Enhancing Vocabulary Acquisition and Retention: The Role of Spaced Repetition in Language Learning

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Abstract

Vocabulary acquisition is crucial in language learning, as retaining a large number of words is essential for learners. One effective technique for boosting vocabulary is spaced repetition. Despite extensive research on its effectiveness in retaining vocabulary in L2 courses over time, its full integration into everyday classrooms remains limited. This study aimed to assess the effectiveness of spaced repetition tasks in enhancing vocabulary acquisition among learners and to evaluate the impact of spaced repetition on the retention of vocabulary. The sample were 30 Thai university learners who were selected by convinient sampling. The research instruments for the data collection were the pre-test, post-test, and the vocabulary spaced-repetition tasks. A paired sample t-test was used to analyz the pre-test and post-test scores, while the vocabulary retention rates were analyzed using the descriptive statistics.

Results from a paired sample t-test revealed a significant improvement in vocabulary test scores after the intervention (M=21.93, SD=3.31), compared to before (M=11.57, SD=2.46). Additionally, the results from vocabulary retention tests revealed that, after a 10-day period of utilizing spaced-repetition tasks, learners were able to recall about 79.77 percent of the designated target words. Retention rates remained relatively high, hovering around 79.57 percent after 18 days of practice, but showed a decline to 78.27 percent by the 31st day. Following a 60-day lapse without practice, retention decreased further to approximately 75.27 percent. These findings highlight the effectiveness of spaced repetition in improving both short-term vocabulary acquisition and long-term retention among language learners.

Keywords: Spaced repetition; Vocabulary Acquisition; Vocabulary Retention

Introduction

Vocabulary is paramount in language learning. It is emphasized that while some progress can be made without perfect grammar, nothing substantial can be achieved without vocabulary (Wilkins, 1972). The difference between native speakers and foreign language learners often lies in the size of their mental lexicon (Laufer, 1998). For effective communication, a substantial vocabulary is essential. For instance, Laufer (1989) found that understanding written text requires knowledge of 95% of the vocabulary, while Hu & Nation (2000) suggested that 98% to 99% of the words are necessary for comprehending written discourse. Nation (2006) estimated that around 8000 to 9000 word families are needed to read authentic materials. This underscores the significance of vocabulary acquisition in second language (L2) learning, especially for beginners trying to comprehend authentic texts.

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A rich vocabulary knowledge plays a crucial role in language learning across various aspects. It enhances comprehension and communication, enabling learners to understand spoken and written language effectively, express themselves clearly, and engage in meaningful conversations. Vocabulary knowledge significantly impacts reading and writing skills, aiding in reading comprehension by deciphering unfamiliar words and enhancing writing precision and creativity. It is crucial for listening and speaking proficiency, as a wide vocabulary allows learners to follow spoken discourse better and express ideas accurately. Additionally, vocabulary is essential for academic success, including language exams, essays, presentations, and comprehending academic texts with specialized vocabulary. Furthermore, vocabulary knowledge delves into the cultural aspects of a language, facilitating a deeper understanding of idioms, proverbs, and culture-specific words. It also correlates with language proficiency levels, such as those defined by the Common European Framework of Reference for Languages (CEFR), as learners typically expand their vocabulary as they progress, contributing to their overall language proficiency. Conversely, a lack of vocabulary knowledge can lead to various limitations, hindering comprehension, communication, academic performance, and overall language proficiency. Therefore, language learners should prioritize expanding their vocabulary to ensure a more comprehensive and successful language learning journey.

The importance of vocabulary acquisition is evident in the structure of language courses as the Thai policy which was driven by the recognition of English as a global lingua franca and its importance in enhancing students' competitiveness in the global job market. High school students in Thailand are expected to meet specific English language proficiency standards to ensure they are well-prepared for higher education and future career opportunities. This policy includes a standardized English proficiency examination, which students must pass to graduate from high school. Additionally, the curriculum includes English language instruction throughout high school to help students reach the required proficiency levels. The policy represents a concerted effort to equip Thai students with the language skills necessary to engage in a globalized world effectively. Moreover, the Common European Framework of Reference for Languages (CEFRX is used as a reference framework to assess and standardize language proficiency levels, particularly in English in Thailand. The specific requirement for CEFR levels in Thailand can vary based on educational institutions and government policies. In general, Thai students are expected to reach a minimum CEFR level of B1 (intermediate) by the time they complete high school. This level signifies that students have acquired basic communication skills in English. However, some educational institutions and programs may have higher proficiency requirements. In addition, Thailand's emphasis on CEFR levels reflects the nation's commitment to improving English language proficiency, recognizing its importance in the global context. Achieving specified CEFR levels is often a prerequisite for higher education and various job opportunities, as it indicates a reasonable degree of language competence.

To help learners acquire vocabulary, one technique that has gained significant attention worldwide for enhancing vocabulary learning is spaced repetition. Spaced repetition involves strategically scheduling review sessions at increasing intervals over time, aiming to optimize memory retention and long-term recall (Karpicke & Bauernschmidt, 2011). This approach is rooted in cognitive psychology principles, particularly the spacing effect, which suggests that information learned through spaced intervals is better retained than information learned through massed practice (Cepeda et al., 2006). Despite years of English language education from a young age, many Thai EFL learners struggle to develop a comprehensive vocabulary.

Research indicates that despite prolonged exposure to English instruction, learners often fail to acquire an extensive lexical repertoire (Orawiwatnakul & Khamkhien, 2016). This deficiency in vocabulary knowledge persists even after years of language learning, impacting learners' ability to effectively communicate and comprehend English texts (Lems, 2004). Despite the emphasis on English language education in Thailand's curriculum, learners often face challenges in retaining and applying vocabulary due to factors such as limited exposure to authentic English contexts outside the classroom and traditional teaching methods that prioritize memorization over active engagement (Platapiantong & Thienpermpool, 2020). These issues highlight the need for innovative pedagogical approaches to enhance vocabulary acquisition and retention among Thai EFL learners. Additionally, research on spaced repetition has proliferated globally, with studies conducted in various educational contexts to investigate its effectiveness in vocabulary learning. Moreover, the advent of technology has facilitated the integration of spaced repetition into language learning applications and platforms, making it more accessible to learners worldwide (Kornell & Bjork, 2008). However, despite its potential benefits, the adoption of spaced repetition techniques in formal educational settings remains limited in many countries.

In conclusion, vocabulary acquisition is fundamental in language learning, with research emphasizing its critical role in comprehension and communication. For effective language proficiency, a substantial lexicon is necessary, as evidenced by studies showing the correlation between vocabulary size and reading comprehension. Various language policies, such as Thailand's emphasis on English proficiency standards, underscore the global recognition of vocabulary's importance. Despite efforts in education, challenges persist in vocabulary retention, particularly among Thai EFL learners, necessitating innovative pedagogical approaches like spaced repetition. While spaced repetition shows promise in enhancing vocabulary learning, its widespread adoption in formal education remains limited.

Research Objectives

1. To assess the effectiveness of spaced repetition tasks in enhancing vocabulary acquisition among learners.
2. To evaluate the impact of spaced repetition on the retention of vocabulary

Literature Review

Repetitive theory, also known as the Repetition Hypothesis, is a concept in second language acquisition (SLA) that highlights the importance of repetition and reiteration in the process of learning a second language. This theory posits that repeated exposure to language elements, such as vocabulary, grammar structures, and speech patterns, plays a significant role in language acquisition and proficiency development. Repetition aligns with the idea that language learning is an incremental and cumulative process, and revisiting language components multiple times can lead to better retention and comprehension. Repetition emphasizes the importance of frequent exposure to language elements. The more a learner encounters a specific word, phrase, or structure, the more likely they are to remember and internalize it. This theory aligns with the notion that language learning is a result of repetition and practice. Repetition involves systematic review and revision. Learners should revisit previously learned material to reinforce their knowledge. This can include reviewing vocabulary, re-practicing grammar rules, and rereading texts.Repetition should take into

account the context in which language is used. This means that learners should practice language elements in meaningful and authentic contexts, which aids in comprehension and application. While repetition is crucial, it is also essential to vary the ways in which language elements are practiced. This includes using different exercises, contexts, and materials to prevent monotony and enhance adaptability.

Regarding the repetitive thoery, spaced repetition is a highly effective learning technique that is rooted in cognitive psychology and has gained prominence in the field of education and language acquisition. This approach is designed to optimize memory retention and recall through strategically timed reviews of previously learned material. The framework of spaced repetition is based on the idea that information is more effectively absorbed when it is revisited at increasing intervals over time, as opposed to cramming or constant repetition. Moreover, spaced-repetition is a method frequently used for learning vocabulary, which aims to incorporate new vocabulary into everyday language use quickly, effectively and, above all, sustainably through targeted repetition of the vocabulary within a given time interval. This learning method takes place over a longer period of time, for example, 1 month. Learners are free to choose the length of time, but it is divided into fixed learning phases. Within each phase learners repeat the new vocabulary. The special thing about the Spaced Repetition learning method is that the period between each phase in which learners do not repeat the vocabulary becomes longer. In this way, learners build up their vocabulary in the long term. The process of spaced repetition typically starts with the initial introduction of new information or concepts. This can occur through reading, lectures, or any traditional learning method. After the initial learning, learners review the material. This is typically done through self-assessment, flashcards, or quizzes to ensure that the information is understood. Then, the first review takes place shortly after the initial learning, often within a day or two. This reinforces the memory and helps move the information from short-term memory to long-term memory. These intervals are determined are based on the forgetting curve. As learners remember the information, the intervals lengthen, and if they forget, the intervals shorten. Learners continue to review the material at the predetermined intervals, ensuring that they revisit the information just as they are about to forget it. This process continues until the material is firmly entrenched in long-term memory. Lastly, even after the material has been well-learned, it's important to periodically review it to prevent forgetting over time. This reinforces the knowledge and helps maintain long-term retention. (Ebbinghaus, 1885; Bjork, 1994; Karpicke, 2007).

To examine the effectiveness of using the repetitive technique, linguists usually measure the retention rate of learners. Previous research studies have extensively explored the phenomenon of the forgetting curve and its implications for the retention of vocabulary. Ebbinghaus (1885) pioneered the investigation of the forgetting curve, demonstrating the rapid decline in memory retention over time without reinforcement. This seminal work laid the foundation for subsequent research into memory decay processes. Regarding vocabulary retention, Bahrick and Phelps (1987) conducted a landmark study examining the long-term retention of foreign language vocabulary. Their research revealed that vocabulary knowledge declines over time, with the forgetting curve illustrating a steep initial drop followed by a more gradual decline. These findings underscored the importance of spaced repetition in mitigating memory decay and enhancing long-term retention. Furthermore, the effectiveness of spaced repetition in vocabulary learning has been widely investigated. For instance, Pimsleur (1967) demonstrated the efficacy of spaced repetition in language learning, highlighting its role in promoting durable memory retention. Similarly, recent studies such as Varela (2020) revealed

space repetition positive impact on vocabulary acquisition and retention among learners. Moreover, research has shown the effectiveness of this technique in various domains, including language learning, medical education, and other academic subjects. For instance, a study by Kornell and Bjork (2008) demonstrated that spacing study sessions over time significantly improved long-term retention compared to massed study. Similarly, a meta-analysis by Dunlosky et al. (2013) highlighted the effectiveness of spaced repetition and practice testing in enhancing learning outcomes. Also, Kim et al., (2019) reaffirms the robustness of the spacing effect when analyzed through big data. Through the analysis of large datasets, the researchers found consistent evidence supporting the effectiveness of spaced learning for improved retention and learning outcomes.

Several studies have shed light on the challenges encountered by Thai high school students when acquiring English vocabulary, including limited exposure to English outside the classroom and a lack of effective vocabulary learning strategies (Srisopa & Yoon, 2017). Cepeda et al. (2006) provided compelling evidence supporting the efficacy of spaced repetition in enhancing verbal recall and long-term memory retention, emphasizing the benefits of spacing out study sessions for improved learning outcomes. Platapiantong and Thienpermpool (2020) found that students' vocabulary learning achievement significantly increased after using mnemonics and vocabulary picture books, underscoring the effectiveness of these strategies in vocabulary acquisition. Freed and Karpicke (2016) demonstrated that spaced repetition significantly enhances long-term retention compared to other methods, highlighting its importance in optimizing memory retention and learning outcomes. Moreover, Brown (1985) affirmed the rapid decay of memory over time, emphasizing the importance of effective learning strategies such as spaced repetition to combat memory deterioration. In addition, several studies further underscored the benefits of repeated exposure and spaced repetition in improving vocabulary acquisition and retention among Thai EFL learners (Suksuksema & Chaichanasiri, 2013; Chutopama & Saengboonmee, 2018; Phoocharoensil, 2019; Limviriyakul et al., 2020).

One research gap in the existing literature on the repetitive theory and spaced repetition techniques lies in the exploration of their combined effectiveness in addressing specific challenges faced by Thai university students in acquiring English vocabulary. While studies have individually examined the importance of repetition and spaced repetition in language acquisition and memory retention (Srisopa & Yoon, 2017; Cepeda et al., 2006; Freed & Karpicke, 2016), there is a lack of research that integrates these theories to tailor vocabulary learning strategies for Thai EFL learners. Additionally, while some studies have investigated the benefits of spaced repetition in improving vocabulary retention among language learners (Platapiantong & Thienpermpool, 2020; Suksuksema & Chaichanasiri, 2013; Chutopama & Saengboonmee, 2018; Phoocharoensil, 2019; Limviriyakul et al., 2020), few have explored its combined application with the principles of the repetitive theory. Therefore, this research could fill this gap by examining how a combined approach incorporating both repetitive theory and spaced repetition techniques can effectively address the challenges encountered by Thai university students in acquiring English vocabulary.

Research Methodology

Participants

Thirty language learners, aged 18-22, were recruited as convinient sampling. Participants lagnuage background is Thai and have no prior experience with spaced repetition technique.

Procedure

Participants first completed a vocabulary pre-test to establish their baseline vocabulary knowledge. Participants then received a training session on vocabulary spaced- repetition. They were introduced to the spaced repetition materials developed and also be provided with a list of 104 target words and their meanings. They were encouraged to write the words with their meaning in Thai 1 hour each day for one month. During the training, participants also took a vocabulary retention test as shown in Figure 2

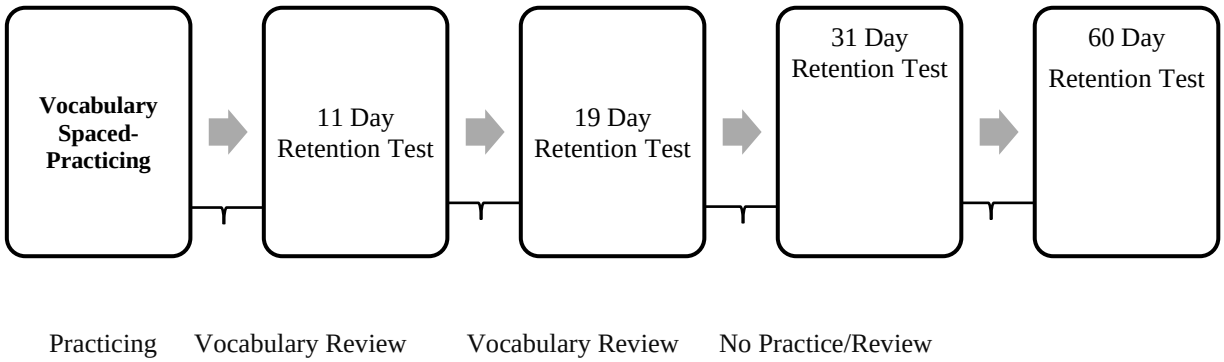

Figure 2 Vocabulary Retention Test

Research Tools

Research tools in this study consisted of the pre-test and post-test which involved 30 words and their meanings drawn from The Oxford 3000™ by CEFR level, which comprises the 3000 most critical words for English learners from A1 to B2 levels. To collect data, a vocabulary spaced-repetition writing tasks were utilized, consisting of 104 words categorized into four main groups: noun, verb, adjective, and adverb, all sourced from the Oxford 3000TM by CEFR level. The space repetition practice and revision schedule is presented in Table 1.

Data Analysis

Performance of the learners was compared by analyzing the pre- and post-test scores using the paired sample t-test. The vocabulary retention tests were compared to determine the effectiveness of spaced repetition in vocabulary retention using descriptive statistics.

Table 1 Vocabulary Spaced-repetition Practice and Revision Schedule

Word List No.	Practicing	Revision 1	Revision 2	Revision 3	Revision 4	Revision 5
1-20	Day1	Day4	Day8	Day20	Day22	Day25
21-40	Day3	Day6	Day11	Day15	Day20	Day26
41-60	Day5	Day7	Day12	Day15	Day20	Day22
61-80	Day7	Day12	Day14	Day17	Day21	Day28
81-104	Day9	Day12	Day16	Day21	Day26	Day29

Research Conceptual Framework

The conceptual framework of this study is grounded in the hypothesis that vocabulary acquisition and retention can be affected by engaging in vocabulary spaced repetition tasks. Specifically, our attention will be directed towards practicing The Oxford 3000™ by CEFR level words. This framework will facilitate the identification and analysis of vocabulary acquisition rates, as well as the retention of vocabulary following the utilization of spaced repetition tasks.

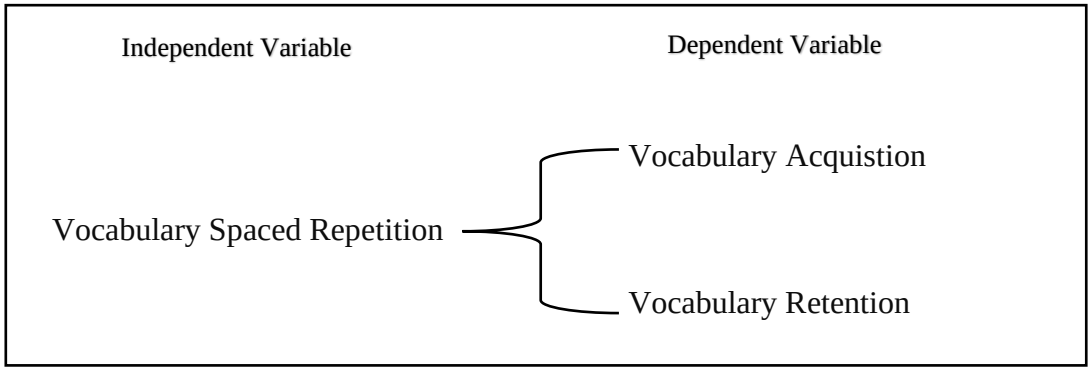

Figure 1 Research Conceptual Framework

Results

The vocabulary tests contrasted target vocabulary knowledge before and after the intervention. To analyze the results, a paired sample *t*-test was conducted to determine the effect of using the vocabulary spaced-repetition tasks. The results indicate a significant difference between the vocabulary test score before training (M=11.57; SD=2.46) and vocabualry test score after the intervention (M=21.93; SD=3.31); [t(29) = 29.29, p = .001]. This suggests that learners acquire a greater vocabulary knowledge following the utilization of spaced repetition tasks.

Table2 Vocabulary Test Score

Vocabulary Test Score	M	SD	*t*	P	Cohen's *d*
Post-test	21.93	3.31	29	0.001	1.94
Pre-test	11.57	2.46			

To answer research objective 2, the findings of the vocabulary retention tests (Figure 3) demonstrated that following a 10-day utilization of vocabulary spaced-repetition tasks, Thai English as a Foreign Language (EFL) learners exhibited the ability to recall approximately 79.77 percent of the 104 designated target words. Subsequently, after an extended practice duration of 18 days, the retention rate remained relatively high at approximately 79.57 percent. However, by the 31st day, there was a discernible decline in the recall percentage, which decreased to 78.27 percent. Notably, following a cessation of practice sessions, the retention

rate experienced a further decrease, with learners able to recall approximately 75.27 percent of the target words after a lapse of 60 days.

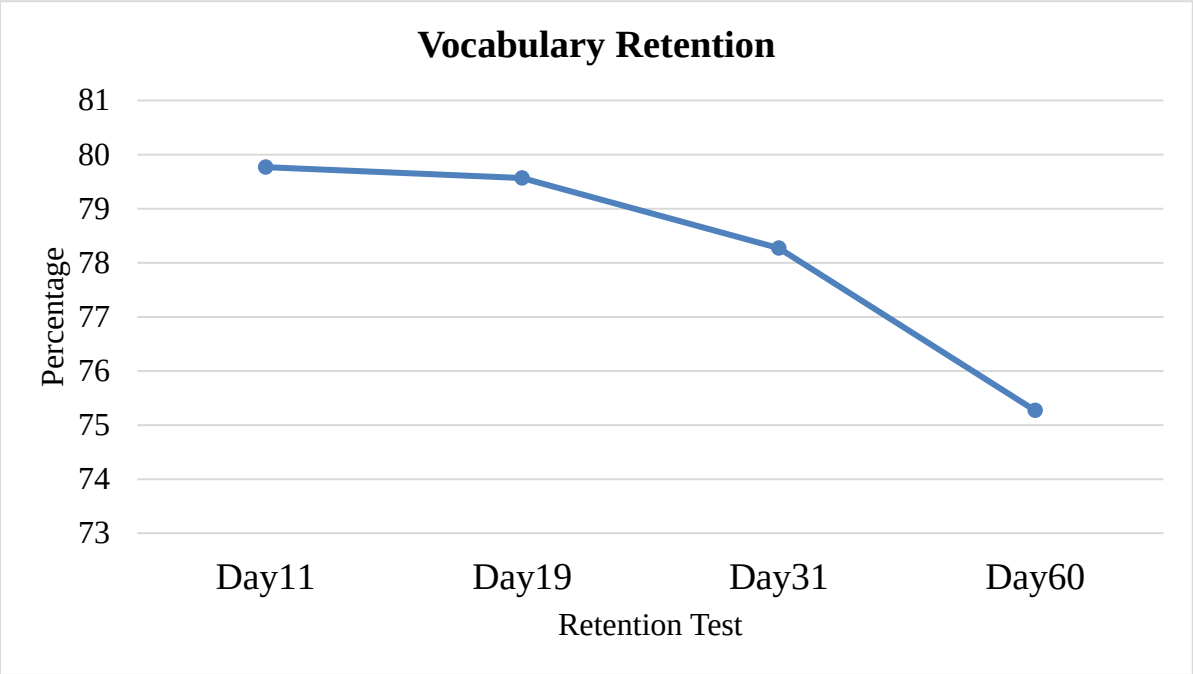

Figure 3 Thai EFL Learners' Vocabulary Retention Rate

Discussion

The findings of the paired t-test reveal a significant improvement in vocabulary test scores following the intervention employing spaced-repetition tasks. This result is consistent with previous research studies that have demonstrated the efficacy of spaced repetition in enhancing vocabulary acquisition and retention (Cepeda et al., 2006; Freed & Karpicke, 2016). For instance, the substantial increase in mean vocabulary test score from 11.57 to 21.93 indicates the effectiveness of spaced repetition in facilitating learning and memory consolidation. This finding aligns with the findings of Cepeda et al. (2006), who reported significant improvements in verbal recall tasks with distributed practice. Moreover, the negligible standard deviation of 2.46 before the intervention compared to 3.31 after the intervention suggests a reduction in variability and an increase in consistency among learners' vocabulary knowledge. This phenomenon can be attributed to the systematic and structured nature of spaced repetition, which provides learners with regular and spaced-out opportunities for practice and review, leading to more uniform levels of knowledge retention (Freed & Karpicke, 2016). Furthermore, the exceptionally high t-value of 29.29 and low p-value of .001 indicate a robust and statistically significant effect of the intervention on vocabulary test scores. These results underscore the effectiveness of spaced repetition as a pedagogical approach for enhancing vocabulary acquisition and retention among learners, highlighting its potential for application in educational settings to optimize learning outcomes.

Furthermore, the findings from the vocabulary retention tests provide valuable insights into the effectiveness of spaced-repetition tasks in enhancing vocabulary retention among Thai English as a Foreign Language (EFL) learners. These results align with previous research studies that have demonstrated the positive impact of spaced repetition on memory retention and learning outcomes (Cepeda et al., 2006; Freed & Karpicke, 2016). For instance, the initial high retention rate of approximately 79.77 percent following a 10-day utilization of spaced-repetition tasks is consistent with the findings of Cepeda et al. (2006), who reported significant improvements in memory retention with distributed practice. Similarly, the sustained retention rate of around 79.57 percent after an extended practice duration of 18 days corroborates previous research by Freed and Karpicke (2016), which emphasized the importance of spaced repetition in optimizing long-term memory retention. However, the observed decline in retention rate to 78.27 percent by the 31st day suggests the presence of the forgetting curve phenomenon, as highlighted by Ebbinghaus (1885), wherein memory retention diminishes over time without reinforcement. This finding underscores the need for continued practice and review to maintain optimal retention levels over extended periods. Furthermore, the significant decrease in retention rate to 75.27 percent after a lapse of 60 days underscores the importance of periodic review and reinforcement to mitigate the effects of memory decay over time. Overall, these findings underscore the effectiveness of spaced repetition in facilitating vocabulary retention among Thai EFL learners, while also highlighting the need for sustained practice and review to optimize long-term memory retention.

Conclusion

The findings of this study provide compelling evidence for the effectiveness of spaced repetition tasks in enhancing vocabulary acquisition and retention among learners. Consistent with previous research, the results demonstrate a significant improvement in vocabulary test scores following the intervention, underscoring the positive impact of spaced repetition on learning outcomes. The substantial increase in mean vocabulary test scores indicates the efficacy of spaced repetition in facilitating learning and memory consolidation. Additionally, the reduction in variability and increase in consistency among learners' vocabulary knowledge suggest the structured nature of spaced repetition, which provides regular and spaced-out opportunities for practice and review, leading to more uniform levels of knowledge retention. Moreover, the robust statistical findings further emphasize the significant effect of the intervention on vocabulary test scores. These results highlight the potential of spaced repetition as a pedagogical approach for optimizing learning outcomes in educational settings.

Suggestions

Suggestions for future research encompass a variety of avenues. Firstly, a longitudinal study could be conducted to evaluate the enduring impact of spaced repetition on vocabulary acquisition and retention by tracking participants over an extended period. Comparative analysis could provide insights into the relative efficacy of spaced repetition in comparison to traditional memorization techniques or immersive learning experiences. Investigating individual differences, including learner motivation and cognitive abilities, may shed light on how these factors moderate the effectiveness of spaced repetition, informing personalized learning strategies. Exploring the influence of cultural factors on the implementation and effectiveness of spaced repetition tasks among diverse learner populations could offer valuable

insights. Additionally, researching the integration of technology into spaced repetition methods, assessing pedagogical practices, developing retention strategies, and examining the generalization of spaced repetition techniques to languages beyond English are all crucial avenues for further exploration in enhancing vocabulary acquisition and retention.

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