Journal of Education and Teaching Learning (JETL)
Volume 8, Issue 2, May 2026
Journal Homepage:
http://pusdikra-publishing.com/index.php/jetl

Investigating the Combined Impact of Microlearning and Spaced Repetition on EFL Learners' Vocabulary Retention

Durotunnasihah[1], Iis Sujarwati[2], Kasmaini[3]
[1,2,3] *Universitas Bengkulu, Indonesia*
Corresponding Author : durotunnasihahmagister@gmail.com

ARTICLE INFO
Article history:
Received
22 April 2026
Revised
25 May 2026
Accepted
15 June 2026

ABSTRACT

Vocabulary retention is a persistent challenge in EFL learning, often limited by insufficient exposure and reliance on rote memorization. Although microlearning and spaced repetition have been studied individually, few investigations have examined their combined effect on vocabulary retention and learning experience. By using quantitative design, this study explored the impact of microlearning integrated with spaced repetition on EFL students' vocabulary mastery, retention, and perceptions. Forty-six beginner-level EFL students in Bengkulu participated in pre-test, post-test, and delayed post-test assessments, complemented by questionnaires, analyzed using repeated-measure ANOVA. The results indicated significant improvement from pre-test to post-test, stable or slightly increased scores in the delayed post-test, and high learner satisfaction. These findings suggest that repeated and manageable exposure effectively strengthen retention. Overall, integrating microlearning with spaced repetition enhances vocabulary learning and long-term retention, providing practical guidance for designing short, repeated, and engaging learning experiences in EFL contexts. Future research should involve larger and more diverse participant groups, extend intervention and retention periods, incorporate qualitative methods to explore learners' experiences, and compare alternative instructional approaches to further clarify the effectiveness of this combined strategy.

Key Word *Microlearning, Spaced-Repetition, Vocabulary Retention.*

How to cite https://pusdikra-publishing.com/index.php/jetl

INTRODUCTION

Vocabulary is widely recognized as a fundamental component of language acquisition, proficiency and communication (Haque et al., 2024; Jahedizadeh et al., 2025; Sujadi & Wulandari, 2021). Despite its importance, vocabulary is often underemphasized in English as a Foreign Language (EFL) classrooms. English instruction tends to focus on grammar and meaning and limited to incidental exposure (Sun & Dang, 2020). As a result, learners struggle to retain and efficiently use of newly acquired words. Furthermore, studies have shown that many EFL settings is often ineffective with numerous learners unable to master

even the 2,000 most common word families (Webb & Chang, 2012; Webb & Nation, 2017, as cited in in Zakian et al., 2022). In Indonesia, English is taught as a foreign language across levels, yet learners frequently struggle with vocabulary acquisition and retention. Large class sizes, limited exposure to authentic English input, and insufficient emphasis on systematic vocabulary instruction in textbooks and curricula contribute to this challenge (Sujadi & Wulandari, 2021). Many students rely on rote memorization or incidental learning, which often leads to rapid forgetting of newly learned words. Therefore, structured vocabulary instruction supported by memory-enhancing strategies are critical for promoting long-term vocabulary development (Schmitt, 2010, as cited in Alshumrani, 2024).

In response to this issue, microlearning has emerged as a promising instructional strategy to address these challenges. Grounded in Cognitive Load Theory (CLT), microlearning delivers content in small, bite-sized lessons, focused units that reduce cognitive overload and enabling learners to quickly understand material and retain it over time (Venkat et al., 2020; Mostrady et al., 2024). Theo Hug (2005) conceptualized microlearning as short lessons targeting a single learning goal that can be delivered through various media and learning models. It aligns with learners' attention spans and working memory limits. Although Hug (2005) suggested microlearning activities can range from under a second to over an hour, most educators advocate sessions of no longer than 15 minutes (Buchem & Hamelmann, 2010, cited in Leong et al., 2021). The focus is not the exact duration but delivering content that is short, focused, and easily absorbed. Longer lessons are typically divided into smaller segments to maintain clarity and cognitive manageability.

The rise of digital technology has further enhanced the potential of microlearning. As one of the emerging technology-based and distance learning approaches, microlearning allows learners accessing instructional materials anytime and anywhere (Shafiee, 2023; Alias and Razak, 2024, citing Kovachev et al. 2011). The materials may include short videos, brief readings, infographics, and interactive tasks that facilitate learners to access and process information flexibly, at their own pace and in any setting (Fitria, 2022, cited in Mahendra & Killis, 2025). Resarch has shown that tech-based vocabulary learning can improve words retention and give more positive attitude compared to conventional approaches (Haque et al., 2024). Multimedia features such as audio, images, and interactive activities, keep students interested, support better understanding and suitable for language context. However, effective integration requires a structured, collaborative approach to ensure that students achieve a deeper and more meaningful understanding (Mahendra & Killis, 2025).

Another evidence-based strategy for enhancing long-term retention is Spaced repetition. It works by reviewing material several times which is gradually increasing the intervals (Jorgensen, 2024). This approach is rooted in in the spacing effect, first identified by Ebbinghaus (1885/1913)'s forgetting curve theory that learners tend to lose a considerable amount of new knowledge after 24 hours and continues to weaken and is usually forgotten within about a week without any systematic review (Atas et al., 2024; Jahedizadeh et al., 2025). Although widely used in modern digital tools, spaced repetition has strong roots in psychological research, including Pimsleur (1967) and Leitner (1972). Furthermore, Kang (2016) empashized that learning works better when you review or practice something a little bit at a time over several days, instead of studying a lot all at once in one long session. This cycle strengthens memory by adjusting review frequency based on how well each item is remembered.. (Lafleur, 2020). Even if the total time spent studying is the same, spreading it out helps your brain remember the information longer, solve problems better, and use the knowledge in different situations.

Integrating microlearning with spaced repetition combines the advantages of both approaches. Microlearning delivers content in digestible units, reducing cognitive load, while spaced repetition ensures repeated exposure over time, consolidating knowledge into long-term memory. This combination is particularly powerful for vocabulary acquisition because it addresses both cognitive processing limits and memory decay (Jahedizadeh et al., 2025). Digital platforms such as Anki, Quizlet, and the PORO app implement this integration through audio-supported flashcards and automated spaced review. Recent studies confirm the efficacy of combining microlearning and spaced repetition. Spaced learning sessions improve vocabulary retention compared to massed practice (Farvardin & Sararoodi, 2020). Similarly, Daiu & Mihali (2025) highlighted the efficacy of mobile-assisted spaced repetition tools in vocabulary and grammar for ESP context and Xodabande et al., (2022) demonstrated that mobile flashcard use led to superior academic vocabulary retention and learner motivation. In addition, the interaction between microlearning and spaced repetition has been shown to support learning outcome across adult age groups (Renjisha, 2025).

Despite the growing evidence supporting these approaches, research gaps remain. Most studies have explored their individual effectiveness or general application, but few have systematically examined the combined effect of microlearning paired with spaced repetition on vocabulary acquisition in EFL learners, especially in experimental designs using PORO App. In response to this gap, the present study investigates how the integration of microlearning and

spaced repetition affect vocabulary retention in EFL learners using audio-supported flashcards and explores the learners' perceptions of microlearning paired with spaced repetition in terms of engagement, motivation, and perceived effectiveness.

This study expands theoretical insights into how microlearning and spaced repetition support vocabulary mastery and long-term retention in EFL learning, reinforcing key cognitive principles such as the spacing effect and the forgetting curve within digital learning contexts. Practically, it offers teachers guidance on designing effective microlearning sessions, provides students with a time-efficient vocabulary-review strategy through the PORO app—as technology-enhanced tool, and informs curriculum developers on integrating microlearning and spaced-repetition principles into digital or blended materials.

RESEARCH METHOD

The study employed a quasi-experimental to observe the effect of the intervention across multiple time (Creswell, 2012; Miller et al., 2020) with repeated-measures within-subjects design. 46 female students from Islamic Boarding School students participated as the same group of learners and assessed at three different points (pre-test, post-test, and delayed post-test) to examine changes in vocabulary retention following the intervention. Through using convenience sampling, the group was considered relatively homogeneous in terms of educational background and English proficiency with a mean age of approximately 16 years.

The intervention was delivered via the PORO mobile application which has features audio-supported flashcards and spaced repetition-based vocabulary learning, presenting 20 vocabulary items—*illness, fever, cramps, headache, cough, chill, nosebleed, chickenpox, migraine, sneeze, nausea, rash, eczema, stomach ache, faint, vomit, epilepsy, diarrhea, measles, and mumps*. Although PORO includes visual elements (such as pictures in flashcards), all vocabulary tests in this study were administered without images to assess students' mastery of vocabulary based on semantic understanding, not visual memory.

Instruments, Data Collection and Analysis Procedures

Data were collected using test and questionnaire. To ensure validity, all instruments were reviewed to confirm clarity, readability, and suitability for learners' proficiency levels. The questionnaire included ten statements across five categories (usability/design, retention, motivation/engagement, perceived learning, and satisfaction) and was rated using a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Reliability was enhanced through consistent administration procedures. All tests were conducted under identical

conditions, using the same instructions, time limits, and supervision. The intervention likewise followed a structured and uniform format: five spaced microlearning sessions delivered on Day 1, 2, 4, 7, and 14, (Jorgensen, 2024) with each collaborative group (five students per device) completing a 15-minute session (Leong et al., 2021) under researcher supervision. Standardized delivery reduces procedural variation and strengthens the reliability of the data collected.

The data were analyzed using SPSS version 25. Both descriptive and inferential statistics were employed. A Repeated Measures ANOVA was conducted to examine differences across the three tests, with Mauchly's test used to check sphericity. When the assumption was violated, Greenhouse–Geisser and Huynh–Feldt corrections were applied. Pairwise comparisons with Bonferroni adjustment identified specific differences between time points, and an Estimated Marginal Means plot visualized score changes. Finally, questionnaire data were analyzed descriptively by calculating means and standard deviations.

RESULT AND DISCUSSION

Research results

The findings of this study are presented in two sections. The first section reports the results of the vocabulary tests, which are summarized in tables. The second section presents a summary of students' perceptions based on the questionnaire data.

1. Results of Vocabulary Tests

Table 1.
Mean and SD of Pre, Post and Delayed Post-Test

Test Time	Min.	Max.	Mean	Sd	N
Pre-Test	10	65	30.22	13.25	46
Post-Test	50	100	78.91	15.38	46
Delayed Post-Test	60	100	81.74	13.47	46

The descriptive statistics for students' vocabulary test performance across the three time points are presented in Table 1. The pre-test recorded a mean score of 30.22 (SD = 13.25), with a minimum score of 10. After receiving the intervention, the mean score on the immediate post-test increased to 78.91 (SD = 15.38). Two weeks later, the delayed post-test showed a mean score of 81.74 (SD = 13.47), with 46 participants measured at all three points. The mean scores increased across the three testing times. The Shapiro–Wilk test indicated that the pre-test ($p = .004$), post-test ($p = .001$), and delayed post-test ($p = .004$) scores were not normally distributed. However, as repeated-measures ANOVA is robust to moderate violations of normality with larger samples (Field, 2013), the analysis

was continued. Following this, Mauchly's Test of Sphericity was conducted to examine the sphericity assumption.

Table 2.
Mauchly's Test of Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Fg.	Greenhouse-Geisser	Epsilon[b] Huynh-Feldt	Lower-Bound
Time	0.231	64.487	2	.000	.565	.570	.500

Based on Table 2, the test was significant, $W = .231$, $\chi^2(2) = 64.49$, $p < .001$, indicating that the assumption of sphericity was violated. Therefore, the Greenhouse–Geisser correction ($\varepsilon = .565$) was applied in the subsequent repeated-measures ANOVA. Furthermore, to determine whether students' vocabulary performance changed across the three assessment points, a one-way repeated-measures ANOVA was conducted using Time 1 (the pre-test), Time 2 (immediately post-test), and Time 3 (delayed post-test).

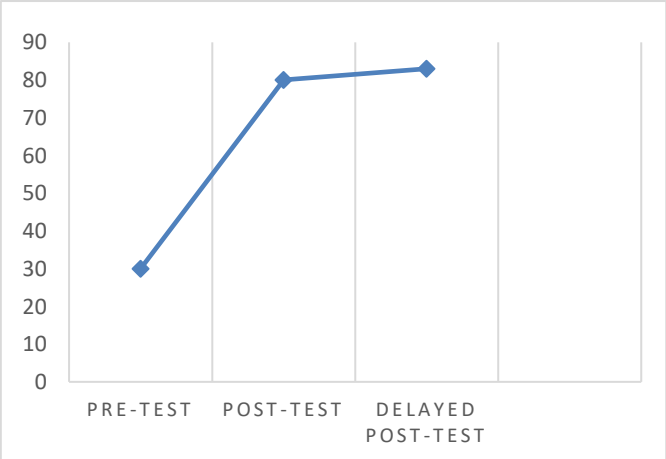

Figure 1.
Plot Representing Performances Obtained by Students in Three Times

Table 3.
Test of Within Subject Effect

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Time	**Sphericity Assumed**	77,184.058	2	38,592.029	405.476	.000	.900
	Greenhouse-Geisser	77,184.058	1,131	68,271.795	405.476	.000	.900

	Huynh-Feld t	77,184.058	1,140	67,713.845	405.476	.000	.900
	Lower-bound	77,184.058	1,000	77,184.058	405.476	.000	.900
Error (Time)	**Sphericity Assumed**	8,565.942	90	95,177			
	Greenhouse-Geisser	8,565.942	50,874	168,375			
	Huynh-Feldt	8,565.942	51,294	166,998			
	Lower-bound	8,565.942	45,000	190,354			

The analysis showed a significant main effect of time on students' vocabulary scores, $F(1.13, 50.87) = 405.48$, $p < .001$, $\eta p^2 = .900$. This indicates that the mean scores differed significantly across the measurement points. The effect size ($\eta p^2 = .900$) reflects that a large proportion of the variance in vocabulary performance was explained by time.

Finally, pairwise comparisons were conducted to examine the differences in vocabulary scores across the three testing occasions, and the results are presented in the table. The analysis showed that the post-test score was significantly higher than the pre-test score (mean difference = 48.70, $p < .001$). The delayed post-test score was also significantly higher than the pre-test score (mean difference = 51.52, $p < .001$). In addition, the comparison between the post-test and delayed post-test indicated a significant difference (mean difference = 2.83, $p = 0.001$).

Table 4.
Pairwise Comparisons

(I) Time	**(J) Time**	**Mean Difference (I - J)**	**Std. Error**	**Sig.[b]**	**95% Confidence Interval for Difference[b]**	
					Lower Bound	**Upper Bound**
1	2	-48.696	2.527	.000	-54.981	-42.411
1	3	-51.522	2.341	.000	-57.343	-45.700
2	1	48.696	2.527	.000	42.411	54.981
2	3	-2.826	0.740	.001	-4.666	-0.987
3	1	51.522	2.341	.000	45.700	57.343
3	2	2.826	0.740	.001	0.987	4.666

2. Result of Students' Perception Questionnaire

The following tables summarize the questionnaire results on learners' perceptions of microlearning integrated with spaced repetition. The ten statements were devided into four categories.

Table 5.
Students' Perception on Microlearning combined with Spaced Repetition

Statement	Mean	SD
Usability/Design		
1. The learning sessions were easy to follow	4.39	0.649
2. The app or learning tool was simple to use	4.93	0.250
Motivation/Engagement		
3. The learning sessions made me want to study more	4.83	0.486
4. I enjoyed using microlearning for vocabulary	4.93	0.250
Vocabulary Retention		
5. Short learning sessions helped me focus better	4.80	0.500
6. Reviewing words several times helped me remember them longer	4.87	0.400
Satisfaction		
I feel I can recall the new words more easily now	4.91	0.285
I am happy with this way of learning	4.98	0.147
I would like to keep using microlearning for future study	4.98	0.147

The first category highlights the responses to statements related to the effectiveness of the usability and design during the learning sessions. Participants rated "The learning sessions made me want to study more" with a mean of 4.83 and a standard deviation of 0.486, showing a strong agreement. For "I enjoyed using microlearning for vocabulary," the mean was 4.93 with a very low standard deviation of 0.250, indicating high agreement and minimal variation.

Similar result is presented by second category, explaining feedback about the ease of following the learning sessions and the perceived effectiveness of the learning tool. The mean for "The learning sessions were easy to follow" was 4.39 with a standard deviation of 0.649, showing general agreement with a moderate level of variability. "The app or learning tool was simple to use" had a mean of 4.93 and a standard deviation of 0.250, indicating strong agreement and low variability. The statement "Short learning sessions helped me focus better" was rated with a mean of 4.80 and a standard deviation of 0.500, reflecting general agreement with minimal variation.

The third set of responses focused on vocabulary retention and recall. Participants rated "Reviewing words several times helped me remember them longer" with a mean of 4.87 and a standard deviation of 0.400, showing strong agreement with low variation. For "I feel I can recall the new words more easily now," the mean was 4.91 with a standard deviation of 0.285, indicating a strong agreement with minimal variability in responses. While the final set of statements assessed overall satisfaction with the learning method. "I am happy with this way of learning" and "I would like to keep using microlearning for future study" both had a mean of 4.98 and a standard deviation of 0.147, suggesting that participants were highly satisfied with the microlearning approach, with very little variation in their responses.

Overall, the data suggests that participants had a highly positive perception of the learning sessions and the microlearning tool, with strong agreement on all statements, and minimal variation in their responses.

Discussion

The findings of this study demonstrate that the combined microlearning and spaced repetition intervention effectively enhanced EFL students' vocabulary acquisition and retention. As shown in Table 1, the pre-test results show that students began with relatively low vocabulary mastery (M = 30.22, SD = 13.25), with scores ranging from 10 to 65. This wide variation indicates inconsistent prior knowledge, a common condition in EFL contexts where learners often have difficulty retaining new vocabulary without repeated or spaced review, consistent with the predictions of the forgetting curve. (Jahedizadeh et al., 2025).

This improvement continues to two other test results, the repeated measures analysis revealed a significant effect of time on students' vocabulary scores, indicating meaningful improvements across the time. Although Mauchly's test showed a violation of sphericity, appropriate corrections such as Greenhouse-Geisser ensured the reliability of the ANOVA results. Furthermore, pairwise comparisons showed that the greatest improvement occurred immediately after the intervention, while the smaller yet significant gains from post-test to delayed post-test indicate that students retained the vocabulary over time.

These results suggest that microlearning and spaced repetition work synergistically to optimize vocabulary learning. The rapid improvement observed immediately after the intervention aligns with microlearning theory, which posits that content delivered in short, focused segments reduces cognitive load and facilitates efficient processing of new information (Venkat et al., 2020). Simultaneously, the sustained gains in the delayed post-test reflect the principles

of spaced repetition, where reviewing material at strategically scheduled interval strengthens memory traces and supports long-term retention (Bachiri et al., 2025; Farvardin & Sararoodi, 2020; Kang, 2016; Sun & Dang, 2020). The maintained growth, even after the delayed post-test, indicates that the intervention not only promoted short-term learning but also helped consolidate knowledge over time. In addition, the smaller differences in delayed post-test scores indicate that the intervention was effective for students with different levels of proficiency, helping to reduce gaps in learning outcomes. This supports previous research showing that structured, repeated practice benefits a wide range of learners, especially in EFL contexts where retaining vocabulary can be difficult (Sujadi & Wulandari, 2021).

Overall, the findings highlight the efficacy of combining microlearning and spaced repetition in promoting vocabulary learning. This approach not only enables quick acquisition of new words but also supports their retention over time, providing a reliable method for enhancing EFL vocabulary instruction.

While the test scores explain the effectiveness of the intervention toward vocabulary retention, the following section examines questionnaire results to explore learners' perceptions during the intervention.

The questionnaire results indicate that students responded microlearning paired with spaced repetition very positively across categories. High ratings on usability and design (M = 4.39–4.93) suggest that the learning sessions and tools were intuitive, clear, and easy to follow. The statements " The learning sessions were easy to follow " and "this app or learning tool was easy to use" reflect the construct of usability, referring to the clarity, accessibility, and user-friendliness of the learning design and interface. This suggests that providing a well-structured program and effectively utilizing digital features can promote more effective learning outcomes (Alias & Razak, 2024; Haque et al., 2024).

In terms of motivation and engagement, students strongly agreed that the sessions encouraged them to study more enjoyable (M = 4.83–4.93). This aligns with the affective dimension of learning, indicating that microlearning can increase learner motivation and engagement by providing short, meaningful, and rewarding learning experiences (Mahendra & Killis, 2025; Venkat et al., 2020).

For vocabulary retention, students perceived that short and repeated sessions enhanced focus and helped them remember words longer (M = 4.80–4.87). The students received scheduled intervals to reinforce the target vocabulary in accordance with the principles of spaced repetition, which emphasize distributing review across multiple sessions rather than concentrating it all at once (Farvardin & Sararoodi, 2020; Kang, 2016). Finally, measures of

satisfaction were exceptionally high (M = 4.91–4.98), with students reporting improved recall, overall happiness with the approach, and a willingness to continue using it. This indicates that the intervention successfully integrated cognitive, motivational, and affective factors, providing a holistic learning experience that reinforces both short-term acquisition and long-term retention.

Based on the questionnaire findings, students expressed a high level of appreciation for the combination of microlearning and spaced repetition. Microlearning prevents students from becoming overwhelmed through small-chunk delivery can enhances engagement and motivation, allowing learners to get both enjoyable and accessible content. When paired with spaced repetition, students are further supported in preventing forgetting, strengthening retrieval processes, and developing long-term retention of vocabulary items.

Taken together, the integration of microlearning and spaced repetition offers a comprehensive response to the challenges commonly experienced in EFL vocabulary learning and demonstrates a promising solution for improving both short-term gains and sustained vocabulary mastery.

CONCLUSION

This study investigated the combined effect of microlearning and spaced repetition on EFL students' vocabulary acquisition, retention, and learning experiences. The findings show that this integration creates a well-structured, cognitively efficient, and motivating learning environment. Students showed substantial improvement from the pre-test, post-test and delayed post-test. Furthermore, none of students experienced a decline in their delayed post-test scores, and many continued to improve. This consistency suggests that regular, spaced exposure—rather than the duration of individual sessions—is critical for sustaining vocabulary gains. The questionnaire findings complement the performance data, showing that students perceived the learning process as simple, enjoyable, and motivating. High ratings across categories, indicate that the microlearning–spaced repetition model provide an accessible and meaningful learning experience. This combination effectively addresses persistent challenges in EFL vocabulary learning and provides a promising pedagogical model for enhancing both immediate learning and long-term retention in EFL contexts.

Several limitations are acknowledged in this study such as lack of participants, involved only one institution, time of intervention and relied primarily on quantitative measures. Future research can extend this study with more paticipants from diverse education levels included, and elaborate the

approach of current study into comparative, qualitative or mixed method to explore deeper on the effectiveness of this integration in longer duration.

In short, the findings of this study provide important implications for teachers and curriculum developers to design manageable learning segments and schedule regular review intervals to minimize cognitive overload and strengthen memory consolidation by using technology-based platforms in vocabulary learning for EFL classroom.

REFERENCES

Alias, N. F., & Razak, R. A. (2024). Exploring The Pedagogical Aspects of Microlearning In Educational Settings: A Systematic Literature Review. *Malaysian Journal of Learning and Instruction*, *21*(1), 217–247.

Alshumrani, H. A. (2024). Unveiling vocabulary teaching and learning beliefs of teachers and learners in an EFL context. *Asian-Pacific Journal of Second and Foreign Language Education*, *9*(1). https://doi.org/10.1186/s40862-023-00242-0

Atas, M., Lindner, H., Strametz, T., Jammoul, F., Feiner, J., & Saad, A. M. (2024). a Fight Against the Forgetting Curve. *Proceedings of the 21st International Conference on Cognition and Exploratory Learning in the Digital Age, CELDA 2024*, *Celda*, 143–150. https://doi.org/10.33965/celda2024_202408l018

Bachiri, Y.-A., Mouncif, H., & Bouikhalene, B. (2025). Harnessing generative AI to boost active retrieval and retention in MOOCs with spaced repetition. *Knowledge Management & E-Learning An International Journal*, *17*(3), 391. https://doi.org/10.34105/j.kmel.2025.17.018

Creswell, J. W. (2012). Educational Research: Planning, conducting and evaluating quantitative and qualitative research. In *Pearson* (4th Editio). Pearson Education.

Daiu, P. S., & Mihali, K. (2025). Spaced Repetition and Virtual Flashcards: Mobile-Assisted Language Learning (MALL) for English Vocabulary and Grammar. *Pakistan Journal of Life and Social Sciences (PJLSS)*, *23*(2), 531–541. https://doi.org/10.57239/pjlss-2025-23.2.00188

Farvardin, M. T., & Sararoodi, A. B. (2020). the Effect of Input Spacing on Efl Learners' Vocabulary Knowledge. *Language Literacy: Journal of Linguistics, Literature, and Language Teaching*, *4*(2), 255–262. https://doi.org/10.30743/ll.v4i2.3068

Haque, A., Ariansyah, M. R., Wiladyah, N. C., & Sari, R. N. (2024). Teaching Vocabulary in a Digital Era: A Study on Tools and Techniques for Engaging English Learners. *IREELL: Indonesian Review of English Education, Linguistics, and Literature*, *2*(2), 225–245. https://doi.org/10.30762/ireell.v2i2.4433

Hug, T. (2005). Micro Learning and Narration Exploring possibilities of utilization of narrations and storytelling for the designing of. *Forschungsnetzwerk*, *August*, 1–13.

Jahedizadeh, S., Khademorreza, A., & Sarvari, S. S. (2025). Vocabulary retention, sustained attention, and enjoyment: using Tick8 method to promote language achievement. *Australian Journal of Applied Linguistics*, *8*(3). https://doi.org/10.29140/ajal.v8n3.102501

Jorgensen, C. (2024). Introducing Spaced Repetition Software (SRS) for vocabulary acquisition in a university-level Arabic language course: A case study. *Journal of Language Teaching*, *4*(2), 33–42. https://doi.org/10.54475/jlt.2024.013

Kang, S. H. K. (2016). Spaced Repetition Promotes Efficient and Effective Learning: Policy Implications for Instruction. *Policy Insights from the Behavioral and Brain Sciences*, *3*(1), 12–19. https://doi.org/10.1177/2372732215624708

Lafleur, L. (2020). The indirect spaced repetition concept. *Vocabulary Learning and Instruction*, *9*(2), 9–16. https://doi.org/10.7820/vli.v09.2.lafleur

Leong, K., Sung, A., Au, D., & Blanchard, C. (2021). A review of the trend of microlearning. *Journal of Work-Applied Management*, *13*(1), 88–102. https://doi.org/10.1108/JWAM-10-2020-0044

Mahendra, I. G. B., & Killis, B. (2025). Impact of Virtual Laboratory-Assisted Microlearning on Students' Motivation, Engagement, and Academic Success. *Journal of Learning for Development*, *12*(1), 1–16. https://doi.org/10.56059/jl4d.v12i1.1715

Miller, C. J., Smith, S. N., & Pugatch, M. (2020). Experimental and quasi-experimental designs in implementation research. *Psychiatry Research*, *283* (March 2019), 112452. https://doi.org/10.1016/j.psychres.2019.06.027

Mostrady, A., Sanchez-Lopez, E., & Gonzalez-Sanchez, A. F. (2024). Microlearning and its Effectiveness in Modern Education: A Mini Review. *Acta Pedagogia Asiana*, *4*(1), 33–42. https://doi.org/10.53623/apga.v4i1.496

R, Ranjisha. (2025). The Effectiveness of Microlearning and Spaced Repetition in Knowledge Retention Across Different Age Groups: A Comparative Analysis of Cognitive Performance and Memory Consolidation. *International Journal of Teacher Education Research Studies (IJTERS)*, 69–73. https://doi.org/10.63090/ijters/3049.1614.0017

Shafiee, H. (2023). Flipping in a Microlearning Way: Effects on Efl Learners' Achievement and Motivation in a Grammar Course. *Teaching English With Technology*, *2023*(1), 58–79. https://doi.org/10.56297/bkam1691/dfgf8748

Sujadi, J., & Wulandari, F. (2021). Study of Students' Vocabulary Difficulties in Third-Semester Students of Food Technology Major. *Edukasi: Jurnal Pendidikan*, *19*(1), 90. https://doi.org/10.31571/edukasi.v19i1.2347

Sun, Y., & Dang, T. N. Y. (2020). Vocabulary in high-school EFL textbooks: Texts and learner knowledge. *System*, *93*. https://doi.org/10.1016/j.system.2020.102279

Venkat, M. V., O'Sullivan, P. S., Young, J. Q., & Sewell, J. L. (2020). Using Cognitive Load Theory to Improve Teaching in the Clinical Workplace. *MedEdPORTAL : The Journal of Teaching and Learning Resources*, *16*, 10983. https://doi.org/10.15766/mep_2374-8265.10983

Xodabande, I., Iravi, Y., Mansouri, B., & Matinparsa, H. (2022). Teaching Academic Words With Digital Flashcards: Investigating the Effectiveness of Mobile-Assisted Vocabulary Learning for University Students. *Frontiers in Psychology*, *13*(June). https://doi.org/10.3389/fpsyg.2022.893821

Zakian, M., Xodabande, I., Valizadeh, M., & Yousefvand, M. (2022). Out-of-the-classroom learning of English vocabulary by EFL learners: investigating the effectiveness of mobile assisted learning with digital flashcards. *Asian-Pacific Journal of Second and Foreign Language Education*, *7*(1). https://doi.org/10.1186/s40862-022-00143-8