

THE EFFECT OF GAMIFICATION INTERACTIVE LEARNING MEDIA ON MOTIVATION AND SCIENCE LEARNING OUTCOMES

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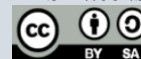
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ABSTRACT

This study analyzes the effect of interactive gamification learning media on motivation and learning outcomes in the Natural and Social Sciences (IPAS) subject of elementary school students. The background of the study shows that low motivation and less than optimal learning outcomes are caused by students' lack of enthusiasm in learning. Using a quantitative approach through the One Group Pretest-Posttest design experimental method, involving 35 students. Data were collected through learning outcome test instruments (pretests and posttests) that have been tested for validity and reliability, questionnaires to measure student motivation levels, and qualitative data from observation and documentation. The results of the study showed a significant increase in the average value of student motivation from 57.43 (pretest) to 71.86 (posttest) or an increase of 25%. This significantly affected the average value of student learning outcomes from 59.14 (pretest) to 86.57 (posttest). This increase was supported by the t-test, which produced a t-value of -13.144 with a significance level of 0.000. The research findings confirm that gamification media successfully transforms learning into a meaningful, engaging experience, and positively impacts student motivation and learning outcomes. Thus, this study demonstrates that gamification-based learning innovation is not simply a technological trend, but rather a powerful, effective, and relevant pedagogical approach to 21st-century learning contexts.

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INTRODUCTIONS

Education in the 21st century demands a transformation of the learning paradigm from teacher-centered to student-centered (Bunari et al., 2024). This change is not merely a shift in methods but also requires innovation in approaches, strategies, and learning media that can accommodate students' increasingly complex and dynamic learning needs (Jayanta, 2025). However, in practice, many elementary schools in Indonesia, including Pesawahan I Elementary School in Tiris District, Probolinggo Regency, still face obstacles in implementing learning that is truly engaging, interactive, and meaningful for students. One of the main challenges that is still frequently encountered is

low student motivation to learn, especially in subjects considered abstract and difficult, such as Natural and Social Sciences (IPAS).

Initial observations indicate that several fifth-grade students at Pesawahan I Elementary School are showing signs of lack of enthusiasm for science lessons. Based on the Minimum Eligibility Criteria (KKM), 75 students still scored below the minimum competency standard. This indicates that student learning outcomes are suboptimal and have the potential to hinder the continuity of the learning process and the achievement of expected competencies at the next level.

This phenomenon is related to the learning patterns that tend to be conventional and still focus on the use of textbooks as the primary learning resource at Pesawahan I Public Elementary School, which impacts students' motivation. According to research (Sudatha, 2024), the lack of motivation to learn is often caused by the teaching methods used. Monotonous learning methods tend to make students passive and less actively involved in the learning process. As a result, student interest and motivation decline, which ultimately impacts conceptual understanding and learning outcomes.

Various learning innovations have been implemented to address the problem of low student motivation and learning outcomes. One learning innovation deemed effective for student needs is the use of interactive gamification learning media. This media is designed with challenging activities, simple simulations, and educational games that are appropriate to students' cognitive developmental stages (Lip et al., 2025). Students' active involvement in completing challenges and receiving feedback helps them understand the material more deeply and meaningfully. This process encourages students not only to memorize information but also to apply science concepts contextually, thereby improving learning outcomes (Sukaesih et al., 2022). Thus, gamification is an effective learning strategy for improving understanding and achievement of science learning outcomes in elementary schools.

A previous study by (Rahmatika et al., 2025), explained that the use of gamified learning media at the elementary school level is a very important part of the activities in supporting student development. Gamification media contributes to physical development, attitude formation, and emotional balance of students (Faradina et al., 2025). This is in line with the characteristics of elementary school students who are at the stage of child development, where play activities are an inseparable part of the learning process. Through the integration of game elements in learning, students become more motivated, interested, and active, so that the learning process can take place in a fun and meaningful way (Araya & González-vicente, 2025).

Gamification has been shown to improve motivation and learning outcomes in various educational contexts, including language, mathematics, and science (Ari et al., 2025). However, its application in elementary schools, particularly in Natural and Social Sciences (IPAS) is still limited and requires further testing. The gap between the need for interactive gamification-based learning and the continued dominance of conventional methods at Pesawahan I Elementary School creates an urgency to test the effect of gamification media in improving motivation and learning outcomes in IPAS. This study aims to analyze in depth the effect of gamification learning media on student motivation and learning outcomes in IPAS at Pesawahan I Elementary School, Tiris District, Probolinggo Regency.

RESEARCH METHODS

This study used a quantitative method, with an experimental research design of One Group Pretest-Posttest. This design involved the same group with an initial test (pretest) before treatment, and continued with the treatment of interactive gamification learning media with a final test (posttest). The purpose of this study was to analyze the effect of gamification learning media on the motivation and learning outcomes of science students. The variables in this study consisted of the independent variable of gamification learning media (X), and the dependent variables of motivation (Y1) and science students' learning outcomes (Y2).

This research was conducted at Pesawahan I Elementary School, Tiris District, Probolinggo Regency, with a sample of 35 fifth-grade students. The interactive gamification learning media used in this research is digital powerpoint technology based on the Quizizz application and Microsoft Office software with a focus on the food chain cycle material. This media is designed by integrating gamification principles, such as gradual game flow, question-based challenges, direct feedback, and simple scoring or awards, to increase student active involvement in the learning

process. Each slide is arranged interactively with a combination of illustrative visuals, animations, and button navigation that allows students to participate directly in understanding the concept of the food chain. The final design of this media not only functions as a means of delivering material, but also as a learning motivation stimulation tool that encourages students to think critically, interact, and learn in a fun way, thus supporting the achievement of science learning objectives more effectively and meaningfully.

Data collection methods include tests, observation, and documentation. Written multiple-choice tests are used to measure student learning outcomes. They are administered before (pretest) and after (posttest) and are structured based on the scope of the learning material. The test instruments are validated through expert assessment to ensure valid and reliable data. The questionnaire instrument, used to measure student motivation, uses a 4-point Likert scale, categorized based on specific intervals, including:

Table 1. Interpretation of the Rating Scale

Interval	Category
3,25 – 4,00	Very High/Good
2,51 – 3,25	High/Sufficient
1,76 – 2,50	Low/Less
1,00 – 1,75	Very Low

Data analysis used descriptive statistics to describe the average motivation and learning outcomes of students before and after treatment and inferential analysis. Hypothesis testing was conducted using paired sample t-tests to determine whether there was a significant difference between the pretest and posttest results. The decision-making criteria for hypothesis testing were if Sig. (P value) < 0.05, then there was a significant effect of the treatment.

RESEARCH RESULTS

This study aimed to examine the effect of interactive gamification learning media on the motivation and learning outcomes of fifth-grade students in science at Pesawahan I Elementary School, Tiris District, Probolinggo Regency. The results showed a significant increase and a positive impact on student engagement, thereby improving motivation and learning outcomes. These findings are relevant to previous research on the effectiveness of interactive learning media in meeting student needs (Silander et al., 2025).

This research was conducted from May 5 to October 6, 2025, with treatment given for 4 weeks (8 meetings) in the experimental class through the use of gamification learning media through the Problem Based Learning (PBL) learning model. Initial observations showed that during the science learning process, some students seemed less enthusiastic about participating in the learning. Students also seemed to get bored quickly and were less motivated to actively participate in discussion activities and learning practices. This condition had an impact on student learning outcomes, as reflected in the large number of scores that did not meet the Minimum Completion Criteria (KKM). The learning media used tended to be conventional and focused only on textbooks.

After implementing interactive gamification media in science learning in fifth grade, students showed various positive and significant changes in the learning process. Research findings showed that students were more enthusiastic and eager to participate in learning, actively participated, and paid more attention to teacher explanations and instructions. Student engagement also increased, as seen from the courage to ask questions, answer questions, and collaborate in completing tasks presented in gamification media. The results of an interview with one of the teachers at Pesawahan I Elementary School explained that, with the implementation of interactive gamification media, students showed higher learning motivation, characterized by a sense of enjoyment, a desire to achieve certain scores or awards, and perseverance in completing learning tasks.

Research findings also confirm that gamification elements such as the badge system and leaderboard successfully create a strong sense of accomplishment and recognition in students, thus triggering extrinsic motivation to engage more deeply (Mulyati, 2025). Meanwhile, challenges and learning missions, designed within an engaging storyline, successfully stimulate students' intrinsic motivation to explore the material for satisfaction and curiosity.

Thus, gamification successfully creates a learning environment that psychologically supports the simultaneous growth of various types of motivation.

This increased motivation has a positive impact on student learning outcomes, as indicated by the increased average scores on the pretest and posttest written tests. The average student improvement can be seen in the following table.

Table 2. Student Learning Outcomes Data

Description	Pretest	Posttest
Number of students	35	35
Highest score	85	100
Lowest score	20	65
Average	59.14	86.57
Std. Deviasi	16.73	8.92

Based on the data analysis above, the highest score obtained by students in the pretest was 85 and the lowest score was 20, with an average score of 59.14. This data indicates that students' initial abilities were still in the moderate category with a fairly high level of variation in scores, so that students' abilities were not evenly distributed.

After being given treatment using gamified learning media, the posttest results showed a significant improvement. The average score increased to 86.57, indicating that most students were able to achieve and exceed the established Minimum Completion Criteria (KKM). This increase in scores indicates that gamified learning media is effective in helping students better understand the science material, increasing active engagement during the learning process, and strengthening student learning motivation.

The hypotheses tested were H_0 , which states there is no difference in the average learning outcomes of students before and after treatment, and H_1 , which states there is a difference in the average learning outcomes of students before and after treatment. The following are the results of the analysis of student learning motivation data.

Table 3. Results of the Student Motivation t-Test

Table of Results of the Student Motivation t-Test								
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pretest	16.86	10.245	1.732	13.34	20.38	-9.734	34	.000
Posttest								

Based on the table above, the results of the paired sample test showed a t-test value of -9.734 with a significance level (Sig. 2-tailed) of 0.000. Since the significance value of $0.000 < 0.05$, H_0 is rejected. Therefore, it can be concluded that there is a significant difference between student learning motivation before and after the implementation of gamification media. This means that the use of gamification media has a positive influence on student learning motivation.

Meanwhile, the results of the paired sample t-test for the learning outcome variable in the science subject are as follows:

Table 4. Results of the t-test of the results of the science learning

			95% Confidence Interval of the Difference					
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pretest	27.86	12.541	2.120	23.55	32.17	-13.144	34	.000

Posttest

Based on the table above, the paired-sample correlation between the pretest and posttest results obtained a correlation value of 585 with a significance level of 0.000 (<0.05). This indicates a strong and significant positive relationship between the pretest and posttest scores. Furthermore, the results of the paired-sample test obtained a t-test value of -13.144 with a significance level (Sig. 2-tailed) of 0.000.

Since the significance value is $0.000 < 0.05$, H_0 is rejected. Thus, it can be concluded that there is a significant difference between student learning outcomes before and after the implementation of gamification media. This means that the use of gamification media has a positive impact on the learning outcomes of fifth-grade students.

These statistical results are also supported by research findings proving that gamification media offers a new paradigm in science learning, shifting from a one-way knowledge transmission model (teacher-centered) to a constructivist, student-centered model (Ayu et al., 2020). In the implementation of gamification, the teacher acts as a facilitator and game master who guides, while students become the main actors who actively explore, test, and construct their own knowledge. This role shift not only improves learning outcomes but also fosters 21st-century skills such as problem-solving, critical thinking, and digital literacy (Gold et al., 2021).

DISCUSSION

This study as a whole shows that the implementation of gamification learning media has a positive impact on improving the motivation and learning outcomes of fifth-grade students in science. This finding is supported not only by statistical analysis obtained from pretest and posttest scores, but also by qualitative data from observations and interviews. The positive impact of improvement in this study is reinforced by several previous studies that explain the role of gamification media in meeting student needs. Based on the integration of gamification media, it is able to create direct stimuli that encourage student activity, thereby creating a more enjoyable learning experience in developing student potential (Dewi et al., 2025). In this study, gamification media was proven effective in increasing student motivation, interest, engagement, and enthusiasm during the science learning process (Yi Chin, 2025). Gamification is designed to increase active student participation through challenging structures, reward systems, and interesting material presentation. These advantages provide a more meaningful and enjoyable learning experience than conventional classes, which tend to be one-way (F. Nabila, 2024).

Research by (K. Redy, 2020) also highlights that student learning motivation does not emerge automatically, but is significantly influenced by the learning conditions and design faced by students. When the learning process is designed in an interesting, challenging, and enjoyable situation, students tend to show more active engagement, high curiosity, and a willingness to complete learning tasks more diligently (Mega et al., 2024). Challenging learning can encourage students to think critically and solve problems, while a pleasant atmosphere can reduce boredom and anxiety in learning. This process directly creates a conducive and meaningful learning environment, which is an important factor in increasing student learning motivation continuously.

Meanwhile, testing of student learning outcomes also showed significant differences between students before and after using gamification-based learning media. This proves that gamification media not only influences the affective aspect (motivation), but also has a significant impact on student learning outcomes in science subjects (Mulyati, 2025). This improvement in learning outcomes can be explained through cognitive theory, which states that student understanding of the material will be more easily achieved when the learning process involves direct experience, visualization, and active participation through game mechanisms (Ari et al., 2025).

Research (Linayanti et al., 2025) explains that the use of interactive media with a gamification approach has a significant positive impact on students' science learning outcomes. The gamification approach is able to create a more interesting and meaningful learning atmosphere, thereby encouraging active student involvement during the learning process (Bashith, 2025). This is in line with research findings in grade V which showed that the application of gamification not only increased student interest and motivation to learn, but also helped students understand science concepts more concretely and systematically. With increased student participation and focus, the process of

internalizing the material becomes more optimal, which ultimately has an impact on significantly improving learning outcomes (Sch & Marticke, 2025).

Overall, this study enriches the educational literature by providing positive empirical evidence regarding the impact of implementing gamified learning media, particularly at the elementary school level. The implication is that teachers should consider simple media or tools such as online quizzes with a point system on a whiteboard or dividing the class into clans that compete to complete projects. These findings encourage teachers to experiment boldly, shifting their role from being sources of knowledge to designers of learning experiences.

CONCLUSION

This research generally proves that the implementation of gamification-based learning media has a significant and multidimensional positive impact on the quality of science learning in grade V of Pesawahan I Public Elementary School. The media designed by integrating game principles such as points, badges, leaderboards (PBL), storylines (narrative), and tiered challenges has succeeded in transforming the learning experience that previously tended to be passive and conventional into a dynamic, participatory, and motivating activity. This gamification approach is not just entertainment or a diversion, but a learning structure that is systematically designed to exploit students' intrinsic and extrinsic motivation to achieve educational goals.

The implementation of gamification has proven effective in increasing student learning motivation. Statistical analysis showed a significant difference between before and after the use of gamification media, with an increase of 25.13%. This was reflected in increased enthusiasm, active questioning, engagement in discussions, and student persistence in completing learning tasks. This increase in learning motivation directly impacted students' cognitive learning outcomes. A comparison of pretest and posttest scores showed a significant improvement, as evidenced by the highest score increasing to 100 and the lowest to 65. This indicates that gamification not only impacts affective aspects but also strengthens conceptual understanding through gradual presentation of material, immediate feedback, and meaningful learning activities.

Furthermore, gamification media aligns with the developmental characteristics of elementary school students who learn optimally through concrete, visual, and interactive activities. This approach also supports student-centered learning, with teachers acting as facilitators, thereby fostering 21st-century skills such as critical thinking, problem-solving, collaboration, and digital literacy. Overall, the results of this study confirm that gamification-based learning media is an effective, relevant, and innovative pedagogical approach in improving elementary school students' motivation and learning outcomes in science.

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