



Wayground Gamification and Learning Motivation in Economics: An SDT-Based Study with Grade X Students

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DOI:

<https://doi.org/10.46963/asatiza.v7i2.3691>

Cite this Article:

Maknun, A. L., & Isdiati, E. H. (2026). Wayground gamification and learning motivation in economics: An SDT-Based study with grade x students. *Asatiza: Jurnal Pendidikan*, 7(2), 363-377. <https://doi.org/10.46963/asatiza.v7i2.3691>

Keywords:

Wayground;
Learning Motivation;
Economics; Digital
Natives; Self-
Determination
Theory

ABSTRACT

Learning media tailored to students' characteristics can enhance motivation. However, previous studies have measured motivation as a general construct without grounding it in specific theory. Limited research has examined how gamification features in Wayground align with Self-Determination Theory (SDT) components, namely autonomy, competence, and relatedness, in the context of Economics education. This study addresses this gap by measuring the effect of SDT-based Wayground gamification on students' motivation to learn Economics through these three psychological needs. A quantitative quasi-experimental design with a posttest-only control group was employed. The study population consisted of 10th grade students at State High School 12 Semarang, selected via convenience sampling. The final sample comprised classes X-E5 (n=31) and X-E6 (n=32). Prior semester academic grades indicated comparable baseline abilities (experimental: 70; control: 70.4). The results showed that the average posttest learning motivation score for the experimental group (57.03) was higher than that of the control group (50.72). An independent t-test revealed a significant difference ($p = 0.003$), with a medium-to-large effect size (Cohen's $d = 0.78$). Sub-scale analysis based on SDT further indicated that Wayground particularly enhanced students' autonomy and relatedness, while competence showed improvement to a lesser extent. These findings suggest that Wayground has a significant effect on learning motivation for 10th grade students, specifically for market-related Economics topics. The implementation of Wayground is effective in enhancing students' learning motivation in Economics. Future research should employ longitudinal designs with multiple sessions to examine long-term motivation retention.

Article History:

Submitted:
08/04/2026
Revised:
28/04/2026
Accepted:
09/05/2026
Published:
30/05/2026

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INTRODUCTION

PISA data confirms that student motivation and engagement are closely linked to academic achievement (OECD, 2019b, p. 32). Nevertheless, in many countries including Indonesia, students lack self-confidence and perseverance when facing academic tasks, resulting in weak conceptual understanding (OECD, 2019a, p. 86). In Economics, students often face difficulties in analyzing concepts, constructing arguments, and

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applying knowledge to real-world contexts (Gilbert et al., 2025; Kumari & Biswas, 2025). These challenges highlight the importance of engaging and relevant learning experiences to foster student motivation and support deeper learning (Zhou & Zhang, 2025).

Data from the 2025 Academic Competency Test (TKA) in Central Java Province shows that Economics ranked third from the bottom, with an average score of 35.31 and a maximum score of only 78.43. A similar pattern was observed at State Senior High School 12 Semarang, where students demonstrated difficulties in answering literacy-based Economics questions. Limited literacy skills can hinder conceptual understanding, reduce self-confidence, and negatively affect learning motivation (Maksum et al., 2025; Nurafifah et al., 2021; Nuriansyah et al., 2025). Problems in learning are increasingly evident, which indicates weak conceptual mastery in a number of subjects, particularly Economics.

Observations and interviews at State Senior High School 12 Semarang revealed that students perceive Economics as boring and difficult, reducing active participation. Average absenteeism rates in two 10th-grade classes reached 18.88% and 22.22%, well below the 90% attendance threshold. Disengagement behaviors, including absenteeism, are linked to low learning motivation and can lead to avoidance of learning activities (Fadellelmoula, 2018; Riyadi & Sudiyatno, 2023; M. T. Wang & Fredricks, 2014).

As 21st-century students' needs center on technology, integrating digital tools into learning is essential. However, interviews with three Economics teachers at State High School 12 Semarang revealed that despite over 20 years of experience, they rarely used gamification-based platforms. This is problematic because selecting media that align with students' needs is critical (Solikah, 2020); students prefer interactive digital media (Prasetya et al., 2025; Salsabila et al., 2020), while teachers should act as facilitators (Karlen et al., 2019; Tondeur et al., 2020).

Digital learning has driven the integration of gamification elements such as points, badges, leaderboards, and interactive challenges to enhance student motivation (Bergdahl et al., 2020; Heriyanto et al., 2024; Kalogiannakis et al., 2021; Zainuddin et al., 2020). Platforms like Quizizz (now Wayground) and Kahoot have been widely used to improve student engagement and learning outcomes (Maulana & Limbong, 2025; A. I. Wang &

Tahir, 2020). Wayground offers comprehensive features, including game-based interactive questions, serving as both an assessment tool and pedagogical innovation supporting student-centered learning (Al Mawaddah et al., 2021; Citra & Rosy, 2020).

Self-Determination Theory (SDT) provides a relevant theoretical framework for explaining how student motivation can be enhanced through the fulfillment of three basic psychological needs: autonomy, competence, and relatedness (Ryan & Deci, 2000). When psychological needs are fulfilled, students develop autonomous motivation (Guay et al., 2020; Sa'diyah et al., 2025), enabling them to explore examples, analyze cause-and-effect, and build confidence. This is particularly essential in Economics education, where market-related topics require critical thinking and real-world connections.

Previous studies have shown that Quizizz effectively enhances students' learning motivation across various subjects (Astuti & Fatimah, 2022). Motivation also plays a key mediating role in academic achievement (Richardson et al., 2012; Schunk et al., 2014). Nevertheless, most studies measured motivation as a general construct, with limited research examining how Wayground's features align with autonomy, competence, and relatedness.

This study addresses this gap by linking Wayground to three psychological needs, aiming to enhance 10th grade students' learning motivation through Self-Determination Theory. Unlike conventional teaching, Wayground offers a more interactive experience that meets digital native students' needs, and is thus expected to enhance engagement, motivation, and understanding of Economics.

METHOD

This study employed a quantitative quasi-experimental design with a posttest-only control group. This design was chosen due to time constraints in the school setting and to avoid the pretest effect on student responses. This design still allows for comparisons between groups to assess the comparative effects of the treatment. Pretest may introduce a testing effect, where initial measurement influences later performance, thereby threatening internal validity (Dimitrov & Rumrill, 2003; Shadish et al., 2002). To ensure initial group equivalence, prior semester Economics test scores were compared, yielding average scores of 70 (experimental) and 70.4 (control), indicating comparable baseline

abilities. While comparing prior academic records is common practice in quasi-experimental research when random assignment is not feasible (Creswell & Creswell, 2018), the absence of formal statistical testing means that initial group equivalence cannot be confirmed with complete certainty. Therefore, the initial comparability of the two groups should be interpreted with caution.

This study was conducted at State Senior High School 12 Semarang in April 2026. The population of this study consists of 10th grade students in the 2025/2026 academic year. The sampling technique used was convenience sampling, which was chosen due to practical considerations such as class availability and scheduling constraints. The final sample consisted of students from classes X-E5 and X-E6, numbering 31 and 32 students, respectively.

The selected sample consisted of digital native students, who have been exposed to digital technology from an early age (Prensky, 2001). This characteristic is relevant to the theoretical framework of this study, particularly in understanding how technology-based learning media such as Wayground can support students' motivation. The independent variable was the Wayground gamification platform, and the dependent variable was students' motivation to learn the market module.

The research design based on the research method used is as follows:

Table 1

Posttest-only control design

NR ₁	X	O ₃
NR ₂	C	O ₄

Source: Creswell & Creswell (2018)

Notes. *Classes were not randomly selected for the experimental groups. NR₂: Classes were not randomly selected for the control groups. X: Treatment (Wayground learning platform). C: No treatment. O₃: Posttest of learning motivation among students in the experimental class. O₄: Posttest of learning motivation among students in the control class.*

Students' learning motivation in Economics was measured using a 5-point Likert scale questionnaire based on Self-Determination Theory (SDT) (Ryan & Deci, 2000), administered after the intervention. Each dimension of SDT that emphasizes learning motivation was elaborated and adapted into indicators and learning objectives, which were then developed into 15 items, consisting of 12 positive statements and 3 negative statements.

Table 2
Posttest Questionnaire

Dimension	Indicators	Item
Autonomy	Students' freedom to choose own learning strategies	Positive
	Self-motivated learning	Positive
	A sense of control over the learning process	Positive
	Initiative to improve learning outcomes	Positive
	Lack of control over the learning process	Negative
Competence	Confidence in ability to understand the material	Positive
	Self-confidence in solving problems	Positive
	Awareness of ability to understand the material	Positive
	Motivation to achieve better results	Positive
	A feeling of being unable to keep up with the lesson	Negative
Relatedness	Student engagement in learning	Positive
	A classroom environment that supports lesson	Positive
	Teacher support in learning	Positive
	A sense of belonging to the learning process	Positive
	Lack of interaction with peers or teachers	Negative

The experimental and control groups each participated in a single 2-hour session (3 class periods). Previous studies have shown that gamified learning media can have an immediate impact on student engagement and motivational responses within a single learning session (Kalogiannakis et al., 2021). Data were collected through a learning motivation questionnaire, supported by observations and interviews. Content validity was established through expert judgment by an Economics teacher familiar with Self-Determination Theory (SDT) and the student population. Due to limited access to additional experts, content validity was assessed by one qualified validator.

Empirical validity and reliability tests using IBM SPSS 25 software showed that all 15 items used in the questionnaire met the validity criteria. Reliability testing yielded Cronbach's Alpha of 0.889, exceeding the 0.60 threshold and indicating a high level of reliability.

This study was conducted in accordance with established research ethics principles. Prior to data collection, informed consent was obtained from the students' parents or guardians. Participation was voluntary, and all respondents were assured of the confidentiality of their responses. The study protocol was reviewed and approved by the school administration.

The data were analyzed using an independent t-test. Prior to hypothesis testing, normality and homogeneity tests were conducted. In addition, effect size was calculated using Cohen's *d* to determine the strength of the Wayground learning platform's impact on student learning motivation beyond statistical significance.

RESULT AND DISCUSSION

Results

Data analysis was conducted using an independent t-test. Before hypothesis testing, normality and homogeneity assumptions were examined. The normality test is crucial because violations can lead to inaccurate statistical conclusions (Field, 2018; Habibzadeh, 2024). Table 3 presents the Shapiro-Wilk normality test results.

Table 3
Normality Test for Learning Motivation

		Experimental Class	Control Class
Shapiro-Wilk	Statistic	0.980	0.926
	df	31	32
	Sig.	0.799	0.31

Based on the results of the Shapiro-Wilk test presented in Table 3, the normality test for learning motivation in the experimental class yielded a test statistic of $W = 0.980$ with a Sig. value of 0.799. Meanwhile, the control class showed a test statistic of $W = 0.972$ with a Sig. value of 0.31. Since both Sig. values (0.799 and 0.31) are greater than 0.05, it can be concluded that the data in both classes are normally distributed according to the established criteria.

The homogeneity test is important before conducting parametric analyses such as the t-test or ANOVA, as equal variances affect the validity of results. The homogeneity test ensures that the research samples come from a population with equal variances so that the statistical analysis can provide accurate results (Tabachnick & Fidell, 2019). Using IBM SPSS 25, the following results were obtained:

Table 4
Homogeneity Test of Learning Motivation

Levene Statistic	df1	df2	Sig.
1.974	1	61	0.165

Based on Table 4, the significance value (0.165) exceeds the 0.05 threshold, indicating that the data have equal variances. Thus, the two samples are homogeneous.

After meeting the prerequisite tests, an Independent Sample T-Test was conducted to determine differences in students' learning motivation in Economics (market material) between the experimental class (received Wayground) and the control class (did not). Both groups were compared to assess the effectiveness of the Wayground learning media in enhancing students' learning motivation. The analysis results refer to the "Equal Variances Assumed" row. If the Sig. (2-tailed) value is < 0.05 , it can be concluded that H_1 is accepted and H_0 is rejected, indicating that Wayground has an effect on students' learning motivation.

Table 5 presents the independent samples t-test results comparing learning motivation between experimental and control groups.

Table 5
Independent Sample t-test Results for Learning Motivation

F	Sig.	Df	Sig. (2-tailed)	Mean	Std. Error	Lower	Upper
1.974	0.165	61	0.003	6.31351	2.03801	2.2386	10.38875
						95% confidence interval of the difference	

From Table 5, the results of the independent samples t-test on students' learning motivation show that the average learning motivation score for the experimental group was 57.0323, which was higher than that of the control group (50.7188). The p-value is 0.003, where $0.003 < 0.05$, so H_0 is rejected and H_1 is accepted. Therefore, based on the decision-making criteria, it can be concluded that there is an effect of learning motivation among students using the Wayground learning media.

Next, Cohen's d was used to determine the magnitude of the treatment effect, thereby measuring the extent of the difference between the control group and the experimental group.

Table 6
Effect Size Result

Group	Mean	Standard Deviation
Experimental	57.0323	9.29
Control	50.7188	6.71

To assess the magnitude of the treatment effect beyond statistical significance, Cohen's *d* was calculated using the mean scores and standard deviations from both groups. The calculation yielded a Cohen's *d* value of 0.78, as presented in Table 7.

Table 7
Effect Size Result

Effect Size (<i>d</i>)	Categories
0.7806	Medium

Based on Table 7, an effect size of 0.78 falls into the medium category. According to Cohen's *d* interpretation criteria, a value between 0.50 and 0.80 indicates a medium effect, while values above 0.80 indicate a large effect. These findings suggest that the implementation of Wayground learning media exerts a meaningful medium effect on improving learning motivation among 10th grade students, approaching the threshold for a large effect.

To provide deeper insight into how the Wayground learning platform affected each component of Self-Determination Theory (SDT), a sub-scale analysis was conducted. Mean scores for the three basic psychological needs (autonomy, competence, and relatedness) were calculated separately for both the experimental and control groups. The results are presented below:

Table 8
Mean Scores of Psychological Needs by Group Size

Psychological Need	Experimental Group	Control Group
Autonomy	19.26	16.78
Competence	18.74	17.31
Relatedness	19.03	16.63

As shown in Table 8, the experimental group outperformed the control group across all three dimensions. The largest difference was in Autonomy (2.48), followed by Relatedness (2.40) and Competence (1.43). Within the experimental group, Autonomy scored highest (19.26), followed by Relatedness (19.03) and Competence (18.74). In the control group, Competence scored the highest (17.31).

These findings indicate that students in the experimental group who used the Wayground learning media had a stronger internal drive to participate in economics learning after being provided with gamification-based learning media compared to the control group, which did not receive the intervention and had lower motivation scores.

The difference in motivation scores between the two groups demonstrates that the use of the Wayground learning media can serve as an effective learning tool in enhancing student motivation.

Discussion

The significant difference in learning motivation between the experimental and control groups suggests that Wayground effectively supports the fulfillment of autonomy, competence, and relatedness, particularly for market-related material. This finding aligns with Self-Determination Theory (SDT), which posits that intrinsic motivation flourishes when these three basic psychological needs are satisfied (Ryan & Deci, 2000). In the context of gamification, SDT provides a robust framework for understanding how game elements such as points, leaderboards, and interactive challenges can foster autonomous motivation (Guay et al., 2020; Zainuddin et al., 2020). The present study extends this theoretical understanding by demonstrating that Wayground, as a gamification platform, can effectively satisfy students' psychological needs within a single learning session.

Field observations supported the quantitative findings. Students in the experimental group were more enthusiastic, actively participated in discussions, and asked more questions than those in the control group. This behavioral engagement is consistent with Bergdahl et al. (2020), who found that technology-based learning environments can enhance student engagement when designed to meet learner needs. Similarly, Kalogiannakis et al. (2021) reported that gamification elements in digital platforms increase student motivation and participation in science education, a pattern that appears transferable to Economics education.

Sub-scale analysis revealed three key patterns. First, the experimental group scored higher across all dimensions, with the largest gain in autonomy, indicating greater choice and control. This finding supports the theoretical claim that autonomy-supportive environments enhance intrinsic motivation (Ryan & Deci, 2000). In the Wayground platform, features such as self-paced question navigation and flexible answer strategies may have contributed to students' sense of autonomy.

Second, relatedness also increased substantially, suggesting that even a single session fostered connection through platform features. Gamification elements such as

leaderboards and real-time performance comparisons can create a sense of social presence and healthy peer competition (Wang & Tahir, 2020). This finding aligns with studies showing that interactive digital media can facilitate relatedness among learners (Prasetya et al., 2025; Salsabila et al., 2020).

Third, competence showed the smallest difference. This may be because the control group experienced mastery through conventional instruction, or because one session was insufficient for competence effects to fully develop. Previous research has shown that competence satisfaction often requires extended engagement with learning materials (Schunk et al., 2014; Richardson et al., 2012). Thus, Wayground appears particularly effective in enhancing autonomy and relatedness, with competence effects potentially emerging over longer intervention periods.

The positive effect of Wayground on learning motivation is consistent with previous studies on gamification platforms. Heriyanto et al. (2024) found that Quizizz increases student motivation and engagement in learning. Ahsan et al. (2026) reported that Quizizz serves as an effective digital learning tool for enhancing motivation. Tupen et al. (2025) also demonstrated that Quizizz effectively increases student motivation and learning activity. The present study extends these findings by specifically linking Wayground's features to the three SDT components, providing a more nuanced understanding of *why* gamification works.

This study also has practical implications for Economics education. Technology-based learning aligned with the needs of digital native students can effectively contextualize Economics concepts (Prensky, 2001). The use of Wayground is technically effective in increasing student engagement and psychologically capable of meeting students' basic needs, thereby reinforcing short-term motivation while strengthening cognitive and affective engagement. This finding supports the argument that teachers should act as facilitators of technology-integrated learning rather than sole content deliverers (Karlen et al., 2019; Tondeur et al., 2020).

However, several limitations should be acknowledged. The study employed a posttest-only design with a single session, which captures immediate motivational effects but does not examine long-term retention. As noted by Zainuddin et al. (2020), the long-

term impact of gamification on learning outcomes requires further investigation. Future research should measure motivation retention over several weeks or months using longitudinal designs. Additionally, future studies could incorporate qualitative methods to explore students' subjective experiences with Wayground features.

CONCLUSION

This study concludes that Wayground learning media significantly improves 10th-grade students' learning motivation in Economics at State Senior High School 12 Semarang. Through interactive, competitive, and technology-based features, Wayground encourages active engagement and creates meaningful learning experiences. Sub-dimension analysis based on Self-Determination Theory further revealed that Wayground supports all three basic psychological needs, with the strongest effects observed on students' sense of autonomy and relatedness, while competence also showed improvement, though to a lesser extent.

Nevertheless, several limitations should be acknowledged. First, the study employed a posttest-only design, which focuses on comparing outcomes between groups after the intervention rather than examining changes over time. While this approach is appropriate for assessing the immediate effect of the treatment, it does not provide longitudinal insight into the development of students' learning motivation. Second, the instrument validation process involved only one expert, potentially limiting content validity. Ideally, multiple validators such as educational psychologists or university lecturers should be involved.

Based on these findings, two recommendations are proposed. For teachers, it is recommended to implement technology-integrated learning approaches that align with students' characteristics. Gamification-based media such as Wayground can be utilized as an effective strategy. Specifically, teachers should provide flexibility to support students' basic psychological needs. For future research, it is recommended to employ multiple sessions over several weeks or months to examine long-term effects and to involve multiple validators in the instrument development process.

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