DIDAKTIKA
Vol. 6 No. 2, Juni 2026, pp. 262-280
https://ejournal-serang.upi.edu/didaktika

Gamified Digital Assessment and Student Learning Outcomes: An Experimental Study Using Quizizz

Muldiyana[1]✉ & Asma Amir[2]

[1]✉Universitas Muhammadiyah Bone, muldiyana@unimbone.ac.id, Orcid ID: 0009-0002-9936-3241
[2] Universitas Muhammadiyah Bone, asmahamir@unimbone.ac.id, Orcid ID: 0000-0003-1937-4320

Article Info

History Articles
Received:
02 June 2026
Accepted:
25 June 2026
Published:
30 June 2026

Abstract

Sustaining student engagement and optimizing formative evaluation remain persistent challenges in modern classroom instruction, necessitating innovative digital assessment strategies. This study examines the impact of gamified digital assessment on students' learning outcomes. The study aimed to determine the extent to which Quizizz, as a gamified digital assessment tool, supports students' learning performance and engagement during the educational process. Twenty-five ninth-grade students from an Indonesian school participated in the study, which employed a pre-experimental one-group pretest-posttest design and a quantitative approach. Pretest and posttest assessments were employed to collect data before and after the implementation of Quizizz-based learning activities. IBM SPSS Statistics was employed to analyze the data using descriptive statistics, a paired-sample t-test, and the Kolmogorov–Smirnov normality test. The mean score increased from 27.8 on the pretest to 76.6 on the posttest, indicating an average gain of 48.8 points. A statistically significant difference was observed between the two assessments ($t = 13.654$, $p < 0.05$), according to the paired-sample t-test. The findings indicate that Quizizz-based gamified digital assessment was associated with improved student learning scores. The results demonstrate the potential of integrating interactive digital platforms into classroom assessment to create more engaging and technologically supported learning environments. Although learning motivation is discussed as a possible mechanism underlying engagement, it was not directly measured by a separate motivation questionnaire in the reported pretest-posttest data.

Keywords: Digital Assessment, Gamification, Learning Outcomes, Quizizz

How to cite: Muldiyana, M., & Amir, A. (2026). Gamified digital assessment and student learning outcomes: An experimental study using Quizizz. *Didaktika, 6*(2), 262-280.

Info Artikel

Riwayat Artikel
Dikirim:
02 Juni 2026
Diterima:
25 Juni 2026
Diterbitkan:
30 Juni 2026

Abstrak

Mempertahankan keterlibatan siswa dan mengoptimalkan evaluasi formatif tetap menjadi tantangan berkelanjutan dalam pembelajaran di kelas modern, sehingga diperlukan strategi penilaian digital yang inovatif. Penelitian ini mengkaji dampak penilaian digital berbasis permainan (gamifikasi) terhadap hasil belajar siswa. Penelitian ini bertujuan untuk mengetahui sejauh mana Quizizz, sebagai perangkat penilaian digital berbasis permainan, mendukung kinerja belajar dan keterlibatan siswa selama proses pendidikan. Sebanyak duapuluh lima siswa kelas sembilan dari sebuah sekolah di Indonesia berpartisipasi dalam studi ini, yang menggunakan desain pra-eksperimental satu kelompok dengan tes awal (pretest) dan tes akhir (posttest) serta pendekatan kuantitatif. Penilaian pretest dan posttest digunakan untuk mengumpulkan data sebelum dan sesudah penerapan kegiatan pembelajaran berbasis Quizizz. Data dianalisis menggunakan perangkat lunak IBM SPSS Statistics dengan metode statistik deskriptif, uji-t sampel berpasangan (paired-sample t-test), dan uji normalitas Kolmogorov–Smirnov. Skor rata-rata meningkat dari 27,8 pada pretest menjadi 76,6 pada posttest, yang menunjukkan peningkatan rata-rata sebesar 48,8 poin. Berdasarkan uji-t sampel berpasangan, ditemukan perbedaan yang signifikan secara statistik antara kedua penilaian tersebut ($t = 13,654$, $p < 0,05$). Temuan ini mengindikasikan bahwa penilaian digital berbasis permainan menggunakan Quizizz berkaitan dengan peningkatan skor hasil belajar siswa. Hasil penelitian ini menunjukkan potensi integrasi platform digital interaktif ke dalam penilaian di kelas untuk menciptakan lingkungan pembelajaran yang lebih menarik dan didukung oleh teknologi. Meskipun motivasi belajar dibahas sebagai kemungkinan mekanisme yang mendasari keterlibatan siswa, variabel ini tidak diukur secara langsung melalui kuesioner motivasi terpisah dalam data pretest-posttest yang dilaporkan.

Kata Kunci: Penilaian Digital, Gamifikasi, Hasil Pembelajaran, Quizizz

Cara mengutip: Muldiyana, M., & Amir, A. (2026). Gamified digital assessment and student learning outcomes: An experimental study using Quizizz. *Didaktika, 6*(2), 262-280.

©2026 Universitas Pendidikan Indonesia
e-ISSN: 2775-9024, p-ISSN: 2987-9388

INTRODUCTION

The swift advancement of digital technology has profoundly altered educational methodologies globally. Educational institutions are increasingly incorporating digital resources into teaching and assessment practices to enhance student engagement, learning outcomes, and classroom interaction. In classroom instruction, a continual problem for educators is sustaining student motivation, especially in disciplines deemed difficult or abstract. Learning motivation is pivotal in influencing students' engagement in classroom activities, the effort they dedicate to learning tasks, and their overall academic achievement (Ganapathy et al., 2025; Kurt & Dindar, 2024). As educational institutions evolve toward technology-enhanced learning settings, digital platforms that integrate interactive features with pedagogical strategies have gained interest as potential ways to promote student motivation.

A new approach is using gamified digital assessment systems that integrate game elements—such as points, leaderboards, time challenges, and competition—into instructional activities. Gamification in education refers to incorporating game design features into non-game environments to promote involvement and improve engagement (Çiğdem et al., 2024; Hong et al., 2024; Rogelj et al., 2024). In recent years, platforms like Quizizz, Kahoot, and Socrative have gained popularity among educators for developing interactive quizzes and assessments in educational settings. Quizizz is a web-based tool that lets educators create game-like quizzes accessible to students on digital devices. The platform offers immediate feedback, rankings, and visual incentives that might enhance students' attention and participation. For example, when an educator uses Quizizz for formative assessment, students respond to questions in real time, with their scores and ranks updating instantly, which may motivate them to engage more actively and improve their performance.

Prior research has investigated the impact of gamification and digital learning platforms on augmenting student motivation and engagement. Researchers examined the efficacy of gamified assessment tools in enhancing student engagement in classroom activities (Bayrak & Kaban, 2024; Kurukaya, 2024; Rosati et al., 2024; Velu et al., 2025). The researchers employed a quasi-experimental approach to compare standard paper-based quizzes against gamified quizzes administered via a digital platform. The findings showed that students in gamified exams showed greater engagement and motivation than those in standard examinations. The findings indicate that including game aspects in assessment tasks can foster a more engaging and inspiring learning environment.

Another study similarly examined the efficacy of digital quiz platforms in enhancing learning outcomes and motivation in middle school students (Bachiri et al., 2023; Maraza-Quispe, 2024; Zainudin & Zulkiply, 2023). The researchers used an experimental design in which one cohort of students used a gamified digital platform for formative assessment, while the control cohort used traditional instructional approaches. The findings showed a substantial increase in both student motivation and academic achievement in the experimental group. The authors concluded that gamified learning environments can support active learning by motivating students to engage more actively in classroom activities.

Moreover, numerous investigations have examined the pedagogical effects of Quizizz as a gamified educational tool. One study investigated the impact of Quizizz on student involvement and motivation in technology-related disciplines (Nordin et al., 2025; Sitompul et al., 2024). Using a mixed-methods design with questionnaires and classroom observations, the study found that students reported greater enjoyment and engagement in learning activities delivered via Quizizz. The authors contended that the platform's interactive features—namely quick feedback,

competitiveness, and aesthetically pleasing interfaces—enhanced student motivation and engagement.

Nonetheless, not all research has yielded consistently favorable outcomes. Conversely, some scholars argue that gamification's motivational effects may depend on contextual factors such as instructional design, subject matter, and student characteristics (Li et al., 2023; Ukgoda, 2025; Zhang & Huang, 2024). A study of gamified learning environments found that although students initially showed heightened enthusiasm, the novelty effect of digital games sometimes diminished over time (Li et al., 2024; Luo, 2024; Patras et al., 2025). This suggests that the effectiveness of gamified assessment tools may vary depending on how they are integrated into teaching methods.

Collectively, current research offers substantial evidence that gamification and digital learning platforms can improve student engagement and motivation. Research indicates that interactive digital evaluations may boost engagement in learning activities, provide fast feedback, and cultivate a competitive yet fun classroom atmosphere. Furthermore, incorporating digital resources aligns with the learning preferences of modern students, who are increasingly adept with technology in their everyday lives.

Despite the growing body of research on gamification in education, several gaps remain. Much prior research has focused on overall classroom participation rather than investigating learning motivation as a quantifiable psychological phenomenon. Second, empirical evidence from experimental designs in school settings, especially in developing nations, remains scarce. Third, although platforms like Quizizz are prevalent in educational settings, few comprehensive studies use controlled experimental methods to assess their effect on student motivation. Addressing these deficiencies is crucial, as understanding the motivational effects of gamified digital assessments can guide the development of more effective instructional strategies and digital learning environments.

This study examines the impact of gamified digital assessment via Quizizz on students' learning outcomes, addressing the identified gap in experimental evidence. The main aim of this research is to investigate whether incorporating Quizizz as a gamified assessment tool can improve students' learning scores. The study examines the following research question: Does using Quizizz as a gamified digital assessment platform significantly improve students' learning outcomes? The study posits the following hypothesis: H_1: Implementation of gamified digital assessments using Quizizz significantly improves students' learning outcomes compared with students' performance before the intervention.

This study uses a pre-experimental design, including a one-group pretest–posttest methodology, to address the research topic. The design compares students' learning scores before and after adopting Quizizz-based learning activities. The study seeks to ascertain whether gamified digital assessment results in a quantifiable improvement in learning outcomes. The interactive and competitive elements of Quizizz are expected to support students' engagement and participation during learning activities.

METHODS

Research Design

This study utilized a quantitative research methodology with a pre-experimental one-group pretest-posttest framework. This design was chosen to examine changes in students' learning outcomes after implementing a gamified digital assessment platform in a school setting. Students first undertook a pretest (O1) to establish their baseline learning score. After the pretest, students

engaged in educational activities that utilized Quizizz as a gamified digital assessment instrument (X). The technology facilitated interactive quizzes and provided instant feedback during classroom instruction. After the intervention, students completed a posttest (O2) to measure changes in their learning scores.

Research Setting and Participants

This research was conducted in a public school in Indonesia, where digital learning technologies are increasingly incorporated into classroom instruction. The study took place in a ninth-grade class, reflecting a standard educational setting in Indonesian schools. Twenty-five students participated in the study. The researchers recruited participants using purposive sampling, as the designated class was deemed appropriate for implementing the gamified digital assessment intervention and reflected typical classroom learning conditions. The students were roughly 14 to 15 years old, aligning with the typical age range for ninth-grade students. The school facilitated access to digital devices and internet connectivity, enabling the utilization of Quizizz in educational activities. Ethical considerations were meticulously examined before the investigation commenced. Authorization to perform the research was secured from the school administration, and all participants were apprised of the study's objective. The students' identities were anonymized to maintain confidentiality and safeguard their privacy during the research procedure.

Study Variables

This study encompassed two primary variables: the independent variable and the dependent variable. The independent variable was the implementation of gamified digital assessment using Quizizz. Quizizz served as a digital learning platform with diverse gamification elements designed to enhance student engagement, including points, leaderboards, time constraints, and immediate feedback to foster a competitive and participatory educational atmosphere throughout evaluative tasks. The dependent variable was students' learning outcomes, operationalized through pretest and posttest scores ranging from 0 to 100, reflecting students' cognitive comprehension and academic achievement.

Data Collection Procedures

The Quizizz-based learning activities were subsequently executed during classroom instruction. Students engaged in interactive quizzes via the digital platform, which incorporated gamification features such as points, rankings, and immediate feedback. Following the learning intervention, a posttest was conducted to measure changes in students' learning outcome scores. Classroom activities were also recorded through observation and documentation to provide contextual support for the quantitative findings.

Data Analysis

The gathered data were examined utilizing both descriptive and inferential statistical techniques. Descriptive statistics were initially employed to summarize the mean, maximum score, and minimum score derived from both the pretest and posttest. These statistics describe students' learning performance before and after the Quizizz-based learning intervention. Before hypothesis testing, an assumption test was conducted to assess the normality of the data distribution. The Kolmogorov–Smirnov test was used for this purpose. If the significance value exceeded 0.05, the data were deemed normally distributed. A paired sample t-test was used to evaluate the mean scores of the pretest and posttest in order to test the research hypothesis. This

test assessed whether a significant difference existed post-intervention. The decision criterion indicated that if $p < 0.05$, the hypothesis was accepted. All statistical analyses were performed with IBM SPSS Statistics software.

RESULTS AND DISCUSSION

Descriptive Statistics of Pretest and Posttest Scores

This section summarizes the descriptive statistical findings from the pretest and posttest assessments. Descriptive statistics were employed to summarize the overall properties of the data and identify preliminary patterns in students' learning outcomes before and after the Quizizz-based intervention. The analysis encompasses the mean scores, maximum scores, minimum scores, and the average improvement (gain score) between the two assessments. The descriptive data indicate that the mean pretest score was 27.8, while the maximum and minimum pretest scores were 60 and 10, respectively. Following the gamified digital assessment via Quizizz, the average posttest score rose to 76.6, with a maximum of 95 and a minimum of 55. The results therefore show a substantial increase in the measured learning outcome scores after the intervention.

The mean improvement between the pretest and posttest scores was 48.8 points, indicating a substantial favorable change in students' measured learning outcomes following the intervention. The findings provide quantitative evidence of improved learning scores after incorporating Quizizz as a gamified digital assessment tool. For clarity, Table 1 presents the descriptive data are displayed in Table 1 (Descriptive Statistics of Pretest and Posttest Scores). Furthermore, Figure 1 visibly depicts the disparity in mean scores between the two assessment phases, emphasizing the significant enhancement following the Quizizz-based learning activities.

Table 1. Descriptive Statistics of Pretest and Posttest Scores

Metric	Pretest	Posttest	Improvement
Mean	27.8	76.6	
Highest Score	60.0	95.0	
Lowest Score	10.0	55.0	
Average Improvement			48.8

Table 1 presents descriptive statistics for students' learning outcome scores before and after the deployment of the gamified digital assessment using Quizizz. The findings demonstrate a substantial increase in scores after the intervention. The average pretest score was 27.8, while the average posttest score rose to 76.6. The highest score increased from 60 to 95, and the lowest score increased from 10 to 55. The mean improvement of 48.8 points indicates a favorable change in the measured learning outcomes. These results should be interpreted as changes in learning scores; they do not constitute direct evidence of a change in learning motivation because a separate motivation scale was not reported.

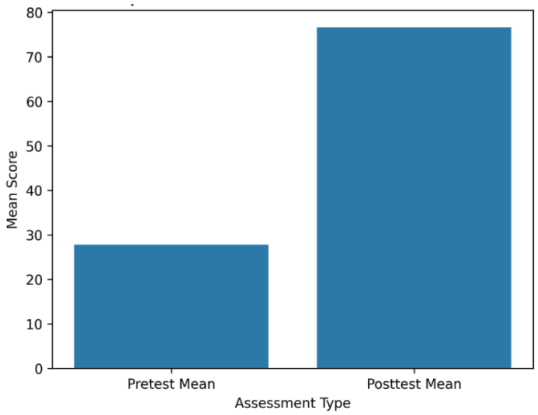


Figure 1. Comparison of Mean Score Between Pretest and Posttest

Figure 1 compares the average learning outcome scores derived from the pretest and posttest assessments. It illustrates a substantial increase in the mean score from 27.8 before the intervention to 76.6 after the Quizizz-based gamified learning activities. The figure therefore provides descriptive evidence of improved learning scores following the intervention.

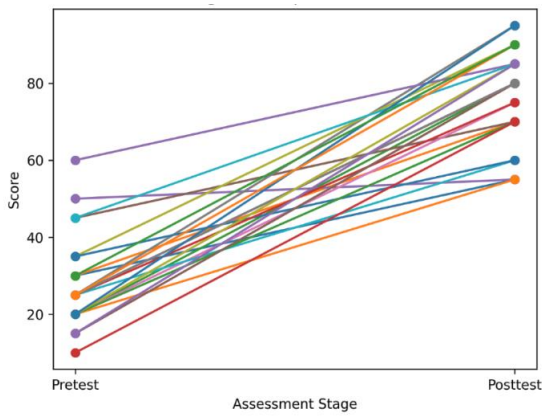


Figure 2. Student Learning Score Improvement Before and After Quizizz

Figure 2 depicts improvements in individual student scores from the pretest to the posttest after introducing the Quizizz-based gamified learning activity. Each line denotes a student's performance variation between the two evaluation phases. The upward trend in nearly all lines shows that most pupils achieved higher scores after engaging in the gamified digital evaluation. This pattern shows a consistent improvement across participants rather than sporadic gains. The image illustrates how an interactive digital platform can enhance student engagement and participation in classroom activities. The data clearly show Quizizz's effectiveness in improving students' learning outcomes. Figure 3 provides clear graphical evidence supporting the effectiveness of Quizizz-based learning methodologies.

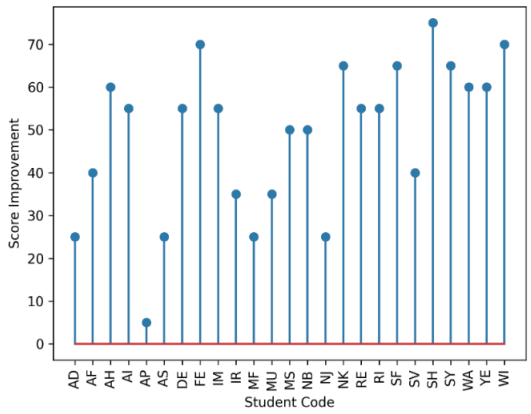


Figure 3. Individual Student Score Improvement

Figure 3 illustrates the individual score enhancements of pupils with a lollipop-style display. Each vertical line represents the difference between a student's pretest and posttest scores for an individual student. The graphic shows the extent of improvement each participant achieved after participating in Quizizz-based gamified learning sessions. The majority of students exhibit significant positive progress, suggesting that the intervention facilitated enhanced learning outcomes. This visualization enables users to discern patterns of enhancement among participants and examine discrepancies in individual learning trajectories. The lollipop chart effectively and attractively represents the distribution of score improvements from the digital gamified evaluation.

Normality Test Results

Before hypothesis testing, a normality assessment was conducted to determine whether the data met the statistical prerequisites for parametric analysis. The normality test is a crucial preliminary procedure, as parametric statistical procedures, including the paired-sample t-test, require normally distributed data. This study employed the Kolmogorov–Smirnov test to analyze the distribution of pretest and posttest scores. The Kolmogorov–Smirnov test assesses whether the observed data significantly diverge from a normal distribution. The test results are displayed in Table 2 (Results of Normality Test). The analytical judgment rule indicates that if the p-value exceeds 0.05, the data are deemed to be normally distributed. If the p-value is below 0.05, the data are deemed not normally distributed.

The study results indicate that the pretest data yielded a significance value over 0.05, suggesting that the pretest scores follow a normal distribution. The posttest data similarly indicated a significance value greater than 0.05, suggesting that the posttest scores are normally distributed. The findings show that both datasets meet the normality assumption required for subsequent parametric analysis. This normal distribution supports the use of the paired-samples t-test for hypothesis testing. This statistical test compares the mean scores of the pretest and posttest to determine whether a significant difference exists after implementing the Quizizz-based learning intervention. The normality test results support the use of parametric statistical methods in this investigation.

Table 2. Kolmogorov–Smirnov Normality Test Results

Variable	Test	Statistic	p-value	Decision
Pretest	Kolmogorov–Smirnov	0.236	0.104	Normal
Posttest	Kolmogorov–Smirnov	0.170	0.417	Normal

Table 2 presents the results of the Kolmogorov–Smirnov normality test used to assess the normal distribution of the pretest and posttest data. The findings indicate that the pretest data have p = 0.104; however, the posttest data have p = 0.417. In this study, data are deemed normally distributed if the p-value surpasses the significance threshold of 0.05. As both values exceed 0.05, the pretest and posttest data satisfy the normality assumption. The results show that the dataset meets the criteria for parametric statistical analysis, particularly the paired-sample t-test.

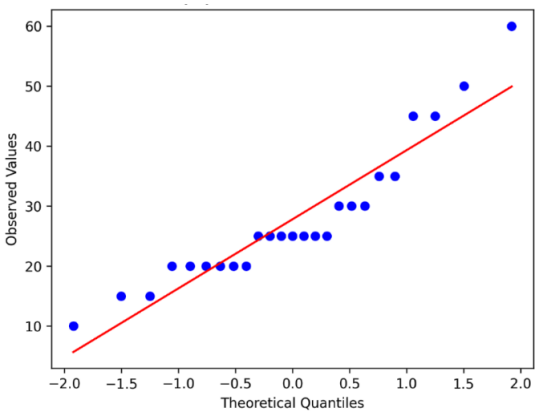


Figure 4. Q-Q Plot of Pretest Score Distribution

Figure 4 depicts the normal probability distribution of the pretest scores through a Q–Q (quantile–quantile) plot. This image juxtaposes the observed data points with the theoretical values of a normal distribution. The dots' arrangement around the diagonal reference line suggests that the pretest distribution closely resembles a normal distribution. Despite small discrepancies at certain points, the overall distribution follows the expected linear trend. This graphical representation corroborates the Kolmogorov–Smirnov test findings, confirming that the pretest data are normally distributed and appropriate for subsequent parametric statistical analysis.

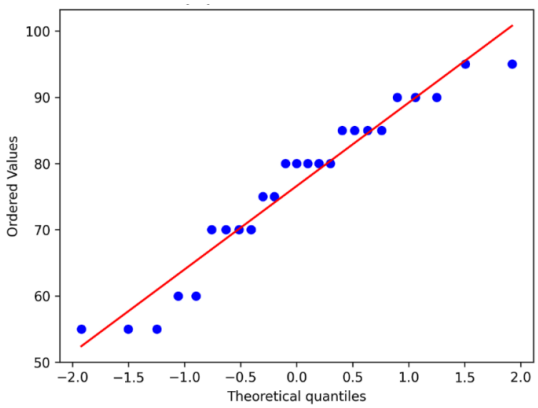


Figure 5. Q-Q Plot of Posttest Score Distribution

Figure 5 illustrates the Q–Q plot of the posttest score distribution. As with the pretest visualization, the chart's points illustrate the contrast between the observed posttest data and the anticipated values of a normal distribution. The majority of the dots closely conform to the diagonal reference line, suggesting that the posttest scores have a normal distribution pattern. This image indicates that the distribution of posttest scores does not significantly diverge from normality. The graphical evidence corroborates the statistical results from the Kolmogorov–Smirnov test, confirming that the dataset meets the prerequisites for the paired-samples t-test in this research.

Hypothesis Testing Results

This study conducted hypothesis testing to determine whether Quizizz, as a gamified digital assessment tool, was associated with a statistically significant change in students' learning outcome scores. A paired-sample t-test was utilized to compare the mean pretest and posttest scores. The paired-sample t-test results indicated a significant difference between students' pretest and posttest scores. The average difference between the two tests was 48.8, indicating a substantial improvement in students' performance after the introduction of Quizizz-based learning activities. The analysis yielded a t-value of 13.654, much above the t-table value of 2.063 at a significance level of 0.05 with the corresponding degrees of freedom. The statistical test produced a significance value (p-value) of 0.000, significantly below the 0.05 threshold.

This study accepts the hypothesis if the p-value is below 0.05. Given that the attained significance value satisfies this criterion, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted. This outcome signifies a statistically significant disparity between the pretest and posttest scores. The findings indicate that utilizing Quizizz as a gamified digital assessment platform was associated with a statistically significant improvement in students' learning outcome scores. The result supports the intervention's effectiveness in improving the measured learning performance of the participating students. Learning motivation may be a plausible explanatory mechanism because Quizizz includes interactive and competitive features, but motivation was not directly measured by the reported pretest-posttest instrument.

Table 3. Paired Sample t-test Results for Quizizz Intervention

Statistic	Value
Mean Pretest	27.8
Mean Posttest	76.6
Mean Difference	48.8
t-value	13.654
p-value	0.000
Decision	Significant ($p < 0.05$)

The paired-sample t-test results assessed the statistical significance of the difference between pretest and posttest learning outcome scores. The average pretest score was 27.8, whereas the average posttest score rose to 76.6, resulting in a mean difference of 48.8 points. The computed t-value of 13.654 exceeded the critical value, while $p = 0.000$ was below the 0.05 threshold. Consequently, the null hypothesis was rejected, indicating a statistically significant difference in measured learning outcome scores after the Quizizz intervention.

Table 4. Learning Improvement Summary After Quizizz Intervention

Metric	Value
Average Improvement	48.8
Maximum Improvement	75
Minimum Improvement	5
Students Improved	25

Table 4 depicts the variation in students' learning results between the pretest and posttest evaluations through a scatter-based effect depiction. Each point represents a distinct student's score before and after the gamified Quizizz intervention. The ascension from the pretest cluster to the posttest cluster indicates a steady enhancement in student performance. The line linking the average scores highlights the overall improvement in learning. This graphic clearly illustrates the benefits of the Quizizz-based digital assessment method, showing that gamified learning activities can markedly improve student engagement and academic performance in the classroom.

Learning Improvement Analysis

A closer examination of the pretest and posttest data highlights not only a substantial aggregate gain but also a remarkably consistent pattern of individual growth across all participating students. As summarized in Table 1, the mean learning outcome score increased markedly from 27.8 at baseline to 76.6 following the Quizizz intervention, yielding an average gain of 48.8 points. This upward progression is reflected across the entire performance spectrum: the minimum baseline score rose from 10 to 55, while the maximum score advanced from 60 to 95. These baseline metrics indicate that while students initially struggled with the instructional content, the gamified assessment supported substantial comprehension gains across both lower- and higher-performing tiers.

This collective achievement is further elucidated by the trajectory of individual student scores visualized in the slope representation (Figure 2). Rather than progress being driven by a select group of outliers, the steep ascending trajectory of virtually every slope line illustrates a uniform, class-wide enhancement. Students who scored in the lowest quartile during the pretest achieved gains comparable to their peers, narrowing the initial performance gap and ensuring that foundational competencies were met. The consistency of these upward trajectories suggests that the gamified digital environment, such as leveraging real-time feedback, interactive mechanics, and self-paced competition, effectively sustained engagement and facilitated active cognitive participation across diverse learner profiles. Consequently, the intervention demonstrated broad pedagogical utility in systematically elevating overall classroom learning performance.

Beyond aggregate mean differences, a detailed breakdown of individual score gains underscores the intervention's universal reach (Table 4 and Figure 3). All 25 participating students recorded positive learning gains exceeding zero, demonstrating that the academic benefits were experienced class-wide rather than confined to high-achieving peers. While individual improvements varied widely, ranging from a modest gain of 5 points to a substantial jump of 75 points, with an average gain of 48.8 points, this distribution highlights both diverse learning paces and a shared upward trajectory. As illustrated in the individual score improvement chart (Figure 3), the gamified digital environment provided sufficient formative scaffolding to stimulate active participation and measurable learning growth across varied baseline competencies.

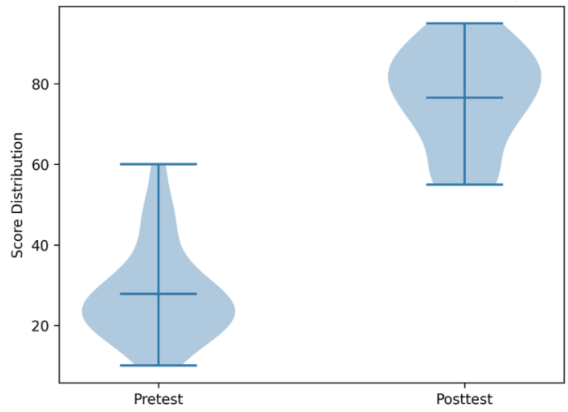


Figure 6. Distribution Shift of Score Before and After Quizizz

Figure 6 displays a violin plot that contrasts the score distributions of the pretest and posttest evaluations. This image offers an enhanced perspective on the alteration in the distribution of student results following the gamified learning intervention. The pretest distribution shows a predominance of lower scores, indicating that pupils initially had limited comprehension of the learning material. Conversely, the posttest distribution shows a notable upward shift, indicating that most students achieved higher scores after using Quizizz. The mean markers in the violin plot underscore the significant rise in the average score. This visualization distinctly demonstrates the beneficial effect of gamified digital assessment on student achievement.

Discussion

Effect of Gamified Digital Assessment on Learning Outcomes

The study's findings show that using Quizizz as a gamified digital assessment platform was associated with a significant improvement in students' learning outcome scores. The rise in scores from the pretest to the posttest indicates that the gamified learning environment Quizizz created supported improved performance during the learning process. Gamified digital assessments convert conventional classroom tasks into interactive experiences that may increase curiosity, attention, and engagement.

A key part in this enhancement is incorporating gamification elements, including leaderboards, point systems, immediate feedback, and interactive competition (Cano et al., 2024). The leaderboard function incentivizes students to attain superior scores and fosters constructive competition among peers. Likewise, the point system offers instant rewards for accurate responses, thereby enhancing students' sense of accomplishment and desire to persist in learning activities (Craig & Kay, 2025; Mayor-Peña et al., 2024). Immediate feedback is crucial because it enables students to recognize errors quickly and improve their performance throughout the learning process (Aibar-Almazán et al., 2024; Liang, 2024).

The findings can be interpreted through Gamification Theory, which proposes that game-like elements incorporated into non-game environments can support motivation and engagement (Benitez-Correa et al., 2025). They can also be discussed in relation to Self-Determination Theory, which emphasizes autonomy, competence, and relatedness as important motivational needs (Shen et al., 2024; Walt & Bosch, 2025). Quizizz provides immediate feedback, performance information, and competitive features that may support these motivational processes. However, because the present study did not directly measure motivation with a separate validated scale,

these theoretical explanations should be regarded as plausible mechanisms rather than directly tested outcomes. The study's direct empirical finding is the improvement in learning outcome scores.

Comparison with Previous Studies

This study's results align with research on gamified learning environments and their effects on motivation, engagement, and learning. Prior studies indicate that integrating points, rankings, rewards, and other game elements into educational activities can enhance participation and engagement (Subiyantoro et al., 2024; Zha et al., 2025). The significant enhancement in posttest learning scores observed in the present study is consistent with this broader evidence base. Previous studies on digital assessment platforms have shown that tools such as Quizizz and Kahoot can support student engagement and academic achievement (Tabing et al., 2025). These platforms include interactive features such as immediate feedback and competitive components that can sustain attention during learning activities. The present findings corroborate this literature by demonstrating a statistically significant improvement in the measured learning outcome scores after Quizizz-based assessment.

Conversely, research indicates that the efficacy of gamification may vary according to instructional design, classroom environment, and students' digital proficiency (Liu et al., 2025). Some studies also suggest that motivational effects may decline over time because of novelty effects. The current study demonstrates that, even within a brief intervention period, gamified digital assessment can be associated with measurable improvement in learning scores (Ariffin et al., 2024; García-López et al., 2023; Kyung-Mi, 2023; Li et al., 2024). The findings contribute to the literature on technology-enhanced learning by providing empirical evidence of improved learning outcome scores following the use of a gamified digital assessment platform in a school context. The motivational literature remains relevant for interpreting why interactive features may support engagement, but the present study directly measures learning outcomes rather than motivation.

Pedagogical Implications

This study's findings have significant pedagogical implications for instructional methods, educational settings, and incorporating technology in classroom learning (Camacho & Alexander, 2025; Murcia et al., 2024; Pathan et al., 2024). The findings indicate that gamified digital platforms like Quizizz can serve as a successful novel evaluation tool for educators. In contrast to conventional assessment techniques, Quizizz enables educators to design interactive quizzes that offer immediate feedback and facilitate real-time performance monitoring (Moreira & Freire, 2024; Munirah & Sahriani, 2024). These qualities assist educators in assessing students' comprehension more effectively while concurrently enhancing students' enthusiasm to engage in learning activities. Gamification elements, such as leaderboards, points, and competitive challenges, can augment student engagement, rendering classroom learning more dynamic and fun.

Second, for educational institutions, effectively implementing Quizizz-based learning underscores the need to foster a digital learning environment. Educational institutions can promote the incorporation of digital platforms into teaching methodologies by ensuring sufficient technological infrastructure, including internet connectivity, digital devices, and professional development programs for educators (Al-Ali & Wardat, 2024; Brugliera, 2024; Köstler & Wolff, 2025). By advocating for educational technologies, schools can create more dynamic, student-centered learning environments that align with contemporary educational demands.

The findings also bear significance for the wider domain of educational technology. The findings underscore the efficacy of gamified learning platforms in augmenting students' interest and engagement in classroom activities (Ahmed et al., 2025; Narayanan & Kumaravel, 2024). Incorporating gamification into digital learning systems can boost engagement and improve the effectiveness in instructional strategies. Consequently, educators and educational technology developers should persist in investigating innovative gamified platforms to enhance learning experiences and cultivate more significant interactions between students and digital learning environments.

Limitations of the Study

This study offers useful insights into the efficacy of gamified digital assessment via Quizizz; however, several limitations must be acknowledged. The sample size was limited to 25 students from one class, which may reduce the generalizability of the findings. In addition, the study directly measured changes in learning outcome scores rather than learning motivation. Therefore, conclusions about motivational change should not be inferred from the pretest-posttest score data. The investigation was conducted in a single school, which may limit the generalizability of the findings. Educational settings, technology frameworks, and student attributes might differ markedly among schools and countries. Consequently, the findings may not fully reflect educational environments with different learning contexts or levels of technological preparedness.

This study utilized a pre-experimental research design using a one-group pretest–posttest model. Although this approach allows researchers to observe changes before and after the intervention, it lacks a control group for comparison. Consequently, external factors may have contributed to the observed improvement in students' learning scores. Experimental or quasi-experimental designs incorporating control groups would provide stronger evidence regarding the causal effect of gamified digital assessment on learning outcomes. Identifying these limitations is crucial for understanding the findings' scope and for directing future research to strengthen the evidence base for gamified learning interventions in educational contexts.

Recommendations for Future Research

Given the intuitive and visually engaging nature of Quizizz, future research should investigate its application across lower and upper elementary school classrooms. Examining age-appropriate gamification dynamics can help determine how digital formative assessments influence early foundational literacy, numeracy, and young learners' sustained attention. Future investigations should use true experimental or quasi-experimental frameworks with active control groups (e.g., comparing gamified digital assessments with conventional paper-based quizzes or non-gamified computer-based tests). This approach would isolate the specific pedagogical effects of gamified mechanics from general instructional practice and control for potential novelty effects over time.

While this study operationalized outcomes through achievement scores, future work should incorporate validated psychometric instruments, such as standardized scales for intrinsic motivation, academic self-regulation, or classroom anxiety, to empirically test the affective mechanisms underlying gamified learning. Subsequent studies should recruit larger, stratified cohorts spanning schools with differing levels of technological infrastructure and digital readiness. Longitudinal tracking over an entire semester or academic year would provide clearer evidence of whether the observed performance gains persist once the platform's initial novelty subsides.

CONCLUSION

This research examined the impact of gamified digital assessment via Quizizz on students' learning outcomes. The study aimed to determine whether incorporating gamification elements into a digital assessment platform could improve students' measured learning performance. The descriptive analysis revealed an increase in students' scores from the pretest to the posttest, with the mean rising from 27.8 to 76.6 and an average improvement of 48.8 points. Normality test results indicated that the data met the assumptions for the paired-sample t-test. The paired-sample t-test showed a statistically significant difference between pretest and posttest scores ($t = 13.654$, $p < 0.05$). These findings support the conclusion that Quizizz-based gamified digital assessment was associated with improved learning outcome scores among the participating students. The study does not directly establish a change in learning motivation because a separate motivation questionnaire was not reported.

This study contributes to the literature on technology-enhanced learning and gamification by providing empirical evidence of improved learning outcome scores after using Quizizz in a school context. The findings are theoretically consistent with gamification perspectives in which interactive and competitive elements may support engagement and motivation. However, these motivational processes were not directly measured in the present study. The results therefore underscore Quizizz's potential as a tool for interactive assessment and student-centered learning. In light of these findings, educators may consider integrating gamified digital technologies into instructional and assessment procedures to support engaging learning environments and improve formative learning performance. Educational institutions should facilitate such adoption by ensuring adequate technological infrastructure and providing professional development opportunities for educators. Future research is recommended to involve larger and more diverse samples, utilize more rigorous experimental designs, and explore additional variables such as student engagement, digital literacy, and AI-assisted learning further to understand the broader impact of gamified digital learning environments.

REFERENCES

Ahmed, H. M. M., El-Sabagh, H. A., & Elbourhamy, D. (2025). Effect of gamified, mobile, cloud-based learning management system (GMCLMS) on student engagement and achievement. *International Journal of Educational Technology in Higher Education*, *22*(1), 49. https://doi.org/10.1186/s41239-025-00541-1

Aibar-Almazán, A., Castellote-Caballero, Y., Carcelén-Fraile, M. del C., Rivas-Campo, Y., & González-Martín, A. M. (2024). Gamification in the classroom: Kahoot! As a tool for university teaching innovation. *Frontiers in Psychology*, *15,* 1370084. https://doi.org/10.3389/fpsyg.2024.1370084

Al-Ali, R., & Wardat, Y. (2024). Empowering education through digital transformation: Confronting educational wastage in basic education schools in Jordan. *International Journal of Innovative Research and Scientific Studies*, *7*(3), 1148–1162. https://doi.org/10.53894/ijirss.v7i3.3144

Ariffin, W. N. J. W., Chik, A., Rosli, R., & Halman, N. N. A. N. (2024). Examining the impact of gamification assessment on motivation and engagement in learning social science courses in higher education. *International Journal of Academic Research in Progressive*

Education and Development, *13*(3), 2888-2898. https://doi.org/10.6007/ijarped/v13-i3/22332

Bachiri, Y.-A., Mouncif, H., & Bouikhalene, B. (2023). Artificial intelligence empowers gamification: optimizing student engagement and learning outcomes in e-learning and MOOCs. *International Journal of Engineering Pedagogy (IJEP)*, *13*(8), 4–19. https://doi.org/10.3991/ijep.v13i8.40853

Bayrak, C., & Kaban, A. L. (2024). Understanding the adoption and usage of gamified web tools by K-12 teachers in Turkey: A structural equation model. *Education and Information Technologies*, *29,* 24759–24781. https://doi.org/10.1007/s10639-024-12825-6

Benitez-Correa, C., Quiñonez-Beltran, A., & Morocho-Cuenca, E. (2025). Implementation of gamification as an active methodology to enhance motivation and academic performance in EFL learners. *World Journal of English Language*, *16*(2), 203. https://doi.org/10.5430/wjel.v16n2p203

Brugliera, P. (2024). The Effectiveness of Digital Learning Platforms in Enhancing Student Engagement and Academic Performance. *Journal of Education Humanities and Social Research*, *1*(1), 26–36. https://doi.org/10.70088/xq3gy756

Camacho, Q., & Alexander, C. (2025). Socio-emotional competencies in primary school through a social constructivist approach. *Journal of Ecohumanism*, *4*(2), 224–234. https://doi.org/10.62754/joe.v4i2.5930

Cano, E. V., Bravo, C. B., Regaña, C. B., & Menéses, E. L. (2024). Exploring the role of interactive games in improving Spanish spelling skills: A mobile app study. *EDMETIC*, *14*(1), 4. https://doi.org/10.21071/edmetic.v14i1.17374

Çiğdem, H., Öztürk, M., Karabacak, Y., Atik, N., Gürkan, S., & Aldemir, M. H. (2024). Unlocking student engagement and achievement: The impact of leaderboard gamification in online formative assessment for engineering education. *Education and Information Technologies*, *29,* 24835–24860. https://doi.org/10.1007/s10639-024-12845-2

Craig, C. D., & Kay, R. (2025). Online student peer-assessment in higher education: A systematic review of the literature. *Journal of University Teaching and Learning Practice, 22(2),* 1-47. https://doi.org/10.53761/7jj6at39

Ganapathy, N. N. D. F., Ghazali, I. M., Hamid, M. H. A., Sulaiman, N., Bakar, N. S. A., & Rahmat, N. H. (2025). Exploring motivation and demotivation factors for learning. *International Journal of Research and Innovation in Social Science*, *9*(24), 1024–1039. https://doi.org/10.47772/ijriss.2025.924ileiid00115

García-López, I. M., Gonzaga, E. A., & Ledesma, E. F. R. (2023). Investigating the impact of gamification on student motivation, engagement, and performance. *Education Sciences*, *13*(8), 813. https://doi.org/10.3390/educsci13080813

Hong, Y., Saab, N., & Admiraal, W. (2024). Approaches and game elements used to tailor digital gamification for learning: A systematic literature review. *Computers & Education*, *212*, 105000. https://doi.org/10.1016/j.compedu.2024.105000

Köstler, V., & Wolff, M. (2025). Promoting digital competencies in pre-service teachers: the impact of integrative learning opportunities. *Education Sciences*, *15*(3), 337. https://doi.org/10.3390/educsci15030337

Kurt, E., & Dindar, A. Ç. (2024). Thinking through play: how designing educational games enhances critical thinking, motivation and achievement in science classes. *Instructional Technology and Lifelong Learning, 6*(1), 229-259. https://doi.org/10.52911/itall.1592036

Kurukaya, M. (2024). A brief review of the impact of some web 2.0 tools on language learners' motivation. *Journal of English Language, 2*(2), 131-143. https://izlik.org/JA42WK77SG

Kyung-Mi, O. (2023). Impact of quiz mode on students' learning achievement: A gamified e-quiz study. *International Journal of Emerging Technologies in Learning (IJET)*, *18*(12), 158–177. https://doi.org/10.3991/ijet.v18i12.34155

Li, L., Hew, K. F., & Du, J. (2024). Gamification enhances student intrinsic motivation, perceptions of autonomy and relatedness, but minimal impact on competency: a meta-analysis and systematic review. *Educational Technology Research and Development*, *72*(2), 765–796. https://doi.org/10.1007/s11423-023-10337-7

Li, M., Ma, S., & Shi, Y. (2023). Examining the effectiveness of gamification as a tool promoting teaching and learning in educational settings: a meta-analysis. *Frontiers in Psychology*, *14*. 1253549. https://doi.org/10.3389/fpsyg.2023.1253549

Li, Y., Chen, D., & Deng, X. (2024). The impact of digital educational games on student's motivation for learning: The mediating effect of learning engagement and the moderating effect of the digital environment. *PLoS ONE*, *19*(1), e0294350. https://doi.org/10.1371/journal.pone.0294350

Liang, Z. (2024). More haste, less speed? Relationship between response time and response accuracy in gamified online quizzes in an undergraduate engineering course. *Frontiers in Education*, *9*, 1412954. https://doi.org/10.3389/feduc.2024.1412954

Liu, P.-L., Chen, C.-J., & Huang, C.-Y. (2025). Evaluating the effectiveness of Quizizz for enhancing English vocabulary acquisition and engagement among rural elementary students. *Sage Open*, *15*(4), 1-15. https://doi.org/10.1177/21582440251379697

Luo, Z. (2024). Factors contributing to teachers' acceptance intention to gamified EFL tools: a scale development study. *Educational Technology Research and Development*, *72*(2), 447–477. https://doi.org/10.1007/s11423-023-10249-6

Maraza-Quispe, B. (2024). Impact of the use of gamified online tools: a study with Kahoot and quizizz in the educational context. *International Journal of Information and Education Technology*, *14*(1), 132–140. https://doi.org/10.18178/ijiet.2024.14.1.2033

Mayor-Peña, F. C. Y., Barrera-Animas, A. Y., Escobar-Castillejos, D., Noguez, J., & Escobar-Castillejos, D. (2024). Designing a gamified approach for digital design education aligned with Education 4.0. *Frontiers in Education*, *9*, 1439879. https://doi.org/10.3389/feduc.2024.1439879

Moreira, H., & Freire, M. L. L. (2024). Promoting formative assessment with Quizizz: A classroom action research study. *Ciencia Latina Revista Científica Multidisciplinar*, *8*(2), 590–604. https://doi.org/10.37811/cl_rcm.v8i2.10511

Munirah, M., & Sahriani, S. (2024). Transformation of student motivation through the use of Quizizz in language learning: A longitudinal approach in secondary education. *International Journal For Multidisciplinary Research*, *6*(6), 1-8. https://doi.org/10.36948/ijfmr.2024.v06i06.30354

Murcia, J. A. M., Hernández, E. H., León, J., Fin, G., Júnior, R. J. N., Valenzuela, A. V., Rodríguez, J. L. T., Gastélum-Cuadras, G., Enríquez, M. del C. Z., Vitoria, R. V., Cid, L., Monteiro, D., & Teixeira, D. (2024). Motivation to learn: an international multilevel study on student autonomy and teacher emphasis on content usefulness. *Anales de Psicología*, *40*(2), 265–271. https://doi.org/10.6018/analesps.571161

Narayanan, K. S., & Kumaravel, A. (2024). Hybrid gamification and AI tutoring framework using machine learning and adaptive neuro-fuzzy inference system. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, *42*(2), 221–233. https://doi.org/10.37934/araset.42.2.221233

Nordin, N. A., Noh, K. S. S. K. M., Wardati, A., Zawawi, S. A., Karoman, N. F. A., Mustapha, H. M., & Kamaruzaman, N. (2025). Academic achievement, enthusiasm and attitude of high school students regarding Quizizz as an educational gamification tool for physics. *International Journal of Research and Innovation in Social Science*, *9*(26), 8778–8799. https://doi.org/10.47772/ijriss.2025.903sedu0664

Pathan, H., Moskvitcheva, S., Khatoon, S., & Aleksandrova, O. I. (2024). The relationship between teachers' motivation, professional development, and mobile technology integration in language learning. *International Journal of Interactive Mobile Technologies (IJIM)*, *18*(9), 50–60. https://doi.org/10.3991/ijim.v18i09.48865

Patras, Y. E., Japar, M., Rahmawati, Y., & Hidayat, R. (2025). Integration of culturally responsive teaching approach, local wisdom, and gamification in Pancasila education to develop students' multicultural competence. *Educational Process International Journal*, *14*(1), e2025045. https://doi.org/10.22521/edupij.2025.14.45

Rogelj, B., Planinc, T. R., Repe, B., & Klun, M. I. (2024). Education for sustainable mobility in Slovenia: Using gamification to influence the travel habits of children. *European Journal of Geography*, *15*(2), 81–93. https://doi.org/10.48088/ejg.b.rog.15.2.081.093

Rosati, R., Regini, L., Pauls, A., Strafella, E., Raffaelli, F., & Frontoni, E. (2024). Gamification in nutrition education: the impact and the acceptance of digital game-based intervention for improving nutritional habits. *Journal of Computers in Education*, *12,* 367–390. https://doi.org/10.1007/s40692-024-00314-1

Sanulita, H., Hendriyanto, D., Lestari, N. C., Ramli, A., & Arifudin, O. (2024). Analysis of the effectiveness of audio visual learning media based on Macromedia Flash usage on school program of increasing student learning motivation. *Journal on Education*, *6*(2), 12641–12650. https://doi.org/10.31004/joe.v6i2.5121

Shen, Z., Lai, M., & Wang, F. (2024). Investigating the influence of gamification on motivation and learning outcomes in online language learning. *Frontiers in Psychology*, *15,* 1295709. https://doi.org/10.3389/fpsyg.2024.1295709

Sitompul, H., Sayekti, R., Saragih, S. R. D., & Salminawati, S. (2024). Exploring Students' perception of quizizz as a learning media in higher education. *Canadian Journal of Learning and Technology*, *49*(3), 1–24. https://doi.org/10.21432/cjlt28449

Subiyantoro, S., Degeng, I. N. S., Kuswandi, D., & Ulfa, S. (2024). Developing gamified learning management systems to increase student engagement in online learning environments. *International Journal of Information and Education Technology*, *14*(1), 26–33. https://doi.org/10.18178/ijiet.2024.14.1.2020

Tabing, J. G., Terco, R. A. G., & Tubola, C. J. S. (2025). Fun with Quizizz: Gamified formative assessment utilizing integer operation drills to build mastery in polynomial operations. *International Journal of Research and Innovation in Social Science*, 7188–7201. https://doi.org/10.47772/ijriss.2025.903sedu0534

Ukgoda, H. (2025). Gamification in education: Its impact on engagement, motivation, and learning outcomes. *Journal of Educational Technology Development and Exchange*, *18*(3), 41–66. https://doi.org/10.18785/jetde.1803.03

Velu, S. R., Wahid, I. S., & Tabianan, K. (2025). Stimulating innovative learning practices with tech: artefacts influence learners' actions. *Journal of Innovation and Entrepreneurship*, *14*(1), 60. https://doi.org/10.1186/s13731-025-00523-7

Walt, L. van der, & Bosch, C. (2025). Co-creating OERs in computer science education to foster intrinsic motivation. *Education Sciences*, *15*(7), 785. https://doi.org/10.3390/educsci15070785

Zainudin, Z. A., & Zulkiply, N. (2023). Gamification in learning: Students' motivation and cognitive engagement in learning business using Quizizz. *Asian Journal of University Education*, *19*(4), 823–833. https://doi.org/10.24191/ajue.v19i4.24928

Zha, S., Tang, Y., Gong, J., & Xu, Y. (2025). COLP: Scaffolding children's online long-term collaborative learning. *International Journal of Human-Computer Interaction, 41*(24), 15453–15475. https://doi.org/10.1080/10447318.2025.2498492

Zhang, Z., & Huang, X. (2024). Exploring the impact of the adaptive gamified assessment on learners in blended learning. *Education and Information Technologies*, *29*(16), 21869–21889. https://doi.org/10.1007/s10639-024-12708-w