing future learning. Overall, the results of this study indicate that the use of Edpuzzle learning media has a positive impact on improving student learning outcomes in the energy transformation topic. Data obtained from pretests, posttests, t-tests, and N-Gain provide quantitative evidence that interactive video-based learning is more effective than conventional methods. Therefore, the use of Edpuzzle is worthy of consideration as an innovative and effective alternative learning strategy at the elementary school level.

.*Discussion*

The research results show that the use of Edpuzzle learning media significantly improved student learning outcomes in the energy transformation topic. This is evidenced by the higher posttest and N-Gain scores in the experimental group compared to the control group. These findings reinforce

the understanding that technology-based learning media significantly contributes to the effectiveness of elementary school learning.

According to (Wardani et al., 2024), the use of interactive video-based learning media such as Edpuzzle can improve students' focus and absorption of the material because it combines visual, audio, and active engagement elements. In this context, Edpuzzle not only presents information in a one-way format but also encourages students to process the information through questions that arise during the video.

In multimedia learning theory by (Muthi et al., 2023), students learn better from words and images than from words alone. Edpuzzle, as an interactive video medium, combines both. Students receive audio-visual explanations reinforced with cognitively stimulating questions. This supports information retention in long-term memory. Research by (Kurnia & Sunaryati, 2023) also shows that learning using interactive video has a positive impact on student engagement and learning outcomes. Interactivity in videos, such as questions and pauses for reflection, has been shown to be more effective than passive video viewing. In this study, students appeared more active when using Edpuzzle than when using lectures.

According to (Prasetya et al., 2024), learning that utilizes digital technology appropriately will create truly student-centered learning. Edpuzzle gives students the freedom to control their learning flow, pause, repeat, and think independently. This helps students learn at their own pace and style. Modern constructivist theory also supports the use of Edpuzzle. As explained by (Yeni et al., 2023), effective learning is learning that allows students to construct their own understanding through active interaction with the material. In Edpuzzle, students not only watch videos but also construct understanding through problem-solving in the form of questions that arise.

Edpuzzle-based learning is also related to the flipped classroom approach, where students can access materials outside of class and use them for discussion or reinforcement in class. According to (Ayuningsih et al., 2025), the flipped classroom model, which uses interactive videos, has been shown to improve learning outcomes because students have sufficient time to understand the material before face-to-face learning. In the study, increased student learning motivation in the experimental class was a contributing factor to learning success. This is supported by (Hukom, 2025) who stated that students learning using interactive media showed higher levels of enthusiasm than students who only received lectures. High learning motivation has a direct impact on learning outcomes.

Furthermore, this finding aligns with behaviorist learning theory in the context of reinforcement. The questions in Edpuzzle serve as a form of reinforcement for the material presented. Students who answer correctly feel successful and are motivated to continue learning. According to (Sukma et al., 2022), this form of reinforcement can strengthen the association between stimulus (material) and response (understanding). Teachers also benefit from Edpuzzle because the platform provides learning analytics. According to (Sofianah & Sholihah, 2024), technology that provides feedback to teachers is very helpful in diagnosing learning. Teachers can identify areas where students have not yet mastered the material, allowing them to design more effective follow-up interventions.

From a pedagogical perspective, Edpuzzle provides an active, participatory, and reflective learning experience. This type of learning is crucial for developing 21st-century competencies. According to (Mailani et al., 2025), critical thinking and reflection are key competencies that must be instilled from elementary school, and interactive video-based learning can support this. Edpuzzle also encourages students to engage in self-assessment, which involves evaluating their own understanding through embedded questions. This strengthens metacognitive skills.

Interactive media like Edpuzzle are highly relevant to the development of Generation Z and Alpha students who are familiar with digital technology. According to (Manurung et al., 2023), today's students have a strong interest in visual and interactive learning. Therefore, teachers need to innovate

with digital media to keep learning engaging and meaningful. Furthermore, from a differentiated learning perspective, Edpuzzle provides space for students with diverse abilities to learn at their own pace. Faster students can complete videos efficiently, while slower students can repeat them as needed. This supports the principle of inclusivity in learning, as emphasized by (Sukma et al., 2022).

Significant improvements in learning outcomes are also inseparable from approaches that facilitate active recall, namely the practice of recalling newly learned information. In Edpuzzle, questions that appear mid-video are a form of active recall that force students to actively process information, rather than simply receive it. Edpuzzle also functions as a material enrichment tool. In addition to meeting the needs of struggling students, Edpuzzle can also be used to challenge students who have already understood the material with advanced questions. Furthermore, media like Edpuzzle contribute to inclusive and gender-responsive learning. The content used in the videos can be adapted to local contexts and is gender-neutral, as recommended by the Ministry of Education and Culture in its 2020–2023 digital learning guidelines. Overall, the results of this study demonstrate that the use of Edpuzzle learning media can significantly improve student learning outcomes, increase learning engagement, and provide a deeper learning experience. Strengthened by theories and expert findings from the past five years, Edpuzzle has proven relevant, effective, and aligned with the direction of 21st-century education.

CONCLUSION

This study was conducted to answer the primary objective, which was to determine the effect of using Edpuzzle as a learning medium on student learning outcomes in the topic "Energy Transformation Around Us" in fourth-grade students at Paninggaran Public Elementary School. Based on the data analysis and discussion, it can be concluded that Edpuzzle has a positive and significant impact on improving student learning outcomes compared to conventional methods.

The improvement in learning outcomes is evident in the comparison of posttest scores between the experimental and control groups, as well as the N-Gain value, which indicates greater effectiveness for students learning using Edpuzzle. This medium not only delivers material visually and engagingly but also encourages active student engagement through interactive features that stimulate conceptual understanding, critical thinking skills, and the ability to reflect on the material.

More than just a teaching aid, Edpuzzle functions as a digital learning system that allows teachers to monitor learning in real time and design adaptive and contextual learning experiences tailored to student needs. Therefore, Edpuzzle is relevant for implementation in elementary school science lessons, particularly for materials that require an understanding of energy transformations in everyday life.

The findings of this study provide theoretical and practical implications that technology-based learning, when properly designed and implemented, can support the principles of active, differentiated, and enjoyable learning, as emphasized in the Independent Curriculum. This opens up opportunities for educators to continuously develop and evaluate digital media-based learning approaches.

However, this study has limitations, such as its limited scope to a single school and focus on a single subject matter. Therefore, further research is recommended to test the effectiveness of Edpuzzle at other grade levels and subjects, as well as in different geographic and social contexts. Future research could also explore the impact of Edpuzzle use on non-cognitive aspects such as learning motivation, student self-confidence, or collaboration skills.

Furthermore, longitudinal studies are needed to explore the long-term sustainability of Edpuzzle-based learning and how this media integration can be integrated with other learning models such as flipped classrooms, blended learning, or project-based learning. Edpuzzle's potential to support data-driven formative assessment is also a promising area for further research.

With the continuous advancement of educational technology, research focused on developing inclusive and adaptive interactive learning media is needed. Edpuzzle is just one example of digital opportunities that can be leveraged in elementary education. Future research is expected to encourage learning innovations that not only improve learning outcomes but also shape a generation of active, creative, and globally competitive learners.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest. They have no financial relationships, personal interests, or professional affiliations that could inappropriately influence the representation or interpretation of the results of this study.

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