

Examining The Effectiveness of Wordwall-Enhanced Gamification Learning Models on Student Engagement, Motivation, and Academic Performance in Economics Education

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Abstract: This study examines the impact of gamification learning model assisted by Wordwall media on students' learning interest, motivation, and achievement in Economics subject. Using quasi-experimental design with Non-Equivalent Control Group, 41 tenth-grade students at SMA Yadinu Masbagik were divided into experimental (21 students) and control groups (20 students). Data were collected using validated questionnaires for interest and motivation (10 items each) and achievement test (10 questions), with reliability $\alpha > 0.88$. Analysis employed paired and independent sample t-tests, Cohen's d, and N-Gain scores using SPSS. Results showed significant improvements in the experimental group: learning interest increased 68.2% vs 33.3% (control), motivation 67.2% vs 30.1%, and achievement 56.4% vs 29.5%. All differences were statistically significant ($p < 0.001$) with large effect sizes (Cohen's $d > 1.8$) and high N-Gain scores (71.60%-76.19%). The gamification learning model assisted by Wordwall media proved highly effective in enhancing students' learning interest, motivation, and achievement in Economics education.

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Introduction

The advancement of digital technology has fundamentally transformed educational paradigms in contemporary society, necessitating innovative teaching methodologies to address the needs of Generation Z and Alpha learners who have been immersed in technology from early childhood. Technology integration in education has evolved from being optional to becoming essential for creating more effective and engaging learning experiences (Dahalan et al., 2024). However, field observations indicate that numerous Indonesian educational institutions continue implementing conventional approaches such as lecture-based and question-answer methods, which are considered less effective in promoting active student participation, particularly in subjects containing extensive theoretical concepts like Economics (Wibowo & Nugraha, 2024).

Statistical data from Indonesia's Ministry of Education, Culture, Research, and Technology (2023) demonstrates that student interest in Economics learning remains relatively low, with average national examination scores in this subject falling below those of Mathematics and Natural Sciences. This situation indicates significant challenges in enhancing Economics education effectiveness at the senior high school level. Conventional teacher-centered learning approaches tend to create passive learning environments where students merely function as information recipients without active involvement in the learning process (Kotob & Ibrahim, 2019).

Gamification, defined as the application of game elements in non-gaming contexts, has demonstrated substantial potential in enhancing student engagement and learning motivation (Deterding et al., 2011; Sailer et al., 2017). Digital platforms such as Wordwall provide mechanisms for implementing gamification through various educational game templates that can be customized to match learning materials (Sari & Husnin, 2021). Previous research indicates that Wordwall utilization can increase learning interest from 64% to 80% and student achievement from 62.5% to 79.2% (Indrawati et al., 2024).

Nevertheless, most gamification studies continue focusing on language learning and STEM subjects, while applications in social subjects, particularly Economics, remain relatively limited (Ortiz-Rojas et al., 2025). Additionally, research on Wordwall implementation in Economics education remains minimal, despite educators' increasing adoption of this platform (Wu et al., 2024). Existing studies typically examine only one aspect of gamification implementation or Wordwall platform usage separately (Duisenova & Zhorabekova, 2024).

This research offers novelty by integrating gamification learning models with the Wordwall platform within Indonesian Economics education contexts, which has not been extensively explored previously. The scientific innovation lies in a comprehensive approach measuring gamification impacts enhanced by Wordwall on three variables simultaneously: learning interest, learning motivation, and student achievement in Economics subjects. This study also employs quasi-experimental design with control groups to provide stronger validity compared to previous research that typically uses pre-post test designs without comparison groups.

Based on empirical conditions at SMA Yadinu Masbagik, findings revealed that student interest and motivation in Economics subjects remain low, reflected in mid-semester examination data showing 25 out of 41 students (60.98%) failing to achieve minimum mastery criteria. Learning continues being dominated by conventional approaches with print media, causing students to remain passive and less engaged in learning processes.

The research hypothesis proposes significant differences between students using Wordwall-enhanced gamification learning models compared to those using conventional learning models regarding learning interest, learning motivation, and academic achievement in Economics subjects.

This research aims to: (1) examine the significant impact of Wordwall-enhanced gamification learning models on student learning interest; (2) analyze the significant impact of Wordwall usage in gamification learning on student learning motivation; and (3) measure the magnitude of Wordwall media impact on student learning outcomes in Economics subjects for Grade 10 students at SMA Yadinu Masbagik.

This study aims to: 1) examine the significant impact of a gamification-based learning model supported by Wordwall on students' learning interest; 2) analyze the significant effect of integrating Wordwall within gamified instruction on students' learning motivation; and 3) assess the magnitude of the influence of Wordwall as an instructional medium on students' learning outcomes in Economics for Grade X at SMA Yadinu Masbagik.

Research Method

This study employed a quantitative approach using quasi-experimental methodology. The research design implemented was Non-Equivalent Control Group Design, which shares similarities with Pretest-Posttest Control Group Design but does not involve random subject selection (Sugiyono, 2022). This design involves two groups: an experimental group receiving Wordwall-enhanced gamification learning treatment and a control group using conventional learning methods. The research population consisted of all SMA Yadinu Masbagik students, comprising 115 students distributed across 6 learning groups. Sampling technique utilized purposive sampling considering students' initial capabilities and academic characteristic similarities (Sugiyono, 2022; Etikan et al., 2016). The sample comprised two classes: Class XA as the control group (20 students) and Class XB as the experimental group (21 students).

Data collection employed three primary instruments: (1) learning interest questionnaire (10 items) using 1-5 Likert scale, (2) learning motivation questionnaire (10 items) using 1-5 Likert scale, and (3) achievement test in multiple-choice format (10 questions). All instruments underwent validity testing using Pearson Product Moment correlation and reliability testing with Cronbach's Alpha. Test results showed all instruments were valid (r -calculated > 0.361) and reliable with Cronbach's Alpha values > 0.88 , categorized as very high reliability (Arikunto, 2014).

Data collection procedures were conducted in three stages: (1) pretest to measure initial conditions of both groups, (2) implementation of Wordwall-enhanced gamification learning treatment for the experimental group during the learning period, and (3) posttest to measure changes in both groups. Learning activity documentation was also conducted as supporting data (Ratnasarianti, 2021).

Data analysis was performed systematically using SPSS version 30. The first stage involved descriptive statistical analysis to describe data characteristics including mean, median, mode, and standard deviation (Suwartono, 2014). The second stage comprised prerequisite analysis tests including normality tests with Kolmogorov-Smirnov and Shapiro-Wilk, and homogeneity tests with Levene's Test.

Inferential analysis utilized Paired Sample t-Tests to compare pretest-posttest results within the same group, and Independent Sample t-Tests to compare differences between experimental and control groups. When normality and homogeneity assumptions were not met, analysis continued with non-parametric tests using Wilcoxon Signed-Rank Test and Mann-Whitney U Test (Ghozali, 2018).

Treatment effectiveness was measured using Normalized Gain (N-Gain) with the formula:

$$\text{N-Gain} = (\text{Posttest Score} - \text{Pretest Score}) / (\text{Maximum Score} - \text{Pretest Score})$$

Effect magnitude was calculated using Cohen's *d* to determine effect size with interpretation criteria: $d \geq 0.8$ (large effect), $0.5 \leq d < 0.8$ (medium effect), $0.2 \leq d < 0.5$ (small effect), and $d < 0.2$ (very small effect).

Result and Discussion

This research examined the effectiveness of Wordwall-enhanced gamification learning models on student interest, motivation, and achievement in Economics subjects. Statistical descriptive and inferential test results demonstrate significant impacts from the provided treatment.

1. Enhancement of Interest, Motivation, and Learning Achievement

Pretest and posttest data from experimental and control groups were analyzed to observe improvements. The experimental group demonstrated more substantial mean improvements across all three variables compared to the control group.

Tabel 1. Average Score Improvements from Pretest-Posttest in Experimental and Control Groups

Variable	Group	Pretest (Mean)	Posttest (Mean)	Improvement (Poin)	Improvement (%)
Learning Interest	Experimental	25.95	43.67	17.72	68.2
	Control	26.10	34.80	8.70	33.3
Learning Motivation	Experimental	26.71	44.67	17.96	67.2
	Control	26.10	33.95	7.85	30.1
Learning Achievement	Experimental	55.71	87.14	31.43	56.4
	Control	52.50	68.00	15.50	29.5

Paired sample *t*-tests confirmed that improvements in the experimental group for interest ($t(20) = -20.543$, $p < 0.001$), motivation ($t(20) = -17.442$, $p < 0.001$), and learning achievement ($t(20) = -11.286$, $p < 0.001$) were statistically significant. Furthermore, independent sample *t*-tests proved that improvement differences between experimental and control groups were also significant for interest ($t(39) = -7.656$, $p < 0.001$), motivation ($t(39) = -15.086$, $p < 0.001$), and learning achievement ($t(39) = -5.802$, $p < 0.001$).

2. Treatment Effectiveness (Effect Size and N-Gain)

To measure impact magnitude, effect size analysis (Cohen's *d*) and N-Gain Score analysis were conducted. Results indicated that the intervention had large effect sizes and high effectiveness.

Tabel 2. Effect Size and N-Gain Score Analysis Result

Variable	Cohen's d	Effect Size Category	Average N-Gain Score (%)	N-Gain Category
Learning Interest	2.392	Large	73.61	High
Learning Motivation	4.713	Large	76.19	High
Learning Achievement	1.813	Large	71.60	High

This research's findings provide strong empirical evidence that gamification integration through Wordwall media significantly enhances student interest, motivation, and learning achievement. The following discussion elaborates these scientific findings and analyzes them through relevant learning theory perspectives.

1. Gamification Enhances Learning Interest through Optimal Challenge and Flow

The highest learning interest improvement occurred in the "feelings of enjoyment" indicator (44.44%). This phenomenon can be explained by Flow theory developed by Csikszentmihalyi (Alsadoon, 2023). Gamification elements in Wordwall, such as timers, points, and leaderboards, create optimal challenges where task difficulty levels match student capabilities. This condition generates flow states—complete engagement and intrinsic enjoyment in learning processes, preventing students from feeling bored or pressured (Deci & Ryan, 2000). Real-time feedback provided by Wordwall systems fulfills basic psychological needs for competence, which serves as the primary driver of intrinsic interest according to Self-Determination Theory (SDT) (Deci & Ryan, 2000). These findings align with research by (Marensi et al., 2023) reporting increased student activity and attention when using Wordwall as practice media.

2. Learning Motivation Stimulated by Psychological Need Fulfillment and Growth Mindset

Learning motivation demonstrated the highest effect size (Cohen's $d = 4.713$). This occurred because gamification fulfills three psychological needs in SDT: (1) Competence through instant feedback and badge achievements; (2) Autonomy by providing freedom to choose levels or strategies; and (3) Relatedness through leaderboard features facilitating social interaction and healthy competition (Deci & Ryan, 2000). Additionally, this system promotes growth mindset (Dweck, 2012). Failures in games are viewed as part of learning processes, not endpoints. Students are motivated to try again and work harder because they believe capabilities can be developed. These results are consistent with research by (Nurmelati, 2022) which also found motivation increases up to 70.15% after Wordwall implementation.

3. Learning Achievement Enhanced through Active Learning and Multimedia Information Processing

Learning achievement improvements are supported by cognitive learning theory. Wordwall facilitates active learning where students actively construct knowledge through exploration and repetition in game formats (Wininger et al., 2019). According to the Cognitive Theory of Multimedia Learning (Mayer, 2022), information presentation through text, images, and interactions in Wordwall facilitates dual information processing (visual and verbal) in working memory, making conceptual understanding deeper and more lasting. In Economics

contexts, visualization of abstract concepts like supply-demand laws becomes more concrete. Findings by (Julen et al., 2025) showing significant advantages for experimental classes in Computer Science subjects reinforce consistency of Wordwall effectiveness across academic disciplines.

4. Comprehensive Analysis: Holistic Effects of Gamification

High N-Gain values across all three variables (71.60% - 76.19%) indicate that gamification has holistic impacts. This model does not only target cognitive aspects (learning achievement) but also affective aspects (interest and motivation). Increases in motivation and interest create high engagement, which ultimately becomes a catalyst for learning achievement improvements. This proves postulates in learning hierarchy theory that affective factors are strong predictors of cognitive achievement (Krathwohl et al., 1964). Thus, gamification is not merely about making learning enjoyable but creating mutually reinforcing learning ecosystems between psychological and academic aspects.

Discussion

This study demonstrates that the development of animated video-based teaching materials significantly improves elementary school students' learning outcomes, particularly in Pancasila Education subjects. The findings indicate that the developed product meets the criteria of validity, practicality, and effectiveness, as evidenced by expert validation scores, user responses, and N-Gain analysis results. These results provide important insights into the role of technology-integrated instructional media in enhancing learning processes in primary education contexts.

First, the validity of the developed teaching materials, as confirmed by experts in content, language, and technology, indicates that the product is pedagogically appropriate and aligned with curriculum standards. Although the validation scores ranged from moderate to high, the consistent categorization as "valid" suggests that the animated video-based materials meet minimum quality standards required for instructional use. This finding aligns with previous studies emphasizing that expert validation is a crucial step in ensuring the feasibility and instructional quality of educational products (Fahrurrozi & Mohzana, 2020). Moreover, the integration of visual, audio, and textual elements in animated videos supports the principles of multimedia learning, which enhances students' comprehension by engaging multiple cognitive channels (Mayer, 2022).

Second, the practicality of the developed materials is reflected in the positive responses from both teachers and students. The results show that the animated videos are easy to use, engaging, and supportive of classroom instruction. From a pedagogical perspective, this finding highlights the importance of user-friendly instructional design in ensuring successful implementation in real classroom settings. Teachers reported that the materials facilitated lesson delivery, while students expressed increased interest and engagement. This supports the notion that instructional media should not only be theoretically sound but also practically applicable (Afidah et al., 2024). The use of platforms such as Canva in developing the videos also demonstrates the accessibility of technology for teachers, which is essential for sustainable implementation.

Third, the effectiveness of the animated video-based teaching materials is evidenced by the improvement in students' learning outcomes, as indicated by the N-Gain scores in both small and large group trials. The results show a moderate increase in the small group and a higher increase in the large group, suggesting that the intervention has a positive impact on students' cognitive achievement. This improvement can be explained through the Cognitive Theory of Multimedia Learning, which posits that students learn more effectively when information is presented through a combination of visual and auditory channels (Mayer, 2022). Animated videos enable students to visualize abstract concepts, making them easier to understand and retain.

Furthermore, the findings are consistent with constructivist learning theory, which emphasizes active learning and knowledge construction. Through animated videos, students are not merely passive recipients of information but actively engage with the content through visual representations and contextual examples. This is particularly important in elementary education, where students tend to have visual and kinesthetic learning preferences. The ability of animated videos to present real-life contexts also supports meaningful learning, allowing students to connect new knowledge with prior experiences.

In addition, the increase in learning outcomes can also be linked to improvements in students' motivation and engagement. Although this study primarily focuses on cognitive outcomes, observational data indicate that students showed greater enthusiasm during the learning process. This finding is in line with previous research suggesting that interactive and visually appealing media can enhance students' intrinsic motivation and attention (Pangemanan et al., 2023; Ningsih et al., 2023). Increased motivation, in turn, contributes to better learning outcomes, as suggested by the learning hierarchy theory, where affective factors influence cognitive achievement.

However, despite these positive findings, several limitations should be acknowledged. First, the sample size was relatively small and limited to a single school, which may affect the generalizability of the results. Second, the study did not employ a control group, limiting the ability to compare the effectiveness of animated video-based materials with other instructional approaches. Third, the duration of the intervention was relatively short, which may not fully capture long-term learning impacts.

Therefore, future research is recommended to involve larger and more diverse samples, apply experimental designs with control groups, and examine additional variables such as learning motivation, engagement, and critical thinking skills. Longitudinal studies are also needed to explore the sustainability of learning improvements over time.

Overall, this study contributes to the growing body of literature on technology-enhanced learning by providing empirical evidence that animated video-based teaching materials are effective, practical, and valid for improving elementary students' learning outcomes. The findings highlight the importance of integrating multimedia elements into instructional design to create more engaging and meaningful learning experiences.

Conclusion

Based on research results and discussions conducted, it can be concluded that implementing Wordwall-enhanced gamification learning models proves effective and provides

significantly positive impacts in enhancing student interest, motivation, and learning achievement in Economics subjects. These findings address research objectives while supporting all proposed alternative hypotheses (H_a).

Specifically, this research concludes that Wordwall-enhanced gamification significantly fulfills students' basic psychological needs for competence, autonomy, and relatedness, which become primary drivers for enhancing intrinsic learning interest and motivation, consistent with Self-Determination Theory principles (Deci & Ryan, 2000). Improvements in affective aspects (interest and motivation) become catalysts for cognitive learning achievement improvements. Combinations of game elements such as instant feedback, measured challenges, and enjoyable repetition in Wordwall create flow conditions and facilitate more effective multimedia information processing, making students' conceptual understanding deeper (Mayer, 2022).

The magnitude of effect sizes (Cohen's $d > 1.8$ for all variables) and high N-Gain scores ($>71\%$) confirm that provided impacts are not only statistically significant but also large and practically meaningful in classroom learning contexts. Therefore, Wordwall-enhanced gamification models can be recommended as innovative learning strategies capable of creating holistic, engaging, and effective learning experiences to address digital era educational challenges.

Recommendation

Based on research findings demonstrating significant effectiveness of Wordwall-enhanced gamification learning models, several strategic recommendations can be implemented systematically. At the practitioner level, teachers are advised to adopt gamification approaches in Economics learning, especially for abstract and theoretical materials, with technical training support and mentoring in designing optimal interactive learning activities. Educational institutions need comprehensive investment in technology infrastructure and adequate internet access, and integrate gamification platforms into curricula through teacher digital competency development workshops. From scientific development perspectives, future researchers are recommended to conduct investigations with more representative sample coverage, longitudinal intervention duration, and exploration of additional variables. At the policy level, governments need to formulate regulations supporting systematic technology integration in learning, including special budget allocation for innovative learning media development and sustainable digital-based teacher training programs, to ensure educational transformation adaptive to technological developments and 21st-century learning needs..

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