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The Effect of the Problem Based Learning Model Using Wordwall on the Motivation and Learning Outcomes of Sciences in Grade V Elementary School

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Abstract: This study aims to analyze the effect of the Problem-Based Learning (PBL) model assisted by Wordwall on the motivation and learning outcomes of fifth-grade science students in elementary schools. The focus of the study is to determine the extent to which the problem-based learning model assisted by the Wordwall application affects students' motivation and learning outcomes. This study aims to provide practical recommendations for educators in designing more effective learning strategies, especially in the elementary school context. This study uses a quantitative method with a quasi-experimental method in the form of a pre-experimental with a one-group pretest-posttest design. The research sample consisted of only one class as the experimental class, namely class Va. Learning outcome test in the form of multiple-choice questions based on cognitive indicators. The results of the study showed that there was a significant increase in student motivation and learning outcomes after the application of the problem-based learning model assisted by the Wordwall application. The statistical test used a t-test in the form of a paired sample t-test. This proves that there is a significant difference between the motivation scores and student learning outcomes before and after the application of the Problem-Based Learning (PBL) model assisted by Wordwall. Thus, it can be concluded that the application of the Problem Based Learning (PBL) learning model assisted by the Wordwall application has a positive effect on increasing the motivation and learning outcomes of class Va students.

Keywords: Elementary school; Learning motivation; Learning outcomes; Problem based learning; Wordwall

Introduction

Education plays a crucial role in preparing quality human resources to face future challenges. One particularly fundamental form of education is elementary school (SD). At this level, students are equipped with basic knowledge, skills, and attitudes that will serve as the foundation for learning at the next level (Golden, 2023; Kwangmuang et al., 2021). Within the context of elementary school education, the study of Natural and Social Sciences plays a strategic role. Natural and Social Sciences (IPAS) is a subject that studies natural phenomena and objects in a systematic, orderly, and generally applicable manner, consisting of a collection of observations and experiments (Loyens et al., 2023). Through learning IPAS, students can develop critical, logical, and creative thinking skills, and gain a deep understanding of the natural world. Critical thinking skills are crucial for students to analyze, evaluate, and solve problems in everyday life and will also impact student learning outcomes (Aristin & Purnomo, 2022). The era of technological and

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information disruption has presented significant challenges in education, particularly in the teaching of Natural and Social Sciences (IPAS) at the elementary school level. One learning model that can improve motivation and learning outcomes is Problem-Based Learning (PBL). Bhardwaj et al. (2025), stated that PBL is a learning model that encourages students to actively seek solutions to real-world problems.

Problem-based learning (PBL) not only increases student engagement but also critical and creative thinking skills. The problem-based learning model emphasizes providing problems at the beginning of the lesson. The problems presented to students are those they commonly encounter or experience in everyday life, and these problems can then be solved in groups (Walraven et al., 2008). The selection of materials or media for the learning process is crucial, considering several factors, including accessibility, assessment type, media design, budget, and the platform's features (Ara et al., 2024). Media serves to guide students through the learning experience, which can be seen through their interactions with the media. The use of appropriate media will enhance the learning experience, thereby improving learning outcomes. This opinion aligns with Edgare Dale's "Cone of Experience" theory, which is the fundamental basis for media use in the learning process (Bondin & Zammit, 2025). One medium that can support student learning is the Wordwall (Pramudita & Sunarso, 2024). This platform offers a variety of games, including quizzes, random cards, crosswords, and many others. Wordwalls can consist of written learning concepts with additional images, diagrams, or real-world objects, designed to be clearly readable by students from all distances and positions within the classroom (Schoenherr et al., 2024).

Wordwalls are free learning resources accessible to all ages. This media can be designed to enhance learning activities, both in groups and individually, ultimately enabling students to be more active during the learning process. Using wordwalls is expected to improve students' understanding of the material without having to constantly rely on textbooks or teacher explanations (Dewi et al., 2024). Wordwalls can be used to monitor student development, thereby helping to increase student motivation, which in turn impacts student learning outcomes. In the digital era, teachers' skills in utilizing technology are crucial in designing adaptive and enjoyable learning. Rahayu et al. (2024), stated that teachers' skills in designing technology-based questions, including in the context of numeracy, are key to increasing students' interest in learning and understanding of the material. Although the focus is on numeracy, these findings reinforce the relevance of utilizing digital media such as wordwalls at the elementary school level to improving the quality of Problem-Based Learning (PBL)-based learning. The expected learning outcomes are usually good and optimal academic performance (Ramdhani et al., 2024; AL-Qadri et al., 2024). However, achieving good learning outcomes often presents challenges, and learning outcomes are suboptimal. Improvement in student learning outcomes is influenced by many factors, one of which is motivation to learn. Student learning will be successful if they possess the will and drive to learn. Motivation to learn motivates students, directing their attitudes and behaviors.

In learning activities, motivation can be defined as the overall driving force within students that generates learning activities, ensures the continuity of learning activities, and provides direction, enabling the desired learning objectives to be achieved. Students with high motivation are likely to achieve high learning outcomes. This means that the higher their motivation, the greater the intensity of their effort and dedication, the higher their learning outcomes. Teachers play a crucial role in enhancing student motivation in school. However, students often feel that teachers only focus on a select few. Prolonged feelings of boredom and laziness can lead to a loss of motivation and interest in active learning and discourage them from further developing their knowledge. This situation is expected to impact student learning outcomes. This aligns with the theory proposed by Feng et al. (2024), which explains that strong motivation and interest in learning will also influence student learning outcomes because they create a drive to make changes. Conversely, if students lack motivation, their learning outcomes will also be unsatisfactory.

Based on initial observations conducted with grade 6 students at the UPT SDN 02 Teratak Teleng, several findings were obtained indicating low student motivation and learning outcomes in science lessons, particularly in the Human Digestive System: First, minimal active participation in learning. During the learning process, it was apparent that most students lacked the courage to ask questions or answer questions from the teacher. Many of them tended to remain silent or appeared hesitant when asked to express their opinions. This indicates that students' internal motivation is still relatively low. Taharu et al. (2019), argues that motivation can be a driving force for students to enrich their learning experiences because it can support student activities in learning. Second, students pay little attention to the teacher during the learning process. While the teacher is explaining the material, some students are seen engaging in unrelated activities, such as chatting with friends, drawing in their books, or even leaving the classroom without permission (Arnesen et al., 2021). This situation indicates a lack of learning awareness and a lack of discipline in participating in the learning process. Third, students

lack a thorough understanding of the material presented by the participating groups. This is evident when a group presents its discussion results in front of the class, while the other students remain silent without responding. Consequently, learning is not efficient and effective (Rea et al., 2022).

Fourth, students lack a thorough understanding of the material. This is evident when the teacher asks students about material they have learned, but the students' answers are still rigid and standard. As a result, many students remain fixated on the textbook they are studying. Furthermore, some students are seen cheating on their peers' completed work (Zhao et al., 2022). This is due to a lack of conceptual understanding of the material presented. Fifth, students are less active in the learning process. This is evident in the learning process, with many students remaining silent when asked questions by the teacher. Consequently, learning remains one-way rather than multi-directional. Sixth, learning is monotonous, as evidenced by the lack of student response when discussion groups present their presentations to the class (Eckhaus et al., 2024). This ultimately makes the discussion process monotonous. Seventh, many students' social studies learning outcomes are still below the minimum competency (KKTP), thus the objectives of thematic learning have not been achieved.

Based on the background presented, this study was conducted with the aim of analyzing the effect of implementing the Problem-Based Learning model with the aid of Wordwall on student motivation and learning outcomes in social studies in fifth-grade elementary schools. This study also aimed to identify student responses to the implementation of this learning. Therefore, the researcher chose the title: "The Effect of the Problem-Based Learning Model with the Assistance of Wordwall on Motivation and Social Studies Learning Outcomes in Fifth-Grade Elementary Schools."

Method

The type of research used was quantitative research with a quasi-experimental experiment with a pre-experimental design. Pre-experimental research is a form of quantitative research that aims to determine the effect of a treatment on research subjects without using a control group and without randomization. This design involves only one group receiving the treatment and being measured before and after the treatment. According to Reio (2024), quantitative research is an approach to empirical studies that collects, analyzes, and presents data in numerical rather than narrative form. Experimental research is research conducted to test the impact of a treatment on research outcomes while controlling for other factors that may also influence the results.

This experimental research aims to establish a causal relationship between two variables, namely the dependent variable and the independent variable. In other words, this experimental research is useful for determining the effects of a treatment on a research subject. That pre-experimental research is a research design that does not meet the requirements of a true experiment because it lacks a comparison group (control) and is not conducted randomly. However, this design is very useful for understanding changes after a treatment. This design is often used in educational research where randomization or comparison is not possible. This study sought to examine and reveal the extent of the influence of Wordwall-assisted PBL on student motivation and learning outcomes by comparing learning outcomes before and after the treatment.

Result and Discussion

The results of the study indicate that the problem-based learning model, supported by the Wordwall application, has an impact on the motivation and learning outcomes of fifth-grade elementary school students at the UPT SDN 02 Teratak Teleng. The implementation of the problem-based learning model, supported by the Wordwall application, in class V (experimental), began with the teacher opening the lesson by covering physical preparation, appreciation, motivation, and information about the learning activities. The teacher then divided students into five heterogeneous groups and explained the rules that would apply during the discussion. The results of this study suggest that the application of the problem-based learning model, supported by the Wordwall application, can be implemented in the teaching and learning process as an effort to instill good habits in students and also improve student motivation and learning outcomes. Based on the results of the study conducted at the UPT SDN 02 Teratak Teleng, the above findings are indeed confirmed. The implementation of the Problem-Based Learning (PBL) model, supported by Wordwall, significantly impacted the motivation and learning outcomes of class V students.

The increase in student learning motivation is evident from the indicators of student learning motivation based on (Chan & Erduran, 2025), in hopes and aspirations for the future, where students become more enthusiastic because they feel the science material is useful for their lives. Student learning motivation also increases along with problem-based learning (PBL) activities and the use of fun Wordwalls. In addition, appreciation in learning can be felt through interactive

learning experiences and appreciation from teachers and peers. The classroom atmosphere also becomes more conducive, collaborative, and enjoyable, supporting active student involvement in learning. On the other hand, in terms of learning outcomes, significant improvements occurred in conceptual understanding, an indicator of cognitive learning outcomes based on (Guo et al., 2020). This was evident in the increase in pretest and posttest scores, indicating that students had a better understanding of the digestive system material after implementing the Wordwall-assisted PBL model. Therefore, this approach has proven effective in improving student motivation and learning outcomes in science.

Therefore, the Wordwall-assisted problem-based learning (PBL) model not only significantly increased learning motivation according to the four motivational indicators but also positively impacted students' understanding of science concepts. This demonstrates that this learning approach is effective in elementary school, particularly in science. In class 6, which was taught using the Wordwall-assisted problem-based learning model, students were initially unfamiliar with the Wordwall application. However, after being given an explanation and step-by-step instructions, they were able to understand it. In the first meeting, students were not yet accustomed to learning to solve problems. The teacher's motivation and encouragement fostered their confidence in implementing the problem-based learning model with the Wordwall application. From the second to fifth meetings, students demonstrated interest in the learning process using the Wordwall application. The teacher's reinforcement and guidance during the learning process, including touches, thumbs-up, and encouraging words, provided numerous benefits for the students. These benefits included fostering self-confidence in the learning process, feeling closer to their peers, and fostering mutual respect among peers when peers asked questions or expressed opinions to the teacher during the learning process.

Student Learning Motivation Before and After the Implementation of Wordwall-Assisted Problem-Based Learning (PBL) in Fifth Grade Elementary School

Learning motivation is a crucial factor in the educational process, as it can act as an internal driver that influences student readiness and learning success (Urhahne & Wijnia, 2023). Based on the results of a questionnaire conducted before the implementation of the Wordwall-assisted PBL model, student learning motivation was categorized as adequate and insufficient. This reflects students' low level of active engagement and interest in learning about the human digestive system, which is taught conventionally through lectures. After implementing the Wordwall-assisted PBL model, there was a significant increase in student learning motivation scores. This is reflected in a significance value below 0.05, indicating a significant difference between motivation before and after the model's implementation. Practically, this increase can also be observed in changes in student attitudes and active participation in learning, such as involvement in group discussions, enthusiasm when using the Wordwall application, and increased self-confidence and curiosity about the material.

The first hypothesis tested in this study was to determine whether there was an influence of motivation and learning outcomes on students taught using the Wordwall-assisted PBL model. The hypothesis regarding student learning motivation in the sample class 6 was tested using the t-test formula. Based on calculations, the learning motivation of students taught using the PBL model was categorized as excellent, 12 students were in the good category, 0 students were in the adequate category, and 0 students were in the poor category. The learning motivation of students taught before using the Wordwall application-assisted problem-based learning (PBL) model was categorized as excellent, 0 students were in the good category, 15 students were in the adequate category, 6 students were in the poor category, and 0 students were in the very poor category. The analysis results showed that student learning motivation increased significantly after implementing the Wordwall-assisted problem-based learning (PBL) model. This is in line with the research findings of Silanto et al. (2025), which stated that AR-based technology can increase student motivation and engagement.

Furthermore, technology integration in learning has been shown to strengthen students' conceptual understanding. Haleem et al. (2022), noted that when technology is used appropriately, students are more active in exploring material and engaging in collaborative discussions. This supports the successful implementation of Wordwall-assisted PBL which is oriented towards problem solving, teamwork, and independent exploration by students. Based on the results of the first hypothesis test, it can be concluded that the Problem Based Learning (PBL) model assisted by Wordwall has a significant effect on the learning motivation of class 6 students at SDN 02 Teratak Teleng. Specifically, this increase is reflected through the four indicators used in the study. Before the use of the Problem Based Learning (PBL) model assisted by Wordwall, most students showed low learning motivation. This was evident from the lack of active participation of students in the learning process and their low initiative in asking questions or finding out more about the material. However, after the implementation of the Problem Based Learning (PBL)

model, students' learning motivation increased, as seen from their enthusiasm in completing group assignments, discussing, and finding solutions to the problems given.

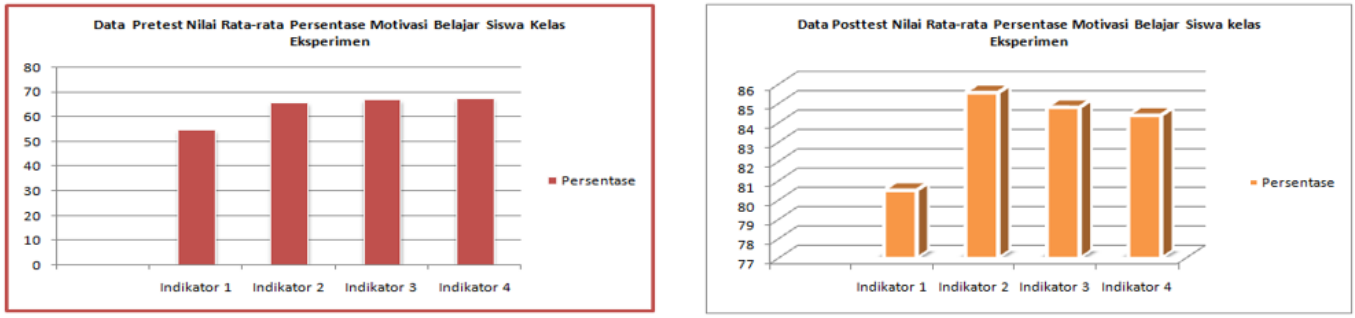

Figure 1. Percentage of each indicator of student learning motivation in the experimental class

The figure above shows the percentages for each indicator of student learning motivation in the experimental class. Indicator I is future hopes and aspirations, Indicator II is motivation to learn, Indicator III is appreciation for learning, and Indicator IV is a conducive environment. For the future hopes and aspirations indicator, before the treatment, students tended not to connect learning material to real life and their future. After implementing problem-based learning (PBL), students began to understand the importance of the material being studied because it was linked to real-life contexts, leading them to demonstrate a greater enthusiasm for learning to achieve their long-term goals. The appreciation for learning indicator also improved. Before the treatment, students had fewer opportunities to showcase their work or receive constructive feedback. With the problem-based learning (PBL) model, students were more recognized through group presentations and discussions, and received reinforcement from both the teacher and classmates. Finally, in terms of a conducive learning environment, conventional learning previously made students feel uncomfortable and less actively engaged. After implementing problem-based learning (PBL) with the aid of a Wordwall, the classroom atmosphere became more lively, enjoyable, and interactive. Teachers and students communicated better, and collaboration among students within groups increased. Thus, the Wordwall-assisted problem-based learning (PBL) model proved effective in improving the four aspects of student learning motivation observed in this study.

Student Learning Outcomes Before and After Implementing Wordwall-Assisted Problem-Based Learning (PBL) in Fifth Grade Elementary School

The second hypothesis test in this study examined student learning outcomes after being taught using problem-based learning (PBL) compared to those before being taught using Wordwall-assisted problem-based learning (PBL). The hypothesis regarding the learning outcomes of students taught using the problem-based learning (PBL) model and those before being taught using Wordwall-assisted problem-based learning (PBL) was tested using parametric statistics using the t-test formula. Based on data analysis obtained after the study, the learning outcomes of fifth-grade students taught using the Wordwall-assisted Problem-Based Learning (PBL) model improved compared to those before using the model. This improvement is not only visible from students' final grades, but is also visible in the learning outcome indicators observed in this study, namely cognitive aspects (understanding of concepts), affective (attitudes in learning), and psychomotor (process skills) as stated by Kuo et al. (2024).

In terms of cognitive aspects, before the implementation of the problem-based learning (PBL) model with the aid of Wordwall, students' understanding of the material was still relatively low. This was evident in the large number of students who were unable to answer questions correctly or simply memorized without understanding. After implementing problem-based learning (PBL), students' conceptual understanding improved significantly. Students were able to explain the material in their own words, relate concepts to everyday experiences, and solve problems more accurately. In terms of affective aspects, students showed positive changes in attitude during the learning process. They became more enthusiastic, actively asked questions, respected the opinions of their peers, and demonstrated a sense of responsibility in completing group assignments. This demonstrates that the problem-based learning (PBL) model can improve students' learning attitudes through collaborative and contextual activities. Finally, in terms of psychomotor aspects, before the implementation of problem-based learning (PBL), students' process skills were not yet optimally developed. Students tended to simply receive information without exploring. After learning with PBL and the aid of Wordwall, students appeared more skilled at observing, formulating answers, discussing,

and presenting problem-solving results. They also became more accustomed to using digital tools as learning media. Thus, the Wordwall-assisted problem-based learning (PBL) model not only improves learning outcomes in general but also encourages improvements in the three learning outcome indicators, particularly the cognitive aspects observed in this study.

According to Suciati et al. (2020), learning outcomes encompass cognitive, affective, and psychomotor competencies achieved by students after participating in the learning process (Sartika et al., 2020). More specifically, when linked to the cognitive domain according to Bloom's taxonomy (C1–C6), the improvement in learning outcomes in this study can be described as follows: C1 (Remembering): After participating in Problem-Based Learning (PBL)-based learning with the aid of a Wordwall, students found it easier to remember facts, terms, and basic concepts related to the human digestive system. This was evident in their ability to answer questions using the correct terminology; (Understanding): Students were able to re-explain learned concepts in their own words, interpret images of digestive organs, and provide examples from everyday life; (Applying): Improvement was also evident in students' ability to apply concepts in real-life contexts, such as correctly sequencing the digestive process or relating the material to a healthy lifestyle.

C4 (Analyzing): Students were able to differentiate the functions of each digestive organ and analyze the effects of certain digestive system disorders. Group discussions helped develop these analytical thinking skills; C5 (Evaluating): Several students began to demonstrate the ability to assess the most appropriate solutions or answers to problems presented in group assignments; C6 (Create). In a simple context, students are able to design a poster, story, or oral explanation related to the human digestive system as part of a group discussion presentation. Thus, learning through the problem-based learning (PBL) model assisted by Wordwall not only encourages students to be active but also helps them develop thinking skills from basic levels (C1) to higher levels (C6) in a gradual and contextual manner. Learning outcomes can be seen in tests completed individually by students (Fischer et al., 2024; Muhayati et al., 2023). Based on data analysis, it can be seen that the average student learning outcomes after using problem-based learning (PBL) are higher than the average student learning outcomes before using the problem-based learning (PBL) model assisted by Wordwall (Muhayati et al., 2023).

The average student learning outcome before was 57.61, and the average student learning outcome after the treatment was 71.14, with a difference of 19.53. The maximum score for student learning outcomes is 100, and the minimum score is 60. Based on calculations, there is a difference in student learning outcomes after being taught using the problem-based learning (PBL) model compared to student learning outcomes before using the PBL model. Learning outcomes are behavioral changes achieved by learners after undergoing the learning process (Lee, 2025; Su, 2016). Learning outcomes are only achieved after a person has completed the learning process (Van Alten et al., 2019; Murtonen et al., 2017). Behavioral changes are an indicator of whether or not a person has achieved learning outcomes (Puspita et al., 2025). Learning outcomes are measured based on whether or not behavioral changes occur in a person who has completed the learning process (Fandos-Herrera et al., 2023; Siregar et al., 2022). Before implementing the problem-based learning (PBL) model in Grade 8, the material was presented through lectures and questions and answers. Students mostly sat silently listening to the teacher's information, and few sought information from other sources.

In traditional teaching methods, only a few students were willing to ask questions and provide feedback on the material being taught (Jensen et al., 2021; Masruddin et al., 2024). When asked questions or explained in their own words, some responded immediately, while others consulted their notes or even refused to open their notebooks if they had any questions. Thus, it can be concluded that the Problem-Based Learning (PBL) model, supported by a Wordwall, had a positive impact on the learning outcomes of Grade 8 students at SDN 02 Teratak Teleng. Specifically, student learning outcomes after participating in the Problem-Based Learning (PBL) model showed significant improvement compared to before the model was implemented. This improvement was evident in student activeness in the learning process, such as the courage to ask questions, the ability to express opinions, and good teamwork. Students were also more motivated and motivated to complete learning topics, making the learning process more meaningful and oriented towards achieving overall competencies.

Conclusion

Based on the research results and discussion in Chapter IV, the problem-based learning (PBL) model with Wordwall support generally influences learning motivation and learning outcomes in fifth-grade elementary school science; Student learning motivation after using the problem-based learning (PBL) model is higher than before being taught using the problem-based learning (PBL) model in fifth-grade elementary school. Therefore, the problem-based learning (PBL) model with Wordwall support positively impacts the learning motivation of fifth-grade elementary school

students; Student learning outcomes after using the problem-based learning (PBL) model with Wordwall support are higher than before being taught using the problem-based learning (PBL) model with Wordwall support. Therefore, the problem-based learning (PBL) model with Wordwall support positively impacts the learning outcomes of fifth-grade elementary school students.

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Conceptualization; methodology; validation; formal analysis; S. M. A.; investigation; resources; data curation; M.; writing—original draft preparation; M. F. A.; writing—review and editing; S. S.; visualization: S. M. A. All authors have read and approved the published version of the manuscript.

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Conflicts of Interest
The authors declare no conflict of interest.

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