



Enhancing Students' Vocabulary Mastery through Kahoot-Based Formative Assessment

Zahratul Fikni^{1*}, Baiq Almalia Lestari¹, M. Junaidi Marzuki¹, Laila Wati¹

¹ Program Studi Pendidikan Bahasa Inggris, Universitas Hamzanwadi, Indonesia

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Correspondence:

Zahratul Fikni

Phone: +6287761736548

Abstract: This study aimed to determine the effect of Kahoot-based formative assessment on students' vocabulary mastery and to describe the relationship between students' Kahoot scores and their post-test results. This study examined the effect of Kahoot-based formative assessment on tenth-grade students' vocabulary mastery at MA NW Kotaraja in the academic year 2025/2026. This studies examine whether the use of Kahoot-based formative assessment significantly improved students' vocabulary mastery, and how students' Kahoot scores related to their post-test results. This study used a pre-experimental design with a one-group pre-test post-test approach. The sample consisted of 22 students selected through purposive sampling from a total population of 92 tenth-grade students. Data were collected through a pre-test, five Kahoot-based formative assessment sessions covering 50 daily activities vocabulary items, a post-test, and brief interviews with six selected students. The pre-test and post-test each consisted of 50 multiple-choice items with a maximum score of 100. Data were analyzed using the Shapiro-Wilk normality test, the Wilcoxon Signed-Rank Test, effect size calculation, and descriptive comparison. Results showed statistically significant improvement in vocabulary mastery with $p = 0.028$ and effect size $r = 0.47$, indicating a medium effect. The mean score increased from 60.45 to 77.64. Descriptively, 81.8% of students with high Kahoot scores achieved good or very good post-test results. These findings confirm that Kahoot-based formative assessment effectively enhances EFL students' vocabulary mastery.

Keywords: Vocabulary Mastery; Kahoot; Formative Assessment; EFL; Gamification

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Introduction

Vocabulary mastery is an urgent component in learning English as a Foreign Language (EFL). Nation (2022) states that students who lack vocabulary knowledge struggle to understand texts, express ideas, and communicate, because vocabulary directly affects their ability to produce language. In Indonesia, where English is a foreign language and students do not speak it daily, vocabulary acquisition becomes a key determinant of language proficiency (Sari et al., 2023).

[Baru] Preliminary observation at MA NW Kotaraja revealed that tenth-grade students showed passive behavior when asked to use newly learned

vocabulary in sentences. Students frequently forgot vocabulary items shortly after they were taught, indicating weak retention. Classroom observation also showed that the teacher relied on conventional teaching methods, particularly memorization drills, without variation in learning activities. This condition reflects the broader challenges reported in EFL vocabulary instruction, where conventional teaching methods often fail to sustain long-term retention (Rahman & Angraeni, 2024).

Many EFL students continue to face difficulties in expanding their vocabulary. These challenges include limited retention, a lack of contextual understanding,

and low motivation to learn new words. Studies show that students often forget newly learned vocabulary due to insufficient practice and meaningful engagement (Rahman & Angraeni, 2024). Students also tend to rely on rote memorization without understanding word usage, which leads to poor long-term retention.

One major contributing factor is the continued use of traditional teaching methods such as rote memorization and teacher-centered instruction. These approaches fail to engage students actively and produce passive learning environments. Traditional assessment methods also emphasize summative evaluation over continuous feedback, limiting opportunities for students to improve during instruction (Putri & Refnaldi, 2021).

Formative assessment addresses these problems. It involves continuous assessment throughout the learning process and provides immediate feedback that helps students identify strengths and weaknesses (Black & Wiliam, 2018). Wiliam (2018) defines formative assessment as any activity that generates feedback used by both teachers and students to modify teaching and learning. Andrade and Brookhart (2020) describe it as a continuous cycle of feedback, self-assessment, and instructional adjustment. Integrating formative assessment into vocabulary instruction allows repeated practice and supports retention.

[Baru] Kahoot is a game-based digital learning platform developed in Norway in 2013 that has become one of the most widely adopted educational technology tools worldwide (Wang & Tahir, 2020). The platform allows teachers to create interactive multiple-choice quizzes accessed through students' personal devices using a unique game PIN. During each session, questions appear on a shared screen while students respond individually within a fixed time limit. According to Deterding et al. (2017), Kahoot incorporates core gamification elements such as points, leaderboards, and time-based challenges that influence behavior and increase engagement. Kahoot automatically records each student's score, response accuracy, and response time after every session, producing quantitative data that teachers can use to monitor learning progress (Jiang et al., 2022).

[Baru] Kahoot connects directly to the principles of formative assessment. Its immediate feedback mechanism, delivered right after each question, mirrors the core function of formative assessment described by Wiliam (2018), namely generating feedback that both teachers and students use to adjust learning in real time. While conventional formative assessment relies on manual observation or periodic quizzes, Kahoot automates this process by scoring responses instantly and displaying results through a live leaderboard. This automation allows teachers to identify students' strengths and weaknesses within the same session,

rather than after a delay, positioning Kahoot as a technology-enhanced form of formative assessment rather than a separate instructional tool (Nicol, 2021).

Technology has significantly expanded formative assessment practice. UNESCO (2022) reported that digital learning technology use rose over 70% globally following the COVID-19 pandemic. Sailer et al. (2021) confirm that gamified assessment tools significantly improve learning outcomes by increasing students' intrinsic motivation. Hamari et al. (2018) found that gamification positively affects motivation and engagement when game elements are meaningfully integrated into learning activities.

According to Deterding et al. (2017), gamification uses game elements such as points, badges, leaderboards, and challenges to influence behavior and increase engagement. Sailer et al. (2021) confirm that gamified assessment tools significantly improve learning outcomes by increasing students' intrinsic motivation. Hamari et al. (2018) found that gamification positively affects motivation and engagement when game elements are meaningfully integrated into learning activities.

Despite growing adoption of Kahoot in EFL classrooms, existing research reveals three specific gaps. First, most studies measure student motivation and engagement rather than measurable vocabulary learning outcomes (Licorish et al., 2018; Wang & Tahir, 2020). Second, few studies isolate vocabulary mastery as the primary dependent variable, with most treating language skills broadly rather than examining vocabulary specifically (Rahman & Angraeni, 2024). Third, no identified study has combined a controlled pre-test post-test measurement of vocabulary mastery with a descriptive analysis of the relationship between Kahoot performance and post-test outcomes at the senior high school EFL level in Indonesia. This study addresses these three gaps directly, positioning its novelty in the specific combination of vocabulary-focused measurement and descriptive score-outcome comparison within an under-researched EFL context.

This study is grounded in three theoretical foundations: Formative Assessment Theory (Yang et al., 2025), Gamification Theory (Saleem et al., 2022), and Data-Driven Instruction (Jiang et al., 2022). Two research questions guided the study: (1) Does the use of Kahoot-based formative assessment significantly improve students' vocabulary mastery? (2) How do students' Kahoot scores relate to their post-test results?

Method

Research Design

This study used a quantitative pre-experimental design with a one-group pre-test post-test approach. This design measures score differences before and after

treatment within a single group without a control group (Fraenkel et al., 2019). According to Ary et al. (2021), pre-experimental designs are useful in preliminary investigations to determine the potential impact of a treatment. The research design is illustrated in Table 1.

Table 1. One-Group Pre-test and Post-test Design

Pre-test	Treatment	Post-test
Y1	X	Y2

Note: Y1 = Pre-test; X = Treatment (Kahoot-based formative assessment); Y2 = Post-test

Setting

This study was conducted at MA NW Kotaraja during the academic year 2025/2026 in a tenth-grade EFL classroom. The instructional focus was on the topic of Daily Activities, consisting of 50 target vocabulary items divided into five units of ten words each.

Participants

The population consisted of 92 tenth-grade students across three classes. The sample comprised 22 students selected through purposive sampling (Creswell, 2018) based on the criterion of participating in at least four of the five Kahoot treatment sessions. Of the 30 students in the selected class, eight were excluded: six attended no Kahoot sessions and two attended only one session. These students were excluded because their level of treatment exposure was insufficient to measure the effect of Kahoot-based formative assessment meaningfully.

Instruments

Two instruments were used. The vocabulary test consisted of 50 multiple-choice items based on daily activities vocabulary distributed across five units. Each correct answer carried 2 points (maximum score: 100). Both the pre-test and post-test used the same item structure. The post-test used modified sentence subjects and repositioned answer choices to reduce memorization effects. Each item presents an incomplete sentence requiring students to select the correct vocabulary item from four choices (A, B, C, D). This format measures students' ability to recognize and apply target vocabulary within contextual sentences.

The Kahoot quiz comprised 10 questions per session across five sessions, each aligned with the vocabulary unit taught in that session. Kahoot automatically recorded individual student scores, accuracy percentages, and response times after each session. Table 2 shows the instrument blueprint.

Table 2. Instrument Blueprint

Vocabulary Unit	Focus	Item Type	Items
Unit 1	Morning routine activities	Sentence-based multiple choice	10
Unit 2	Classroom and study activities	Sentence-based multiple choice	10
Unit 3	Leisure and household activities	Sentence-based multiple choice	10
Unit 4	Social and rest activities	Sentence-based multiple choice	10
Unit 5	Transitional and cognitive verbs	Sentence-based multiple choice	10
Total			50

Procedure

The study ran across seven meetings from May 12 to May 21, 2026. Meeting 1 administered the pre-test. Meetings 2 to 6 consisted of treatment sessions. Each session followed a three-stage procedure.

In the opening stage, the teacher greeted students, checked attendance, and communicated learning objectives. In the main activity stage, the teacher introduced ten target vocabulary items using slides and pronunciation practice, followed by a matching activity and sentence construction task in pairs. After vocabulary introduction, the teacher launched a Kahoot quiz of ten questions. Students accessed the quiz using personal devices via a game PIN displayed on the classroom screen. Immediate feedback appeared after each question, and the teacher reviewed common errors using the live leaderboard. In the closing stage, students reflected on their performance and the teacher summarized the lesson. Meeting 7 administered the post-test. Table 3 presents the full implementation timeline.

Table 3. Research Implementation Timeline

Meeting	Activity	Date	Time
1	Pre-test	May 12, 2026	Regular class period
2	Treatment – Unit 1 + Kahoot Session 1	May 13, 2026	07.15–08.15
3	Treatment – Unit 2 + Kahoot Session 2	May 13, 2026	08.20–09.20
4	Treatment – Unit 3 + Kahoot Session 3	May 20, 2026	07.15–08.15
5	Treatment – Unit 4 + Kahoot Session 4	May 20, 2026	08.20–09.20
6	Treatment – Unit 5 + Kahoot Session 5	May 21, 2026	Regular class period
7	Post-test	May 21, 2026	Following Session 5
8	Supplementary Interview	June 10, 2026	07.15–07.55

Table 4 shows the vocabulary focus per Kahoot session.

Table 4. Vocabulary Focus per Kahoot Session

Session	Date	Vocabulary Focus
1	May 13, 2026	Awaken, get out of bed, take a quick shower, maintain oral hygiene, get properly dressed, have a proper breakfast, commute to school, participate in class, pay attention to the teacher, take detailed notes
2	May 13, 2026	Raise questions, respond to questions, review lessons, read extensively, compose a text, complete assignments, have a meal, have light snacks, stay hydrated, take a short break
3	May 20, 2026	Unwind, use a mobile device, watch television programs, engage in games, work out, jog, take a walk, assist parents, tidy up the room, do the dishes
4	May 20, 2026	Prepare meals, spend time outside, socialize with friends, have a conversation, express amusement, take a rest, take a short nap, listen to music attentively, return home, arrive at a place
5	May 21, 2026	Leave a place, make preparations, begin an activity, complete a task, carry on, put an end to, repeat, keep in mind, fail to remember, go to bed

Data Analysis

Data analysis proceeded in three stages using IBM SPSS Statistics. First, descriptive statistics (mean, median, standard deviation, minimum, maximum) were calculated for pre-test scores, Kahoot scores, and post-test scores. Second, a Shapiro-Wilk normality test assessed data distribution. Because post-test data were not normally distributed, the Wilcoxon Signed-Rank Test replaced the planned paired sample t-test (Field, 2020). Effect size was calculated using the r formula for Wilcoxon: $r = |Z| / \sqrt{N}$. Third, a descriptive comparison between students' average Kahoot scores and post-test results identified performance patterns. Table 5 summarizes all procedures.

Table 5. Summary of Data Analysis

Stage	Analysis	Purpose	Software
Prerequisite	Shapiro-Wilk Test	Test data normality	IBM SPSS
Descriptive	Descriptive Statistics	Summarize data (mean, SD, min, max)	IBM SPSS

Inferential	Wilcoxon Signed-Rank Test	Measure pre-test vs post-test difference	IBM SPSS
Inferential	Effect Size (r)	Measure practical significance of treatment	Manual
Descriptive	Kahoot vs Post-test Comparison	Describe relationship between Kahoot scores and post-test results	Manual

Result and Discussion

Pre-test Results

The pre-test was administered on May 12, 2026, to measure students' initial vocabulary mastery before any treatment. Students completed 50 multiple-choice items covering all 50 daily activities vocabulary items. No instruction was provided prior to the test.

Results showed considerable variation. The highest score was 100 and the lowest was 6, with a mean of 60.45 and standard deviation of 31.52. The grading criteria used to interpret scores are: Very Good (85–100), Good (75–84), Fair (60–74), and Poor (below 60). Table 6 presents the distribution.

Table 6. Distribution of Pre-test Scores

Category	Score Range	N	%
Very Good	85–100	6	27.3%
Good	75–84	2	9.1%
Fair	60–74	2	9.1%
Poor	Below 60	12	54.5%
Total		22	100%

More than half of the students (54.5%) fell in the Poor category before treatment, suggesting limited initial mastery of the target vocabulary. Only 6 students (27.3%) achieved Very Good scores, indicating that a small portion of the class had strong vocabulary knowledge prior to the study.

Treatment

Treatment was conducted across five Kahoot sessions from May 13 to May 21, 2026. Each session followed the three-stage procedure described in the Method section. Students engaged actively during each session. Immediate post-question feedback allowed students to review errors in real time. The teacher addressed common mistakes using the live leaderboard after each question.

Post-test Results

The post-test was administered on May 21, 2026, immediately following Session 5. It used the same format as the pre-test with modified sentence subjects and repositioned answer choices to reduce memorization effects. Results showed improvement. The highest score was 100 and the lowest was 20, with a mean of 77.64 and standard deviation of 25.27. Table 7 presents the distribution.

Table 7. Distribution of Post-test Scores

Category	Score Range	N	%
Very Good	85–100	12	54.5%
Good	75–84	5	22.7%
Fair	60–74	1	4.5%
Poor	Below 60	4	18.2%
Total		22	100%

The proportion of students in the Very Good category increased from 27.3% to 54.5%. Students in the Poor category decreased from 54.5% to 18.2%. This initial comparison indicates a positive effect of the treatment on the majority of students.

Descriptive Statistics

Table 8. Descriptive Statistics of Pre-test, Kahoot Scores, and Post-test

	Pre-test	Avg. Kahoot Score	Post-test
Mean	60.45	7643.79	77.64
Median	64.00	8019.10	86.00
Std. Deviation	31.52	1267.33	25.27
Minimum	6.00	5195.80	20.00
Maximum	100.00	9415.80	100.00
N	22	22	22

The pre-test mean was 60.45 (SD = 31.52), indicating considerable variation in students' initial vocabulary knowledge. Following five Kahoot treatment sessions, the post-test mean rose to 77.64 (SD = 25.27), representing an improvement of 17.18 points. The standard deviation decreased from 31.52 to 25.27, indicating that scores became more clustered after treatment. Of the 22 students, 13 showed improvement, 7 recorded lower scores, and 2 showed no change. The average Kahoot score across five sessions was 7643.79 out of a maximum possible score of approximately 9800, indicating moderately high engagement during the formative assessment sessions.

Normality Test (Shapiro-Wilk)

Before conducting inferential analysis, a Shapiro-Wilk normality test was performed on pre-test and post-

test scores to determine the appropriate statistical test. Table 9 presents the results.

Table 9. Shapiro-Wilk Normality Test Results

Variable	W Statistic	p-value	Distribution
Pre-test	0.9141	0.0575	Normal
Post-test	0.7421	0.0001	Not Normal

Pre-test data were normally distributed ($W = 0.9141$, $p = 0.0575 > 0.05$). Post-test data were not normally distributed ($W = 0.7421$, $p = 0.0001 < 0.05$). Because normality was violated for post-test scores, the parametric paired sample t-test was not appropriate. The Wilcoxon Signed-Rank Test was applied as the non-parametric alternative, consistent with the decision criteria in the research methodology (Field, 2020).

Hypothesis Testing

The Wilcoxon Signed-Rank Test determined whether a significant difference existed between students' pre-test and post-test vocabulary scores. Table 10 presents the results.

Table 10. Wilcoxon Signed-Rank Test Results

	Result
Test Statistic (W)	46.000
p-value	0.028
Mean Pre-test	60.45
Mean Post-test	77.64
Mean Difference	+17.18
Negative Ranks (Post < Pre)	7
Positive Ranks (Post > Pre)	13
Ties (Post = Pre)	2
Decision	H_1 Accepted

The Wilcoxon Signed-Rank Test produced $W = 46.000$ with $p = 0.028$. Since $p = 0.028 < 0.05$, the null hypothesis was rejected and the alternative hypothesis was accepted. Kahoot-based formative assessment significantly improved students' vocabulary mastery.

Effect Size

Table 11. Effect Size of Treatment

	Result
Effect Size (r)	0.4699
Interpretation	Medium Effect (approaching large)

The effect size $r = 0.4699$ indicates a medium effect approaching the threshold for large ($r \geq 0.50$). This confirms that Kahoot-based formative assessment had a

practically meaningful impact on students' vocabulary improvement, not merely a statistically detectable one.

Kahoot Scores and Post-test Results

To answer the second research question, this study compared each student's average Kahoot score

across five sessions with their post-test result. Students were grouped into three categories: High (average Kahoot score above 8000), Moderate (6000 to 7999), and Low (below 6000). Table 12 presents the full comparison.

Table 12. Comparison of Average Kahoot Scores and Post-test Results

Student	Pre-test	Avg. Kahoot	Kahoot Category	Post-test	Post-test Category
S5	96	9193.2	High	96	Very Good
S6	58	9415.8	High	92	Very Good
S7	80	8581.0	High	100	Very Good
S13	12	8440.8	High	88	Very Good
S22	94	8470.6	High	86	Very Good
S24	6	9378.6	High	96	Very Good
S28	98	8806.0	High	94	Very Good
S29	96	8586.2	High	96	Very Good
S21	70	8262.6	High	84	Good
S11	22	8408.8	High	68	Fair
S20	18	8419.6	High	28	Poor
S4	30	6594.4	Moderate	88	Very Good
S10	90	7137.2	Moderate	86	Very Good
S27	100	7536.0	Moderate	94	Very Good
S14	94	6344.6	Moderate	82	Good
S25	76	6235.6	Moderate	80	Good
S26	58	6797.8	Moderate	84	Good
S1	38	7775.6	Moderate	40	Poor
S23	52	6002.0	Moderate	24	Poor
S2	28	7014.6	Moderate	20	Poor
S15	44	5566.6	Low	82	Good
S16	70	5195.8	Low	100	Very Good

Table 13. Summary of Kahoot Category and Post-test Outcomes

Kahoot Category	N	Post-test Good/Very Good	%
High (above 8000)	11	9	81.8%
Moderate (6000–7999)	9	6	66.7%
Low (below 6000)	2	2	100%
Total	22	17	77.3%

Table 13 shows that 77.3% of students across all Kahoot categories achieved Good or Very Good post-test results. Among students in the High Kahoot category, 81.8% achieved strong post-test outcomes. Among Moderate Kahoot students, 66.7% performed

well. Both students in the Low Kahoot category achieved Good or Very Good post-test results. This discussion addresses the two research questions stated in the statement of the problem.

The Effect of Kahoot-Based Formative Assessment on Vocabulary Mastery

The findings confirm that Kahoot-based formative assessment significantly improved students' vocabulary mastery. The Wilcoxon Signed-Rank Test produced $p = 0.028$, confirming a statistically significant difference between pre-test and post-test scores. The mean increased from 60.45 to 77.64, a gain of 17.18 points. The alternative hypothesis was accepted. This finding is consistent with Wiliam (2018), who argues that formative assessment strengthens learning through continuous feedback that helps students identify and

correct errors. Each Kahoot session delivered immediate feedback after every question, allowing students to recognize incorrect responses and reinforce correct understanding in real time. This aligns with Hattie and Timperley (2017), who state that feedback produces the greatest learning impact when it is timely, specific, and actionable.

Gamification elements embedded in Kahoot also contributed to this outcome. Saleem et al. (2022) note that gamified learning environments increase motivation and engagement, both critical to vocabulary retention. The competitive scoring system, live leaderboard, and time-limited responses created a stimulating environment that encouraged active participation. Wang and Tahir (2020) found similar results, reporting that Kahoot significantly improved student engagement and academic performance. Tan et al. (2021) confirmed that gamified tools improve student motivation in classroom settings.

The effect size $r = 0.4699$ indicates a medium practical effect approaching large, confirming that the improvement was not only statistically significant but also practically meaningful. Kahoot-based formative assessment has genuine potential as a vocabulary instruction tool in EFL classrooms, not merely as a motivational tool.

The Relationship Between Kahoot Scores and Post-test Results

The descriptive comparison revealed a general positive tendency between Kahoot performance and post-test outcomes. Among High Kahoot category students, 81.8% achieved Good or Very Good post-test results. This general positive pattern supports Nicol (2021), who argues that continuous digital performance monitoring correlates with eventual learning outcomes.

However, notable exceptions exist. Students S20 and S1 recorded high and moderate Kahoot scores respectively yet achieved post-test scores of only 28 and 40. When interviewed, both acknowledged relying more on guessing than genuine understanding during Kahoot sessions. They described the experience as highly enjoyable due to the excitement of pressing buttons quickly. However, when facing the written post-test without time pressure or immediate scoring, both reported feeling bored and wanting to finish quickly. Neither reviewed vocabulary independently after sessions. These responses indicate that for some learners, Kahoot's fast-paced competitive nature may encourage surface-level engagement rather than deep processing of vocabulary meaning. This is consistent with Licorish et al. (2018), who note that Kahoot scores are partly influenced by response speed rather than genuine understanding. Students S15 and S16 recorded the lowest average Kahoot scores yet achieved post-test

results of 82 and 100. Both reported frustration during Kahoot sessions due to the noisy classroom atmosphere and anxiety from watching their scores drop on the leaderboard. In contrast, both found the post-test environment more conducive to focus, citing the absence of time pressure and public scoring. Crucially, both reviewed vocabulary independently after each session. This combination of a quieter assessment environment and self-directed study appears to have enabled them to demonstrate vocabulary mastery more accurately. This finding supports Panadero, Andrade, and Brookhart (2018), who argue that formative assessment promotes self-regulated learning.

Students S5 and S7, who achieved both high Kahoot scores and high post-test results, described Kahoot as highly engaging. Both attributed their post-test performance directly to repeated vocabulary practice during Kahoot sessions, stating that the game prepared them to recognize and select correct answers in the written format. Their responses indicate that when students engage genuinely with vocabulary content during sessions, the formative and competitive elements of Kahoot produce lasting retention.

These interview findings reveal that the relationship between Kahoot performance and post-test outcomes is shaped by the quality of engagement during sessions, individual responses to competitive environments, and study habits outside the classroom. Students who used Kahoot as a genuine vocabulary practice tool and reviewed material independently tended to perform well in the post-test regardless of their in-game scores. These findings carry practical implications for EFL teachers. Educators should combine Kahoot with explicit reminders for students to review vocabulary after each session. Teachers should also be aware that some students perform better in low-pressure assessment environments, and supplementary strategies may be needed to capture a more complete picture of individual vocabulary mastery.

Conclusion

This study confirms that Kahoot-based formative assessment significantly improved tenth-grade EFL students' vocabulary mastery at MA NW Kotaraja. The Wilcoxon Signed-Rank Test produced $p = 0.028$ with effect size $r = 0.47$, confirming both statistical and practical significance. The mean score rose from 60.45 to 77.64. The proportion of Very Good students increased from 27.3% to 54.5%, while the Poor category decreased from 54.5% to 18.2%.

Regarding the second research question, 81.8% of students with high Kahoot scores achieved Good or Very Good post-test results. Interview data reveal that engagement quality and independent study habits mediated this relationship more than Kahoot scores

alone. Students who guessed during Kahoot sessions and did not review vocabulary independently showed poor post-test performance despite moderate or high Kahoot scores. Students who engaged genuinely and reviewed independently demonstrated strong post-test outcomes.

Based on these findings, both research questions have been answered. The first research question showed that Kahoot-based formative assessment significantly improved students' vocabulary mastery, confirmed by $p = 0.028$ and a mean score increase from 60.45 to 77.64. The second research question showed a general positive relationship between students' Kahoot scores and post-test results, where 81.8% of students with high Kahoot scores achieved Good or Very Good post-test outcomes. These results confirm that Kahoot-based formative assessment served as an effective tool for enhancing vocabulary mastery among tenth-grade EFL students at MA NW Kotaraja.

Teachers should integrate Kahoot as a regular formative assessment tool and encourage students to review vocabulary independently after each session. Future research should use quasi-experimental designs with control groups, involve larger samples from multiple schools, and incorporate qualitative instruments from the outset to explain individual variation in learning outcomes.

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References

- Alawadhi, A., & Abu-Ayyash, E. A. S. (2021). Students' perceptions of Kahoot!: An exploratory mixed-method study in EFL undergraduate Saudi Arabian university context. *Education and Information Technologies*, 26(3), 3181-3214. doi:https://doi.org/10.1007/s10639-020-10425-8
- Andrade, H., & Brookhart, S. M. (2020). Classroom assessment as the co-regulation of learning. *Assessment in Education: Principles, Policy and Practice*, 27(4), 350-372. doi:https://doi.org/10.1080/0969594X.2019.1571992
- Ary, D., Jacobs, L. C., Irvine, C. K. S., & Walker, D. (2021). *Introduction to research in education* (10th ed.). Boston, USA: Cengage Learning.
- Bai, S., Hew, K. F., & Huang, B. (2022). Does gamification improve student learning outcome? *Educational Research Review*, 35, 100431. doi:https://doi.org/10.1016/j.edurev.2022.100431
- Black, P., & Wiliam, D. (2018). Classroom assessment and pedagogy. *Assessment in Education: Principles, Policy and Practice*, 25(6), 551-575. doi:https://doi.org/10.1080/0969594X.2018.1441807
- Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches* (6th ed.). Thousand Oaks, USA: SAGE Publications.
- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2017). From game design elements to gamefulness: Defining gamification. *Proceedings of the 15th International Academic MindTrek Conference*, 9-15. doi:https://doi.org/10.1145/2181037.2181040
- Field, A. (2020). *Discovering statistics using IBM SPSS statistics* (5th ed.). Thousand Oaks, USA: SAGE Publications.
- Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2019). *How to design and evaluate research in education* (10th ed.). New York, USA: McGraw-Hill.
- Goksun, D. O., & Gursoy, G. (2019). Comparing success and engagement in gamified learning experiences via Kahoot and Quizizz. *Computers and Education*, 135, 103-119. doi:https://doi.org/10.1016/j.compedu.2019.03.022
- Hamari, J., Koivisto, J., & Sarsa, H. (2018). Does gamification work? A literature review of empirical studies on gamification. *Proceedings of the 47th Hawaii International Conference on System Sciences*, 3025-3034. doi:https://doi.org/10.1109/HICSS.2014.377
- Hattie, J., & Timperley, H. (2017). The power of feedback. *Review of Educational Research*, 77(1), 81-112. doi:https://doi.org/10.3102/003465430298487
- Ismail, M. A. A., & Mohammad, J. A. M. (2017). Kahoot: A promising tool for formative assessment in medical education. *Education in Medicine Journal*, 9(2), 19-26. doi:https://doi.org/10.21315/eimj2017.9.2.2
- Jiang, B., Li, X., Yang, S., Kong, Y., Cheng, W., Hao, C., & Lin, Q. (2022). Data-driven personalized learning path planning based on cognitive diagnostic assessments in MOOCs. *Applied*

- Sciences, 12(8), 3982.
doi:https://doi.org/10.3390/app12083982
- Licorish, S. A., Owen, H. E., Daniel, B., & George, J. L. (2018). Students' perception of Kahoot!'s influence on teaching and learning. *Research and Practice in Technology Enhanced Learning*, 13(1), 1-23. doi:https://doi.org/10.1186/s41039-018-0078-8
- Nation, I. S. P. (2022). *Learning vocabulary in another language* (3rd ed.). Cambridge, UK: Cambridge University Press.
- Nicol, D. (2021). The power of internal feedback: Exploiting natural comparison processes. *Assessment and Evaluation in Higher Education*, 46(5), 756-778. doi:https://doi.org/10.1080/02602938.2020.1823314
- Panadero, E., Andrade, H., & Brookhart, S. (2018). Fusing self-regulated learning and formative assessment: A roadmap of where we are, how we got here, and where we are going. *The Australian Educational Researcher*, 45(1), 13-31. doi:https://doi.org/10.1007/s13384-018-0258-y
- Plump, C. M., & LaRosa, J. (2022). Using Kahoot! in the classroom to create engagement and active learning: A game-based technology solution for eLearning novices. *Management Teaching Review*, 2(2), 151-158. doi:https://doi.org/10.1177/2379298116689783
- Putri, N. S., & Refnaldi, R. (2021). Vocabulary mastery in EFL students. *Journal of English Language Teaching*, 10(2), 145-156.
- Rahman, A., & Angraeni, C. (2024). Kahoot-based formative assessment and EFL vocabulary learning: A review of recent practices. *English Language Teaching Educational Journal*, 7(1), 14-26.
- Sailer, M., & Homner, L. (2020). The gamification of learning: A meta-analysis. *Educational Psychology Review*, 32(1), 77-112. doi:https://doi.org/10.1007/s10648-019-09498-w
- Sailer, M., Hense, J., Mayr, S., & Mandl, H. (2021). How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction. *Computers in Human Behavior*, 69, 371-380. doi:https://doi.org/10.1016/j.chb.2016.12.033
- Saleem, A. N., Noori, N. M., & Ozdamli, F. (2022). Gamification applications in E-learning: A literature review. *Technology, Knowledge and Learning*, 27(1), 139-159. doi:https://doi.org/10.1007/s10758-020-09491-1
- Sari, D. P., Yusuf, M., & Rahmat, A. (2023). Vocabulary acquisition challenges among Indonesian EFL learners. *Journal of Language and Education*, 9(1), 112-124. doi:https://doi.org/10.17323/jle.2023.14756
- Tan, D. A. L., Ganapathy, M., & Kaur, M. (2021). Kahoot! It: Gamification in higher education. *Pertanika Journal of Social Science and Humanities*, 26(1), 565-582.
- Toda, A. M., Valle, P. H., & Isotani, S. (2021). The dark side of gamification: An overview of negative effects of gamification in education. *Communications in Computer and Information Science*, 803, 143-156. doi:https://doi.org/10.1007/978-3-319-97934-2_11
- UNESCO. (2022). *Reimagining our futures together: A new social contract for education*. Paris, France: United Nations Educational, Scientific and Cultural Organization.
- Wang, A. I. (2019). The wear-out effect of a game-based student response system. *Computers and Education*, 82, 217-227. doi:https://doi.org/10.1016/j.compedu.2014.11.004
- Wang, A. I., & Tahir, R. (2020). The effect of using Kahoot! for learning: A literature review. *Computers and Education*, 149, 103818. doi:https://doi.org/10.1016/j.compedu.2020.103818
- Wiliam, D. (2018). *Embedded formative assessment* (2nd ed.). Bloomington, USA: Solution Tree Press.
- Yan, Z., & Carless, D. (2022). Self-assessment is about more than self: The enabling role of feedback literacy. *Assessment and Evaluation in Higher Education*, 47(7), 1-14. doi:https://doi.org/10.1080/02602938.2021.2001431
- Yang, L., Panadero, E., & Chen, C. (2025). Technology-mediated self-assessment in higher education: A critical review. *Assessment and Evaluation in Higher Education*, 50(1), 1-20.
- Zainuddin, Z., Chu, S. K. W., Shujahat, M., & Perera, C. J. (2020). The role of gamified e-quizzes on student learning and engagement: An interactive gamification solution for a formative assessment system. *Computers and Education*, 145, 103729.

doi:<https://doi.org/10.1016/j.compedu.2019.103729>