JKTP: Jurnal Kajian Teknologi Pendidikan
Vol. 9, No. 1, February 2026: 049-062
e-ISSN: 2615-8787
DOI: 10.17977/um038v9i12026p049-062
https://journal-fip.um.ac.id/index.php/jktp

THE EFFECT OF VIDEO-ASSISTED PROBLEM-BASED LEARNING ON IPAS LEARNING OUTCOMES IN TERMS OF ELEMENTARY SCHOOL STUDENTS' SELF-REGULATION

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Article History
Received: 19 January 2025, Accepted: 28 January 2025, ***Published: 10 February 2025***

Abstrak
Penelitian ini bertujuan pengaruh model *Problem Based Learning* berbantuan video pembelajaran terhadap hasil belajar IPAS siswa kelas V Sekolah Dasar ditinjau dari regulasi diri. Penelitian ini penting dilakukan karena pembelajaran IPAS pada Kurikulum Merdeka menekankan keterlibatan aktif siswa dalam memahami konsep, memecahkan masalah kontekstual, dan mengembangkan kemampuan berpikir kritis. Ruang lingkup penelitian difokuskan pada pembelajaran IPAS Kurikulum Merdeka yang menuntut keterlibatan aktif siswa. Metode yang digunakan adalah kuasi eksperimen dengan desain *posttest-only control group*. Populasi penelitian adalah siswa kelas V Sekolah Dasar, dengan sampel yang dibagi ke dalam kelompok eksperimen dan kelompok kontrol melalui random sampling. Data dikumpulkan menggunakan tes hasil belajar IPAS dan kuesioner regulasi diri, kemudian dianalisis menggunakan analisis varians dua jalur. Hasil penelitian menunjukkan bahwa PBL berbantuan video menghasilkan skor hasil belajar IPAS yang lebih unggul dibandingkan pembelajaran konvensional. Selain itu, terdapat interaksi antara model pembelajaran dan regulasi diri terhadap hasil belajar IPAS. PBL berbantuan video memberikan peningkatan paling optimal pada siswa dengan regulasi diri tinggi, namun tetap efektif pada siswa dengan regulasi diri rendah.

Kata Kunci: *Problem Based Learning* (PBL); Video Pembelajaran; Hasil Belajar IPAS; Regulasi Diri; Siswa Sekolah Dasar

Abstract
This study aims to examine the effect of the Problem-Based Learning model supported by instructional videos on the science and social studies (IPAS) learning outcomes of fifth-grade elementary school students in terms of self-regulation. This study is important because IPAS learning under the Merdeka Curriculum emphasizes active student engagement in understanding concepts, solving contextual problems, and developing critical thinking skills. The scope of the study focuses on Merdeka Curriculum-based IPAS learning, which requires active student participation. A quasi-experimental method with a posttest-only control group design was employed. The population consisted of fifth-grade students from SD Gugus Satu Kuta, with the sample divided into an experimental group and a control group through random sampling. Data were collected using an IPAS learning outcomes test and a self-regulation questionnaire, then analyzed using a two-way analysis of variance. The results indicate that PBL supported by instructional videos produces higher IPAS learning outcome scores compared to conventional learning. In addition, there is an interaction between the learning model and self-regulation on IPAS learning outcomes. PBL supported by instructional videos provides the most optimal improvement for students with high self-regulation, yet it remains effective for students with low self-regulation.

Keywords*: Problem Based Learning (PBL); Instructional Video; IPAS Learning Outcomes; Self-Regulated Learning; Elementary School Students*

To cite this article:
Sumariyanti, N. M., Ardana, I. M., & Suastika, I. N. (2026). The effect of video-assisted problem-based learning on ipas learning outcomes in terms of elementary school students' self-regulation. *JKTP: Jurnal Kajian Teknologi Pendidikan, 9*(1), 49–62. doi: 10.17977/um038v9i12026p049-062

INTRODUCTION

Natural and Social Sciences (IPAS) is an integrated subject that combines scientific and social ideas to provide students with a comprehensive understanding of natural processes, the environment, and social life. IPAS plays a key role in developing critical thinking skills, problem-solving abilities, and scientific attitudes in children from an early age (Zakarina et al., 2024). Science education under the Independent Curriculum seeks to enhance students' capacity to understand and respond to natural and social phenomena in context through meaningful learning experiences (Indiana, 2024). This scenario requires the implementation of learning strategies that stimulate active student participation and the development of independent learning abilities, enabling students to process information more deeply (Renden, 2023). Therefore, science learning techniques must be developed to meet all student learning needs, including emotional, cognitive, and metacognitive engagement in the learning process (Linsih et al., 2025; Suastra et al., 2025).

Students' self-regulation ability is an essential characteristic in ensuring the success of science learning. Self-regulation is defined as students' capacity to manage their own learning processes independently, including planning, managing, and evaluating learning activities (Arisandhi et al., 2023). Students with strong self-regulation skills are able to set learning goals, organize strategies, maintain motivation, and complete tasks consistently (Heriyanti & Bhakti, 2022). Conversely, when learning does not facilitate the development of these abilities, learning effectiveness decreases, making it difficult to achieve curriculum objectives (Arnyana & Suma, 2025; Parwati et al., 2025). Therefore, successful science education must consider student qualities, such as their ability to regulate and develop independent learning.

However, IPAS learning outcomes at the elementary school level still show problems, both in terms of achievement and equity. Changes in students' life trends also pose challenges that affect focus, interest, and learning patterns, thereby influencing learning outcomes (Sanjaya & Suastika, 2025; Triretnoningrum et al., 2025). Based on observations at SD Gugus 1 Kuta, the average summative scores of fifth-grade students across several schools remain below the Learning Objective Achievement Criteria (KKTP), which is 6.50. This finding indicates that mastery of science competencies has not yet been optimal and highlights the need for more innovative learning interventions so that the learning process can facilitate active engagement and student independence (Suastika, 2023). This situation also suggests that the learning approaches used in classrooms are not fully aligned with the needs of the Independent Curriculum, which emphasizes meaningful learning.

Poor science learning outcomes emerge as a consequence of traditional teaching practices that focus on lectures and individual assignments. This learning pattern tends to make students passive, less motivated, and easily bored, resulting in less meaningful learning experiences (Jampel & Antara, 2024; Utama et al., 2021; Widiana et al., 2024). As a result, students' understanding of IPAS concepts becomes superficial, lacks contextual relevance, and is difficult to apply in daily life (Nurhairunnisa & Darmiany, 2024). In IPAS subjects, which require the ability to connect natural and social phenomena through cause-and-effect relationships, conventional learning often fails to adequately motivate students to think critically and gain knowledge through active learning experiences.

In addition to learning approaches, poor science learning outcomes are also influenced by students' weak self-regulation abilities. Students with good self-regulation tend to be more focused, persistent, and responsible in completing assignments, whereas those with low self-regulation are more easily distracted and prone to procrastination (Gusliyarsih & Solfema, 2025; Nita & Agustika, 2023; Tarumasely, 2024). In the context of IPAS learning, self-regulation is crucial because students

need to manage information, organize learning strategies, and engage in reflection to understand interconnected concepts. Low self-regulation causes the learning process to become unfocused, resulting in poor learning outcomes.

Previous literature reviews indicate that IPAS learning achievements are often not aligned with students' critical thinking skills and self-regulation. Many students have not been able to internalize essential 21st-century learning skills, such as independent and reflective thinking, so learning has not yet produced the expected competencies (Maksum et al., 2021). Other studies show that interventions based on self-regulation strategies, such as scaffolding, can significantly improve learning outcomes compared to learning without self-regulation support (Howard et al., 2020). These findings emphasize that effective learning should not merely focus on content delivery but must also provide support for students' learning processes so they are able to regulate learning independently and sustainably.

To address the issue of low science learning outcomes, learning approaches that encourage active and independent learning are needed. Problem-Based Learning (PBL) is an important approach that emphasizes real-world problem-solving as the primary foundation of learning (Letasado et al., 2024; Sari et al., 2023). Through PBL, students are trained to set learning goals, explore information, collaborate, and evaluate solutions, thereby indirectly developing self-regulation skills (Lestari et al., 2025). Instructors act as facilitators, guiding students to discover concepts through thinking and investigation rather than directly providing knowledge (Pozuelo-Muñoz et al., 2023). These characteristics are consistent with the ethos of the Independent Curriculum, which promotes student-centered and contextual learning (Agustina & Margunayasa, 2024).

To enhance the effectiveness of problem-based learning, instructional media that align with the characteristics of elementary school students must be utilized. Appropriate media can help students understand concepts more concretely, increase attention, and facilitate connections between learning material and real-world situations (Rosyidah & Supriyadi, 2024; Wabula et al., 2020). Learning videos or films are considered beneficial because they present information through engaging visual and audio combinations, allow students to review material as needed, and thereby support self-regulation (Prastica et al., 2021). The use of instructional media that match elementary students' characteristics is essential, as appropriate media can help students grasp concepts more concretely, increase motivation, and enable them to relate material to real-life experiences, thus making PBL implementation more effective (Báró, 2024; Darwati & Purana, 2021; Nu'man et al., 2024; Saraha & Ardiansyah, 2023). Based on current conditions, the novelty of this scientific article lies in examining the effectiveness of PBL assisted by learning videos on science learning outcomes while considering differences in students' self-regulation. Therefore, this study investigates differences in learning outcomes between groups taught using PBL and conventional learning, as well as interaction models between learning approaches, learning outcomes, and self-regulation among students with high and low self-regulation at SD Gugus 1 Kuta.

METHOD

This study employed a quantitative approach with a quasi-experimental design aimed at examining the effect of the Problem-Based Learning (PBL) paradigm assisted by instructional videos on science learning outcomes, with students' self-regulation considered as a moderating variable. A quantitative method was selected because the study focused on hypothesis testing using numerical data that were statistically analyzed (Sugiyono & Lestari, 2021). The experimental design applied was a posttest-only control group design, in which participants were divided into two groups—experimental and control—and only a posttest was administered after the treatment to determine the

effect of the intervention on learning outcomes (Arikunto, 2019). The study was conducted during the odd semester of the 2025/2026 academic year at SD Gugus 1 Kuta, which consists of seven schools.

The population of the study included all 270 fifth-grade elementary school students from Gugus 1 Kuta. The research sample consisted of 110 students selected through random sampling at the class level, as class groupings had been predetermined and individual randomization was not feasible. Therefore, the experimental and control classes were randomly selected using a lottery method (Sugiyono, 2021; Sukardi, 2021). The lottery results indicated that SD No. 1 Kuta served as the experimental group with 56 students, while SD No. 5 Kuta served as the control group with 54 students.

The research instruments consisted of test and non-test tools. Science and social studies (IPAS) learning outcomes were measured using a 35-item multiple-choice objective test with four answer options. The test was developed based on IPAS learning outcomes and instructional objectives and was designed to assess higher-order thinking skills. A score of 1 was assigned for each correct answer and 0 for each incorrect answer. These scores were then converted to a 0–100 scale to calculate learning outcome scores. Students' self-regulation was measured using a non-test instrument in the form of a closed-ended questionnaire with a five-point Likert scale, ranging from "strongly disagree" to "strongly agree." The results were classified of students with high and low levels of self-regulation. Before use, both instruments were tested for validity and reliability to ensure the suitability of the data for analysis (Sugiyono, 2021).

The data collection procedure began with the determination of experimental and control classes, the preparation of instructional materials, and the implementation of learning activities according to the assigned treatments. The experimental group learned science using the Problem-Based Learning approach supported by instructional videos, while the control group received conventional instruction. Subsequently, both groups were administered a posttest to obtain data on IPAS learning outcomes. Self-regulation was measured through the distribution of questionnaires to all sampled students at a time determined by the researcher, after which self-regulation scores were categorized into high and low levels for analytical purposes. Data were analyzed using prerequisite tests and hypothesis testing. As prerequisite analyses, tests of normality and homogeneity of variance were conducted. A mean-based homogeneity test in SPSS version 26 was used to examine the normality of learning outcome data; the data were considered normally distributed if the significance value exceeded 0.05 (Arikunto, 2019). The Kolmogorov–Smirnov and Shapiro–Wilk tests were employed to assess data normality, while variance homogeneity criteria were applied across groups (Arikunto, 2019). The effects of the learning model, self-regulation, and their interaction on science learning outcomes were evaluated using two-way ANOVA (2×2 design) after all assumptions were met. All statistical tests were conducted at a 5% significance level ($\alpha = 0.05$), and the null hypothesis (H_0) was rejected if the significance value was less than 0.05 (Dewi et al., 2021).

RESULT

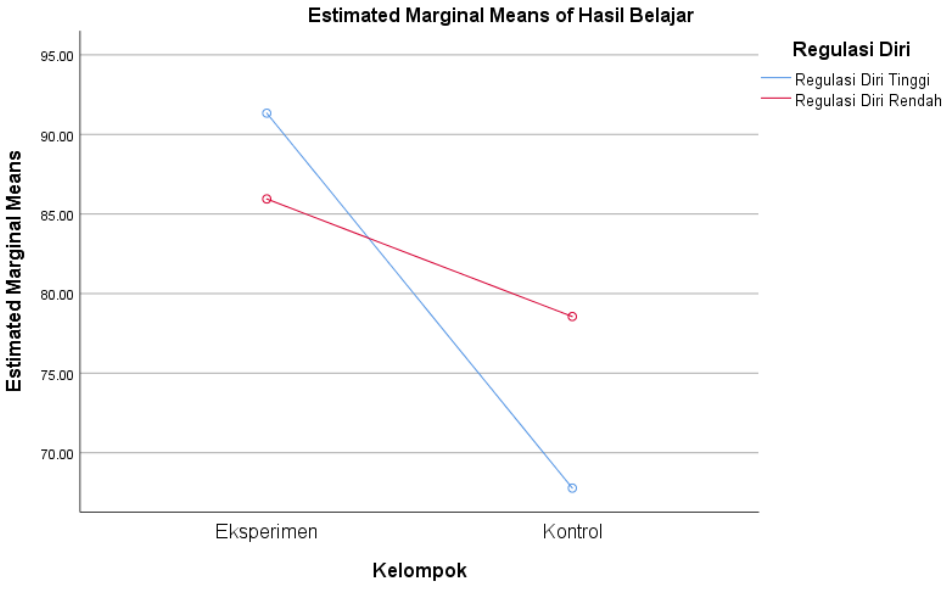
After confirming the normality and homogeneity of the data, the hypotheses were tested using two-way analysis of variance (ANOVA). The results are presented below. ANOVA was applied in two ways: to examine the effect of each main variable and to analyze the interaction between variables in relation to the dependent variable. Through this approach, the analysis provides more comprehensive information regarding differences in outcomes across groups.

Table 1. Two-Way ANOVA Test Results

Inter-Subject Effect Test						
Dependent Variable: Science Learning Outcomes						
Sources of Variation	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	7917,022	3	2639,007	42,338	0,000	0,545
Intercept	725872,728	1	725872,728	11645,306	0,000	0,991
Group	**6918,328**	**1**	**6918,328**	**110,992**	**0,000**	**0,512**
Self Regulation	774,611	1	774,611	12,427	0,001	0,105
Self-Regulation Group	**239,411**	**1**	**239,411**	**8,841**	**0,003**	**0,103**
Error	6607,169	106	62,332			
Total	743217,000	110				
Corrected Total	14524,191	109				
a. R Square = .545 (Corrected R Square = .532)						

The results of the two-way ANOVA presented in Table 1 indicate that the group variable, namely the learning model, yielded a significance value of 0.000 with an F value of 110.992. Since the significance level (0.000) is lower than 0.05, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. This finding demonstrates that students who were taught using the Problem-Based Learning (PBL) model supported by instructional videos achieved significantly higher science learning outcomes than those who were taught using conventional learning models. Thus, the application of the PBL approach in combination with learning videos results in superior science learning outcomes compared to traditional instructional methods. This result suggests that students are able to enhance their understanding of science concepts by engaging in problem-solving activities supported by visual media.

Furthermore, the two-way ANOVA results also show that H_0 is rejected and H_1 is accepted for the interaction effect. The interaction between the learning model and self-regulation (Group × Self-Regulation) produced a significance value of 0.003 with an F value of 8.841. As illustrated in Figure 1, this interaction indicates that both the learning model and students' self-regulation jointly have a significant influence on science learning outcomes.



Graph 1. Interaction of Learning Models with Self-Regulation on Science Learning Outcomes

Based on Graph 1 above, students with high self-regulation achieved the highest mean learning outcomes in the experimental group, followed by students with low self-regulation. This finding

indicates that the implementation of Problem-Based Learning (PBL) supported by instructional videos enables students to maximize their learning potential more effectively. Meanwhile, students with low self-regulation in the experimental group obtained lower scores than those with high self-regulation; however, their achievement remained higher than that of students in the control group. This result suggests that the instructional approach is still effective across different student characteristics. In contrast, a more pronounced decline was observed in the control group, particularly among students with high self-regulation, indicating that traditional instruction has not been sufficient to help students maintain and optimally utilize their learning capacities. This condition alters the pattern of differences between students with high and low self-regulation in the control group when compared to the experimental group. Furthermore, the non-parallel line patterns in the graph indicate an interaction between the learning model and self-regulation, suggesting that the effectiveness of instruction is influenced by students' levels of self-regulation. Subsequently, the results of the two-way ANOVA for students with high self-regulation are presented in Table 2 below.

Table 2. Results of 2-Way ANOVA Test for High Self-Regulation

Multiple Comparison (Advanced Test)						
Dependent Variable: Science Learning Outcomes						
LSD						
(I) Group	(J) Group	Mean Difference (I-J)	Standard Error	Sig.	95% Confidence Interval	
					Lower Limit	Upper Limit
High Self-Regulation Experimentation	Experimentation-Low Self-Regulation	5,5539*	2,24680	0,016	1,0705	10,0373
	High Self-Control-Regulation	9,8133*	2,24680	0,000	5,3299	14,2968
	Low Self-Control-Regulation	24,8111*	2,24680	0,000	20,3277	29,2945
Based on the average observation results. The error component used is the Mean Squared Error = 45.433.						
*. The mean difference is significant at the 0.05 significance level.						

The results of the two-way ANOVA conducted on students with high levels of self-regulation revealed a significant difference in science learning outcomes between students who were taught using the Problem-Based Learning (PBL) model supported by instructional videos and those who were taught using conventional instructional methods. The obtained significance value of 0.000 (< 0.05) indicates that the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was accepted, with a mean difference in learning outcomes of 9.8133. These findings suggest that students with strong self-regulation skills benefit more substantially from the implementation of PBL, particularly in terms of managing learning strategies, maintaining focus during problem-solving activities, and evaluating the results of discussions and solutions developed throughout the learning process. The integration of instructional videos further enhanced students' understanding by presenting learning materials in a more concrete, realistic, and engaging manner. This visual and auditory support enabled students to connect scientific concepts with real-world contexts more effectively. Moreover, the Problem-Based Learning approach requires active participation, collaboration, and critical reasoning, which encourages students to take greater responsibility for constructing knowledge and drawing conclusions based on their own investigations. Consequently, the PBL paradigm, when combined with video-assisted learning, demonstrates strong potential in

improving science learning outcomes, particularly for students with high levels of self-regulation. The results of the fourth hypothesis test are presented in Table 3.

Table 3. Results of 2-Way ANOVA Test for Low Self-Regulation

Multiple Comparison (Advanced Test)						
Dependent Variable: Science Learning Outcomes						
LSD						
(I) Group	(J) Group	Mean Difference (I-J)	Standard Error	Sig.	95% Confidence Interval	
					Low Limit	Upper Limit
Low Self-Regulation Experimentation	Experimentation-High Self-Regulation	-5,5539*	2,24680	0,016	-10,0373	-1,0705
	High Self-Control-Regulation	4,2594	2,24680	0,062	-,2240	8,7429
	Low Self-Control-Regulation	19,2572*	2,24680	0,000	14,7738	23,7407
Based on the average observation results. The error component used is the Mean Squared Error = 45.433.						
*. The mean difference is significant at the 0.05 significance level.						

Based on Table 3, the results of the two-way ANOVA indicate a significant difference in learning outcomes between students who were taught using the Problem-Based Learning (PBL) model supported by instructional videos and those who received conventional instruction. The significance value of 0.000 (< 0.05) and the mean difference in learning outcomes of 19.2572 confirm that the null hypothesis (H_0) was rejected, while the alternative hypothesis (H_1) was accepted. These findings demonstrate that the implementation of PBL combined with video-based learning has a significant positive effect on the learning outcomes of students with high levels of self-regulation.

DISCUSSION

The difference in learning outcomes between students who used a video-based learning model and those who used a traditional learning model in SD Gugus 1 Kuta was examined in this study. The findings revealed a significant difference with a p-value of less than 0.05, indicating that the learning model had a measurable effect on academic achievement. Measuring science learning outcomes is essential because it reflects improvements in students' ability to understand, retain, and apply concepts meaningfully. Learning outcomes can also be used to evaluate whether the implemented instructional methodology helps students achieve science learning objectives, which focus on conceptual knowledge and its relationship with natural and social phenomena in their surrounding environment (Lubis et al., 2024; Nugroho et al., 2023; Suparya et al., 2022). The role of instructional videos strengthens the effectiveness of Problem-Based Learning (PBL) through concrete and engaging visualization of IPAS phenomena, helping students comprehend more abstract concepts, improve focus, and enhance engagement in the learning process (Farr & Roth, 2021; Nurfadhillah et al., 2021; Theresia & Silaban, 2024). Video-assisted problem-based learning improves learning outcomes by emphasizing contextual challenges while simultaneously stimulating reflection, solution formulation, investigation, activation of prior knowledge, and strategy development. This approach transforms rote learning into experiential knowledge construction (Ali et al., 2023; Puspitasari, 2024; Saraha & Ardiansyah, 2023).

This finding aligns with the constructivist perspective, which emphasizes active learning and social engagement, as well as Bloom's taxonomy, which identifies analysis and problem-solving as pathways to higher cognitive abilities (Ruslan & Hamid, 2024). The effectiveness of video-based

instruction can also be explained through multimodal learning theory, which emphasizes information processing through visual and auditory channels to enhance conceptual understanding and retention (Biassari et al., 2021). Supporting factors influencing differences in learning outcomes include video quality, teachers' readiness to facilitate discussions and investigations, students' adaptation to active learning, and the availability of instructional resources in the classroom (Ismanto & Anshari, 2022; Theresia & Silaban, 2024). The results of this study are consistent with previous research indicating that video-assisted PBL improves learning completion and produces better learning outcomes than control classes, reinforcing empirical evidence that PBL supported by visual–auditory media is effective in enhancing conceptual understanding (Durasa et al., 2024; Fatimah et al., 2023; Fithriyani et al., 2023; Indiati & Devega, 2023; Suma & Ardana, 2025). The implications of these findings suggest that video-assisted PBL promotes meaningful learning and is feasible to implement as an alternative strategy to improve science learning outcomes, although its implementation requires careful planning due to the additional time and teaching skills needed for effective learning management (Ismanto & Anshari, 2022).

The interaction between learning models and self-awareness in relation to learning outcomes among students in SD Gugus 1 Kuta was also examined. This study identified a significant interaction with a p-value of 0.003 (sig < 0.05), indicating that students' ability to manage their learning processes enhances the effectiveness of instructional models. This interaction suggests that science learning outcomes are influenced not only by instructors' instructional strategies but also by students' willingness to develop, monitor, and regulate learning activities throughout the learning process. Video-assisted Problem-Based Learning (PBL) requires active participation and learning responsibility; therefore, students with high self-regulation are better able to maximize learning stimuli in the form of contextual problems and visual representations by setting learning goals, selecting problem-solving strategies, monitoring comprehension, and reflecting on outcomes (Nita & Agustika, 2023; Octavianingrum & Savira, 2022).

According to social cognitive theory, learning behavior is the result of interactions among personal, environmental, and behavioral factors; therefore, self-regulation as a personal component influences how students respond to the learning environment created through video-assisted PBL (Rosyidah & Supriyadi, 2024; Suastika, 2023). The concept of self-directed learning also highlights that students with strong self-regulation possess greater metacognitive awareness and behavioral control, enabling them to effectively manage the demands of problem-based learning (Howard et al., 2020; Song & Kim, 2020; Van Der Graaf et al., 2022). Observational results during instruction showed that students with high self-regulation were more active in watching videos, asking questions, and participating in discussions, whereas students with low self-regulation required more intensive guidance; nevertheless, instructional videos helped maintain focus and clarify problem contexts, thereby reducing cognitive load (Aliyyah et al., 2021). Previous studies have demonstrated that PBL affects learning outcomes and self-regulation; these findings further suggest that creative problem-based learning can enhance learning outcomes and foster students' self-regulation (Durasa et al., 2024; Fatimah et al., 2023; Lestari et al., 2023; Renita, 2025). The practical implications emphasize the importance of teachers paying attention to variations in students' self-regulation and providing adequate scaffolding through instructional media to ensure that all students receive optimal learning opportunities, while the limitation of this study lies in the measurement of self-regulation, which relied solely on questionnaires and therefore may not fully capture students' self-regulatory behaviors during the learning process (Dewi & Agustika, 2023).

The science learning outcomes of students with inadequate self-regulation in SD Cluster 1 Kuta were compared between those who participated in PBL with instructional videos and those who did not. This study revealed a substantial improvement with a significance value of 0.000 (sig < 0.05),

indicating that students were able to improve their science learning outcomes despite limited ability to manage their learning independently. This finding is important because students with low self-regulation generally experience difficulties maintaining focus, managing time, and selecting effective learning strategies, which puts them at risk of low learning outcomes if instruction is not supported by appropriate strategies and media (Tarumasely, 2024). This group benefited from video-assisted PBL because videos functioned as attention-guiding tools, concretely illustrating problem contexts and supporting the understanding of abstract scientific ideas, thereby reducing cognitive load and making the material easier to comprehend (Fiirdaus et al., 2021). The problem orientation stage supported by video helped students understand situations holistically, while the investigation stage encouraged information exploration through group discussions, allowing limitations in self-regulation to be compensated through social interaction and peer guidance. Social constructivism asserts that support from teachers, media, and peers helps students reach higher learning potential, particularly when they are still within their zone of proximal development (Sagitarini et al., 2023).

Observational findings showed that students with low self-regulation in the video-assisted PBL group appeared more focused and active than students in the conventional group, whereas conventional instruction, dominated by lectures, caused students to quickly lose attention and become less engaged in the learning process. These findings are consistent with previous studies that found PBL-based learning improves elementary school students' learning outcomes, particularly among those with high learning motivation, by enhancing concentration, focus, and conceptual understanding (Fithriyani et al., 2023; Indiati & Devega, 2023; Ii. Lestari & Ardani, 2023; Theresia & Silaban, 2024). The practical implications indicate that video-assisted PBL can serve as a more inclusive instructional strategy for students with low self-regulation, although the limitations of this study include the lack of in-depth observational data to describe students' self-regulation strategies during the learning process (Maksum et al., 2021).

The impact of science learning outcomes among students with high self-regulation in SD Gugus 1 Kuta was examined by comparing students who participated in video-assisted PBL with those who engaged in traditional learning. The study found a significant difference with a significance value of 0.000 (sig < 0.05), indicating that video-assisted PBL is most effective for students with strong self-regulation. Students with very high self-regulation are better able to establish learning goals, monitor the learning process, and evaluate learning outcomes independently, allowing problem-based learning to be utilized optimally (Sulisthia, 2025). PBL demands independence, responsibility, and active engagement; therefore, students with high self-regulation are able to effectively utilize each learning stage, from identifying core problems and conducting focused investigations to systematically constructing conceptual understanding and engaging in reflection to improve learning strategies.

Social cognitive theory explains that self-regulation as a personal factor enables students to manage learning environment stimuli effectively, while problem-based learning provides an environment that demands high cognitive activity, resulting in improved learning outcomes (Nita & Agustika, 2023). Instructional videos in this group functioned as cognitive reinforcers, as they were used as sources of information and analytical triggers rather than merely as viewing media, enabling students to more easily connect abstract concepts with real-world phenomena and strengthen knowledge elaboration (Mazaimi & Sary, 2023). Significant differences in learning outcomes can also be explained by higher levels of cognitive activity in PBL compared to conventional learning, as PBL encourages students to analyze problems, interpret information, and construct solutions based on data and learning experiences. These findings are consistent with previous research indicating that PBL has a greater impact on students with strong self-regulation because they are able to maximize opportunities for active learning (Durasa et al., 2024; Fatimah et al., 2023; Ii.

Lestari & Ardani, 2023; Suma & Ardana, 2025). The practical implications of these findings suggest that video-assisted PBL should be implemented to maximize the potential of students with high self-regulation. However, the limitation of this study is that qualitative data were not used to provide an in-depth description of the self-regulation strategies employed by students during the learning process (Van Der Graaf et al., 2022).

CONCLUSION

The purpose of this study was to examine the effectiveness of the Problem-Based Learning (PBL) approach. The results indicate that the video-assisted PBL paradigm significantly improves science learning outcomes among fifth-grade students in SD Gugus 1 Kuta compared with traditional instruction. Furthermore, the presence of a strong relationship between the learning model and the level of self-regulation in relation to learning outcomes indicates that self-regulation influences the effectiveness of instructional implementation. The findings show that students with high self-regulation achieve the highest learning outcomes when engaged in video-assisted PBL; nevertheless, students with low self-regulation still perform better than their counterparts with low self-regulation in traditional learning settings. These findings suggest that video-assisted PBL is not only beneficial as a scientific learning strategy that promotes active engagement, but also requires support for self-regulatory skills to enhance learning outcomes. Therefore, further research is needed to develop more interactive forms of instructional video and more coordinated self-regulation support systems to ensure that the impact of PBL is distributed more evenly.

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