EPISTEMA

Vol. 7 No. 2 20 26 | e-ISSN: 2723-8199
https://doi.org/10.21831/ep.v7i2.102355

Article History
Received : 21 September 2026
Revised : 20 October 2026
Accepted : 27 October 2026
Available online : 31 October 2026

Effect of Gamified Quizizz as Digital Assessment on Vocational Students' Learning Motivation and Engagement

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Abstract :

This study analyzes the effect of gamification-based Quizizz as a digital assessment on the learning motivation and engagement of grade X Building Construction and Housing Engineering students in the Basic Building Construction and Housing Engineering course at SMKN 3 Surabaya. A quantitative pre-experimental study with a single-group pretest–posttest design was conducted, and all 33 students in the population participated through total sampling. Data were collected using Likert-scale questionnaires and observation sheets, then analyzed using the paired t-test, the Wilcoxon signed-rank test, effect size calculations, and N-Gain. The findings indicate that Quizizz combined with gamification did not significantly change students' learning motivation (Sig. = 0,769 > 0,05; d = 0,05), but it significantly increased learning engagement (Sig. = 0,027 < 0,05; r = 0,384). Observational data support this, showing an engagement rate of 86,67% (very high). Quizizz-based gamification therefore appears more suitable for enhancing engagement than motivation in technical vocational subjects. Teachers are advised to combine Quizizz with additional strategies, such as linking the material to real-world construction work contexts, to foster students' learning motivation more comprehensively.

Keywords: Quizizz; gamification; digital assessment; learning motivation; learning engagement.

INTRODUCTION

Advances in digital technology have transformed the way learning takes place: the learning process, which used to be teacher-centered, has now shifted to a more interactive approach that places students at the center. Assessment has also been affected. Assessment is now expected to utilize digital tools to measure competency achievement while encouraging active student participation (Handoko et al., 2021). Gamification which integrates game features such as points, leaderboards, and instant feedback into learning and assessment activities to boost motivation and engagement has become an increasingly popular innovation in digital assessment.

One of the most popular gamification-based digital assessment platforms in education is Quizizz. Through features such as leaderboards, avatars, and instant feedback, this platform creates a learning environment that is both interactive and competitive (Widyasari & Wijirahayu, 2025). The effectiveness of Quizizz in an educational context has been demonstrated by various studies. Zhang and Crawford (2024), for example, noted an increase in student answer accuracy from 74,01% to 89,05% after Quizizz was implemented as a formative assessment tool, which also correlated positively with

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https://doi.org/10.21831/ep.v7i2.102355

increased motivation and engagement in learning. Heriyanto et al. (2024), reached a similar conclusion, stating that Quizizz can increase student motivation and engagement during the learning process. Meanwhile, Fatchurrohim et al. (2025) also found that Quizizz creates a lively and positive classroom atmosphere and increases student engagement.

However, most of this research still focuses on general subjects or language learning, so its application in the field of vocational education has not yet been studied in depth. In fact, vocational subjects such as Basic Building Construction and Housing Engineering, particularly in the field of Structural Statics, require a strong conceptual understanding as well as high-level analytical and computational skills (Suwarsono & Winarko, 2022). It is these characteristics that often lead students to perceive these subjects as difficult and boring, and frequently trigger academic anxiety when faced with calculation-based assessments (Afifah & Silaen, 2026). On the other hand, research on the application of gamification-based digital assessment tools, such as Quizizz, in vocational courses in the field of construction is still limited to general aspects of Building Information Modeling and Design (BIMD) (Guntoro et al., 2024), while the use of gamification-based digital assessment tools, such as Quizizz, in this context has not received much attention.

A similar phenomenon was also observed in the Basic Building Construction and Housing Engineering curriculum at SMKN 3 Surabaya. Based on initial observations, 68% of 10th grade Building Construction and Housing Engineering students were classified as having a sufficient level of active engagement. However, this level of engagement has not been matched by the use of digital technology based assessment, so the students' potential has not been fully realized. It is crucial to address this situation, given that the majority of vocational high school students are members of Generation Z who are very familiar with digital technology and, as a result, are less enthusiastic about conventional paper-based assessment methods.

Based on these issues, this study offers a novel approach in the form of implementing gamification based digital assessment through Quizizz in vocational courses in the field of building engineering, specifically the Structural Statics element. It should be clarified that Structural Statics is not a standalone subject, but rather one element within this course, focusing specifically on the quantitative calculation of structural equilibrium and load-bearing capacity. This calculation-intensive nature makes it technical and demanding, a topic that has not been extensively addressed in previous research. Against this background, this study examines whether Quizizz assessments integrated with gamification significantly influence students' motivation and engagement in the subjects of Basic Building Construction and Housing Engineering, and tests this hypothesis among 10th-grade students majoring in Construction and Housing Engineering at SMKN 3 Surabaya.

METHOD

The study follows a quantitative, experimental approach to test how gamified Quizizz, used as a learning assessment tool, affects students' motivation and learning engagement. A quantitative approach suited the data, which were numerical scores gathered through measurement and examined with statistical techniques (Sugiyono, 2023, p. 9). A pre-experimental, single-group pretest–posttest design ($O_1 \rightarrow X \rightarrow O_2$) with no control group was adopted because the Construction and Housing Engineering program at the research site had only a few classes available. To limit bias, the treatment was delivered under uniform conditions in terms of content, instructor, time allocation, and classroom setting, and it relied on instruments whose validity and reliability had been tested beforehand.

The research took place at SMKN 3 Surabaya during the even semester of the 2026 academic year. All participants consisted of 33 10th grade students in the Building Construction and Housing Engineering program who were enrolled in the course Basic Building Construction and Housing Engineering. Because the study population was small and relatively homogeneous, a total sampling method was used, meaning that every member of the population became a participant.

The independent variable (X) is the use of Quizizz with integrated gamification as a digital assessment tool, whose features include automatic grading, leaderboards, time limits, and immediate

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feedback. Two dependent variables were examined: learning motivation (Y1) and learning engagement (Y2). Motivation was measured using a questionnaire adapted from the ARCS-V model (Attention, Relevance, Confidence, Satisfaction, Volition) (Keller, 2016), and the level of engagement was measured using a questionnaire adapted from the behavioral, emotional, and cognitive dimensions of student engagement (Fredricks et al., 2004). Each questionnaire contained 15 closed-ended statements rated on a four-point Likert scale (Strongly Agree = 4 to Strongly Disagree = 1), giving a possible score of 15 to 60. Negatively worded items were reverse-scored before analysis. The motivation questionnaire contained three items for each of the five ARCS-V dimensions, and the engagement questionnaire contained five items for each of the three engagement dimensions. Both questionnaires were administered twice: before the intervention (pretest) and after the intervention (posttest). The pretest items referred to the lesson on the calculation of force equilibrium in building structures, whereas the posttest items referred to the experience of learning and being assessed with Quizizz. Example posttest items (translated from Indonesian) are "I pay more attention to the lesson when using Quizizz" (Attention) and "I try to understand the questions on Quizizz before answering them" (Cognitive Engagement).

The data collection process began with administering a pretest questionnaire to students to determine their initial levels of motivation and engagement in learning. Next, the intervention was conducted in a single meeting of three lesson hours covering the topic of structural equilibrium in buildings. At this stage, Quizizz was used as a formative assessment at the end of the lesson to create a more interactive and stress-free evaluation environment for students. During the quiz, an observer, who was a fellow researcher, monitored student engagement using a pre-prepared observation sheet consisting of 15 indicators (five each for behavioral, emotional, and cognitive engagement). Each indicator was rated on a four-point scale (1 = poor, 2 = fair, 3 = good, 4 = very good), so the maximum score was 20 per dimension and 60 in total. The engagement percentage was calculated as the obtained score divided by the maximum score and interpreted as very high (81–100%), high (61–80%), moderate (41–60%), low (21–40%), or very low (0–20%). After the quiz was completed, students filled out a posttest questionnaire to assess changes in their motivation and engagement following the intervention.

The analysis was conducted in stages. Descriptive statistics were first used to summarize students' motivation and engagement before and after the intervention. The Shapiro-Wilk normality test was then used to determine which hypothesis test was appropriate: a paired t-test if the data were normally distributed, and the nonparametric Wilcoxon signed-rank test if not, both at a 5% (0,05) significance level. The effect size of the treatment was expressed as Cohen's d for parametric results and as the rank-biserial correlation ($r = Z/\sqrt{N}$) for nonparametric results, which were interpreted as small, moderate, or large according to Cohen (1988, pp. 26–27). Finally, N-Gain was calculated to indicate the extent to which students' motivation and engagement scores increased, which were classified as high, moderate, or low according to standard criteria.

RESULTS

Pearson's product-moment correlation was used to examine the validity of the 15 motivation items and the 15 engagement items. In both the pretest and posttest, each item on both questionnaires yielded an r value above the critical r value (0,355), so all 30 items were deemed valid in Table 1.

Table 1. Validity Analysis of the Research Instruments

No	Instrument		Number of Items	Calculated r Range	Table r	Conclusion
1	Learning (Pretest)	Motivation	15	0,499-0,649	0,355	All Items Valid
2	Learning (Posttest)	Motivation	15	0,361-0,735	0,355	All Items Valid
3	Learning (Pretest)	Engagement	15	0,376-0,697	0,355	All Items Valid

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4	Learning (Posttest)	Engagement	15	0,375-0,837	0,355	All Items Valid

In addition, reliability tests conducted using Cronbach's alpha coefficient showed that all research instruments were reliable, with α values greater than 0.70. The results of the reliability tests using Cronbach's alpha coefficient are presented in Table 2.

Table 2. Reliability Coefficients of the Instruments

No	Instrument	Number of Items	Cronbach Alpha	Conclusion
1	Learning Motivation (Pretest)	15	0,852	All Items Reliable
2	Learning Motivation (Posttest)	15	0,824	All Items Reliable
3	Learning Engagement (Pretest)	15	0,809	All Items Reliable
4	Learning Engagement (Posttest)	15	0,877	All Items Reliable

Based on Table 2, all instruments obtained a Cronbach's alpha value above 0.80, indicating a good level of internal consistency.

Descriptive Statistics for Learning Motivation and Engagement Scores

Results of the descriptive analysis of the pretest and posttest scores for these two variables are presented in Table 3. The mean learning motivation score decreased slightly from 48,06 (pretest) to 47,73 (posttest), while the mean learning engagement score increased from 47,39 (pretest) to 50,15 (posttest). These initial findings suggest that, descriptively, the use of gamified Quizizz has a greater impact on increasing students' learning engagement than on their learning motivation, which was subsequently confirmed through hypothesis testing.

Table 3. Descriptive Statistics for Pretest and Posttest Scores

No	Variable	N	Min Score	Max Score	Mean	SD
1	Learning Motivation (Pretest)	33	38,00	56,00	48,06	4,86
2	Learning Motivation (Posttest)	33	37,00	59,00	47,73	6,33
3	Learning Engagement (Pretest)	33	37,00	60,00	47,39	5,42
4	Learning Engagement (Posttest)	33	42,00	60,00	50,15	5,77

Prerequisite tests and hypothesis tests

The Shapiro-Wilk test was selected for normality checking because it performs better with small samples (n = 33 < 50). The test results are presented in Table 4.

Table 4. Results of the Shapiro-Wilk Normality Test

No	Variable	Sig.	Notes
1	Learning Motivation (Pretest)	0,324	Normal
2	Learning Motivation (Posttest)	0,536	Normal
3	Learning Engagement (Pretest)	0,557	Normal
4	Learning Engagement (Posttest)	0,022	Not Normal

Because the pretest and posttest data on learning motivation followed a normal distribution, a paired-sample t-test was conducted to evaluate the hypotheses related to this variable. Conversely, since the posttest data on learning engagement did not follow a normal distribution, the nonparametric Wilcoxon signed-rank test was used to assess the hypotheses related to that variable. The results of both tests, along with their effect sizes, are presented in Table 5.

Table 5. Results of the Paired-Sample T-Test and Wilcoxon Signed-Rank Test

No	Variable	Test Statistic	Statistic Value	Sig.	Decision	Effect Size	Category
1	Learning Motivation	*Paired Sample T Test*	t = 0,296	0,769	H0 Accepted	d = 0,05	Very Small

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No	Variable	Test Statistic	Statistic Value	Sig.	Decision	Effect Size	Category
2	Learning Engagement	*Wilcoxon Signed Rank*	Z = -2,205	0,027	H0 Rejected	r = 0,384	Moderate

The results of the hypothesis test indicate that the use of gamified Quizizz does not have a significant effect on students' learning motivation (Sig. = 0,769 > 0,05), with a Cohen's d effect size of 0,05, which is classified as very small (Cohen, 1988, pp. 26–27). In contrast, the use of gamified Quizizz had a significant effect on students' learning engagement (Sig. = 0,027 < 0,05), with a rank-biserial correlation effect size of 0,384, classified as moderate. These results are supported by the ranking data, in which 21 out of 33 students (63,6%) showed an increase in scores (positive ranking), 9 students showed a decrease (negative ranking), and 3 students showed no change (unchanged).

N-Gain Test

Table 6. N-Gain Test Results

No	Variable	Pretest Mean	Posttest Mean	N-Gain	Category
1	Learning Motivation	48,06	47,73	-0,03	Low
2	Learning Engagement	47,39	50,15	0,22	Low

Based on Table 6, the N-Gain value for learning motivation of -0,03 (low category) indicates that there was no improvement, while the N-Gain value for learning engagement of 0,22 also falls into the low category according to Hake's (1998) criteria, even though the improvement was statistically significant.

Results of the Observation of Learning Engagement

Table 7. Results of the Observation of Student Learning Engagement

No	Dimension	Score	Maximum Score	Percentage	Category
1	*Behavioral Engagement*	17	20	85%	Very High
2	*Emotional Engagement*	18	20	90%	Very High
3	*Cognitive Engagement*	17	20	85%	Very High
	Total	52	60	86,67%	Very High

Student learning engagement achieved a total percentage of 86,67% (very high category), with the highest percentage in the emotional engagement dimension (90%). These observation results reinforce the findings of the hypothesis testing in Table 5, while also demonstrating that the increase in learning engagement is reflected not only in the questionnaire data but also in the students' behavior, emotional responses, and thought processes observed directly during instruction.

DISCUSSION

Quizizz, integrated with game elements, has a different impact on both of these outcomes. Motivation remained statistically unchanged, but engagement levels increased significantly. Therefore, the effectiveness of digital assessment integrated with gamification elements in vocational subjects cannot be assumed to apply uniformly across all psychological aspects of learning. This must be evaluated dimension by dimension, according to which aspects are actually influenced by the applied gamification elements.

The Effect of Gamified Quizizz on Student Learning Motivation

The paired t-test returned a two-tailed significance of 0,769 (> 0,05) and a very small effect size (d = 0,05). Thus, H_0 is accepted, meaning that gamification-based Quizizz has not been able to exert a

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significant influence on increasing students' learning motivation in the Basic Building Construction and Housing Engineering subject. This finding differs from the results of Zhang and Crawford's (2024) study, which actually found a positive correlation between the use of Quizizz in formative assessment and students' learning motivation. When analyzed using the ARCS-V model (Keller, 2016), these results indicate that the gamification elements in Quizizz have not yet fully succeeded in stimulating all components of student motivation namely, Attention, Relevance, Confidence, Satisfaction, and Volition toward the Basic Building Construction and Housing Engineering subject.

It is important to emphasize that these nonsignificant results should not be interpreted as evidence that gamified Quizizz lacks the potential to enhance learning motivation. Rather, this reflects a key limitation of this study: the intervention was administered only once, during a single meeting of three lesson hours. Such a brief, one-time exposure is likely insufficient to allow changes in motivation to reach their full effect, as motivation is a relatively stable psychological construct that typically develops through repeated and sustained experiences, rather than through a single interaction. Therefore, the learning motivation results reported here should be considered a conservative estimate, rather than a definitive assessment of the true potential of gamified Quizizz.

The difference between these results and those of previous studies can be further explored through the findings of Nugroho and Singh (2026), which reveal that in gamified assessments using Quizizz, the components of Relevance, Confidence, and Satisfaction actually have a greater influence on student motivation than the component of Attention, which is relatively easier to elicit solely through game elements. These three components generally require time and repeated experience to develop optimally. For example, the connection between learning material and students' real-world needs (relevance), or the gradual building of self-confidence through the experience of answering questions correctly (confidence). Given that the intervention in this study was conducted only once during a single three-lesson-hour meeting as a form of evaluation at the end of the learning process, the novelty effect of gamification may not have been strong enough to have a significant impact on overall learning motivation. In addition, students who are already quite accustomed to using online quiz platforms may no longer derive significant additional motivation from these gamification elements.

The main limitation of these findings lies in the treatment design, which was implemented only once during a single three-lesson-hour meeting. This condition allowed for a novelty effect In the use of Quizizz as a game-based assessment tool in other words, students' enthusiasm stems solely from the fact that this game-based element is still relatively new and different from the conventional assessment methods they are accustomed to. However, the novelty effect is essentially fleeting and situational thus, it can only trigger spontaneous engagement during the learning session as reflected in the increase in learning engagement scores and the very high percentage of positive observations (86,67%) but is not yet strong enough to substantially alter learning motivation. Conceptually, learning motivation is more stable and is formed through the accumulation of repeated experiences (Keller, 2016). In other words, a single treatment session does not provide students with enough time to build the relevance, self-confidence, or satisfaction necessary for motivational drive to form comprehensively and persist beyond the novelty of gamification itself.

The Effect of Gamified Quizizz on Student Learning Engagement

In contrast, engagement showed clear results. The Wilcoxon signed-rank test yielded a Z-value of -2,205 with a two-sided asymptotic significance level of 0,027 (< 0,05) and a moderate rank-biserial effect size of 0,384; thus, H_0 was rejected, and the gamified Quizizz was found to significantly influence learning engagement. This is consistent with the findings of Heriyanto et al. (2024), who reported that Quizizz can increase engagement, as well as with the engagement framework proposed by Fredricks et al. (2004), which distinguishes between behavioral, emotional, and cognitive dimensions. Observations confirm this all three dimensions fell into the very high category, led by emotional engagement (90%), while behavioral and cognitive engagement stood at 85% each. Features such as real-time scoring, leaderboards, and time limits appear to drive emotional engagement most strongly by creating a fun and

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competitive atmosphere, while also fostering behavioral engagement through active participation in answering questions. The strong cognitive engagement further demonstrates that gamification does not merely encourage superficial participation: it also prompts students to read and think more carefully about questions before answering.

This difference in the patterns of influence between motivation and learning engagement also indicates that statistical significance and the magnitude of the increase are two distinct matters. The N-Gain value for learning engagement of 0,22 still falls into the low category according to Hake's (1998) criteria, even though the increase has been proven to be statistically significant. This indicates that the hypothesis test confirms that the increase in learning engagement was not due to chance, whereas the low N-Gain value suggests that the magnitude of the increase, when compared to the maximum possible increase, is still considered low.

Novelty of the findings in the context of vocational education

The results of this study reinforce and expand upon previous findings most of which were conducted in general academic subjects by demonstrating that gamification-based assessment using Quizizz is effective when applied to Basic Building Construction and Housing Engineering vocational subjects, particularly in the Structural Statics element, which is technical and calculation-based, although its effectiveness is more evident in terms of engagement than in learning motivation. These findings complement the research conducted by Guntoro et al. (2024), who applied Quizizz as an assessment tool in the vocational subject Basic Vocational Studies and found that gamification features such as leaderboards and avatars play a significant role in enhancing students' learning motivation. In the context of the Structural Statics element, which places greater emphasis on technical calculations, this study actually shows that gamification-based digital assessment has a greater impact on increasing learning engagement than on learning motivation in the short term, thereby confirming that the characteristics of vocational course material also influence the extent to which gamification impacts learning motivation.

Practical Implications for the Design of Digital Assessments

The design of digital evaluations in technical vocational topics would be affected practically by these findings. Given that learning engagement has been shown to increase significantly while learning motivation has not, teachers are advised not to rely solely on generic gamification elements such as scores and leaderboards, but also to specifically design assessments that link Basic Building Construction and Housing Engineering material to real-world construction work contexts to strengthen relevance, as well as to provide opportunities for practice and gradual feedback across several formative assessment sessions to build student confidence, as emphasized in the findings of Nugroho and Singh (2026). Thus, the use of gamified Quizizz will be more effective if positioned as one component of a broader assessment strategy, rather than as the sole intervention to boost students' learning motivation.

Overall, this study shows that the effectiveness of gamification-based digital assessments in vocational education is more evident in students' behavioral, emotional, and cognitive dimensions during the learning process than in more comprehensive and long-term motivational drivers. These findings suggest that the use of Quizizz as a digital assessment tool in technical subjects such as Basic Building Construction and Housing Engineering should be combined with additional learning strategies that specifically target students' sense of relevance and self-confidence, so that this significant increase in engagement can be followed by an even greater increase in students' motivation to learn.

CONCLUSION

The evidence shows that Quizizz, integrated with game elements as a digital assessment tool, does not significantly affect the motivation of 10th-grade students majoring in Building Construction and Housing Engineering in the course "Basic Building Construction and Housing Engineering." A paired-sample t-test yielded Sig. = 0,769 (> 0,05), d = 0,05, and N-Gain = -0,03, and average motivation

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actually decreased slightly from 48,06 to 47,73. Conversely, engagement increased significantly according to the Wilcoxon signed-rank test (Z = -2,205; Sig. = ,027 < 0,05; r = 0,384, moderate), with the average score rising from 47,39 to 50,15 and observations across the behavioral, emotional, and cognitive dimensions reaching 86,67% (very high). These findings suggest that, in technical vocational subjects, the Quizizz-based gamification used in this study is a more effective tool for engagement than for motivation. Future research should employ a more robust design for example, with a control group and a longer intervention period and examine other factors that may influence students' learning motivation.

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