The Role of Quizlet Learning Tool in Learners' Lexical Retention: A Quasi-Experimental Study

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Abstract—The integration of technologies into education, especially language learning, has become more prevalent in this information age. One of the widely used tools for supporting second language (L2) vocabulary acquisition is Quizlet. Despite its increased popularity, empirical research on the effectiveness of Quizlet in enhancing L2 learners' lexical retention is still limited. Furthermore, most works primarily used conventional statistical methods such as t-tests or ANOVA, which might generate errors of Type I and II. This study aims to fill in these gaps by examining the impact of Quizlet on the lexical gains of EFL students at a private institution in Vietnam. Fifty-nine undergraduates participated in the study and were separated into two groups. The control group (n = 28) did not utilize Quizlet during the in-class lessons, while the experimental group (n = 31) revised vocabulary using Quizlet on a weekly basis. During four weeks, both groups reviewed thirty-two target words, divided into four sets (one set including eight items). Each set was utilized for one week in class under the supervision of the teacher. The data from the pretest and posttest were analyzed using Generalized Linear Mixed Model to generate more reliable statistics. The results demonstrated that learners in the experimental group achieved significantly better scores than those in the control group. Therefore, it could be concluded that Quizlet should be implemented in the classroom as a review or practice activity on a regular basis.

Keywords—lexical retention, vocabulary, Quizlet, second language acquisition, effectiveness

1 Introduction

Vocabulary plays a pivotal role in second language acquisition (SLA), yet the process of learning and memorizing lexical items, especially academic ones, is not an easy task. Therefore, a growing body of research has been carried out to facilitate learners' acquisition of unfamiliar words [1]–[4], proposing a variety of techniques such as acquiring new words via quizzes [5], speaking [6], or television watching [7]. Over the past decade, many scholars have attempted to implement modern technology in buoying the retention of lexical items, referred to as CALL (computer-assisted language learning) or MALL (mobile-assisted language learning) [8]–[11].

Among these, Quizlet, an application for learning vocabulary on computers and mobile phones, stands out as a prominent tool since it features both CALL and MALL. Several studies have concluded that Quizlet could be useful for encouraging and developing vocabulary acquisition [12]–[14]. Nevertheless, past studies mainly concentrated on how learners perceived this tool [14]; experimental research on its usefulness is relatively scarce [15]. Furthermore, such works mostly followed the quasi-experimental design without a control group. Very little, or even none, has analyzed the obtained data from the pretest and posttest via Generalized Linear Mixed Model (GLMM) for more reliable outcomes [15]–[17]. Thus, it could be indicated that a further study employing a more robust design is needed to validate the results gained from previous research.

To address these gaps, this research aims to (a) explore whether Quizlet is an effective tool for helping learners to remember unfamiliar academic words longer and (b) examine the degree of difference in lexical gains between learners using this tool and those who do not.

The present study, therefore, seeks answers to the following questions:

1. Is Quizlet effective in improving learners' lexical retention?
2. To what extent is lexical retention of learners using Quizlet different from that of those who do not?

This study is significant due to a number of reasons. First, it provides insights into the effect Quizlet has on vocabulary learning, expanding previous research in second language acquisition. Second, it allows teachers and students to maximize their time and other resources that should be spent on Quizlet for reviewing vocabulary in class. Finally, further studies on other technological tools can use this research as a base for their design, which is fortified with a reliable method.

2 Literature review

2.1 Theoretical frameworks for vocabulary learning

The process of vocabulary acquisition and memorization is strongly supported by a number of hypotheses. The first one is known as *distributed learning*, which is the learning of new knowledge in small amounts over a long period of time, shown to be more efficient than *mass learning*, which is the acquisition of new knowledge in large amounts in a short time [18]–[20]. Therefore, vocabulary should be studied and practiced in small sets over the course of many class sessions instead of internalizing all at the same time. Such a theory is the foundation of the present study's design, which is to let learners review vocabulary on Quizlet in small sets rather than in a long list.

Another important theory is regarded as the *testing effect*, which contends that quizzes or tests have an impact on vocabulary acquisition because students are able to recognize their knowledge gaps and attempt to look for the information that can fill the missing piece [21], [22]. Quizlet not only includes tasks for learning but also tests for checking memory and understanding new words, which is well supported by the *testing effect* theory.

The *involvement load hypothesis* is another crucial theory that should be mentioned [23]. Laufer and Hulstijn propose three essential elements in language learning: need, search, and evaluation [23]. During their learning, students should be challenged via a problem which may trigger the need to seek for answers. Facing such a challenge, students will endeavor to look for the necessary information, evaluate the possibility of different solutions, and decide on the most suitable one. Quizlet also features these elements as it provides users with a variety of tasks and challenges to interact with.

It is obvious that Quizlet is a vocabulary learning tool that is supported by a number of important theories in SLA. Further information on this application and its effectiveness is discussed in a later part.

2.2   Quizlet as a vocabulary learning tool

Quizlet is a free website for learning vocabulary through flashcard sets and a range of game-like learning techniques. It is also compatible with Android and iOS, allowing users to access it at any time and in any location via mobile phones. Launched in 2005, Quizlet has attracted millions of language users all around the world who have contributed to the creation of hundreds of millions of vocabulary sets on the platform. Quizlet users, in the teacher role, may design courses to observe the learning of other users, in the student role [24].

Past studies have investigated the effect of Quizlet on vocabulary acquisition as well as how users' perspectives on this tool in different contexts [14], [25], [26], [27]. In the Vietnamese context, Phi attempted to explore the role of Quizlet in promoting learners' vocabulary via a study with the participation of 210 undergraduates [28]. The results of vocabulary tests, a survey, and interviews demonstrated that the participants were motivated to study English vocabulary via Quizlet and that they could enhance their vocabulary knowledge by using this tool. Similar research was conducted by Dizon [12] with Japanese university students utilizing Quizlet in the EFL (English as a Foregin Language) classroom. The findings of the pretest and posttests employed in the study demonstrated that the students made statistically significant lexical gains. In addition, the data collected from the questionnaire administered by the author revealed that the students had favorable opinions of Quizlet as a tool for studying vocabulary. Another empirical investigation of Quizlet by Lander revealed that undergraduate students preferred using Quizlet in English classes [29]. In addition, the exam scores of students who utilized Quizlet extensively increased by 6%, demonstrating the positive impact of Quizlet on lexical accomplishment. Nevertheless, these works only used the survey or quasi-experimental design, with no control group or with groups of non-equivalent characteristics, which may have led to data with questionable objectivity.

A recent quasi-experimental study on the effectiveness of Quizlet in vocabulary retention was conducted by Waluyo and Bucol [15]. In this research, the authors explored whether Thai university students, whose English proficiency was elementary, achieved better lexical gains after using Quizlet for vocabulary revision at home by themselves. Via data analysis using paired-sample t-tests, the authors found that the students made significant improvements in vocabulary tests after reviewing lexical items on Quizlet for five weeks at home. Nonetheless, in Waluyo and Bucol's study,

there was no control group. Furthermore, it is questionable whether the participants actually used the tool at home or not. These concerns cast doubt on the reliability and validity of the research.

In these studies, none has attempted to employ a modern statistical method such as the GLMM for more reliable outcomes. This, coupled with the aforementioned gaps, warrants further research to shed light on the effectiveness of Quizlet as a vocabulary learning tool.

3 Methodology

3.1 Participants

Fifty-nine EFL undergraduates (34 males and 25 females, aged 19–20) from a university in Vietnam took part in the research. Their English proficiency was equivalent to A2 according to the CEFR (Common European Framework for Reference of Languages), which was assessed based on the school's placement tests including reading, writing, and listening [30]. The number of the participants met the conditions set by the "a priori power analysis" tests in the G*Power 3.1 [31], which required at least 54 people for the within-between 2x2 ANOVA experimental design ($f = .25$, $\alpha = .05$, *power* = .95).

The participants were assigned into two intact groups, which were also their classes. One was the control group (1 class, n = 28), and the other was the experimental group (1 class, n = 31). While the students in the experimental group were instructed to use Quizlet for vocabulary practice in class, those in the control group reviewed vocabulary in a conventional instructional way (without the use of Quizlet).

3.2 The instruments

Before the treatment (Quizlet use), all students in the two groups took a paper-based vocabulary pretest which included fifty English words from their coursebook. They had twenty five minutes to write down the Vietnamese meanings of these target words without using dictionaries or exchanging information with their friends. If they did not know the meaning to a particular word, they were instructed to leave it unanswered. After the allotted time, the researchers collected the students' papers for grading. The participants would get 1 for a correct answer, which was relevant to the word's core meaning, and 0 for an incorrect answer, which did not relate to the core meaning in any way. The researchers marked each paper separately before comparing the scores together. Any discrepancies were resolved via in-depth discussions between the two researchers. In order to determine the vocabulary the participants needed to learn, the items that even one participant had previously known (mark = 1) were discarded. Finally, only thirty two words remained, which were the unfamiliar items to all participants. The target words are presented in Figure 1 below:

No.	Item (word form)	No.	Item (word form)
1	Essence (n)	17	Retain (v)
2	Expertise (n)	18	Transparent (adj.)
3	Intuition (n)	19	Recession (n)
4	Acquire (v)	20	Referrals (n)
5	Retain (v)	21	Optimal (adj.)
6	Gesture (n)	22	Evolve (v)
7	Means (n)	23	Distinction (n)
8	Facilitate (v)	24	Blur (v)
9	Systematic (adj.)	25	Complexity (n)
10	Myth (n)	26	Stem from (v)
11	Inferior (adj.)	27	Alternate (v)
12	Comparative (adj.)	28	Defect (n)
13	Cognition (n)	29	Convey (v)
14	Quip (v)	30	Taboo (adj.)
15	Imply (v)	31	Utterance (n)
16	Classification (n)	32	Substandard (adj.)

Fig. 1. The 32 lexical items

In the posttest, the participants were also required to provide the Vietnamese meanings to the 32 keywords as in the pretest. However, the order of the words was changed to avoid any possible testing effect. The grading procedure was similar to that in the pretest, with 1 for the correct answer and 0 for the incorrect one.

The 32 keywords were divided into four sets, Set 1 (Item 1 to 8), Set 2 (Item 9 to 16), Set 3 (Item 17 to 24), and Set 4 (Item 25 to 32). The two classes were instructed by the same teacher who taught Set 1 in the second week, and the other sets in week three, four, and five, respectively.

3.3 The procedure

During the first week of the research and also of the students' English course, both groups were asked to take the pretest on paper. Based on the answers and grades, the researchers removed the words that had previously been known by even one student, only retaining the unfamiliar items. On every Friday from week two to week five, while the experimental group reviewed the words in each set on Quizlet in class, the control group had the revision via conventional practice such as gap-filling or multiple-choice tasks in the coursebook. In particular, Set 1 was used in week two, Set 2 in week three, Set 3 in week 4, and Set 4 in week 5. The teacher supervised the revision activities in both groups in the same way, giving explanations and clarifications to any concerns of the students. Each session of vocabulary revision lasted for 20 minutes in each group.

On Quizlet, each set of words could be practiced via four different functions: *Flashcards* (viewing L1 meaning and English word), *Learn* (typing the word's L1 meaning), *Test* (choosing True or False based on words and meanings), *Match*

(matching L1 meanings and words into appropriate pairs). The four tasks are illustrated in Figures 2–5 below, respectively.
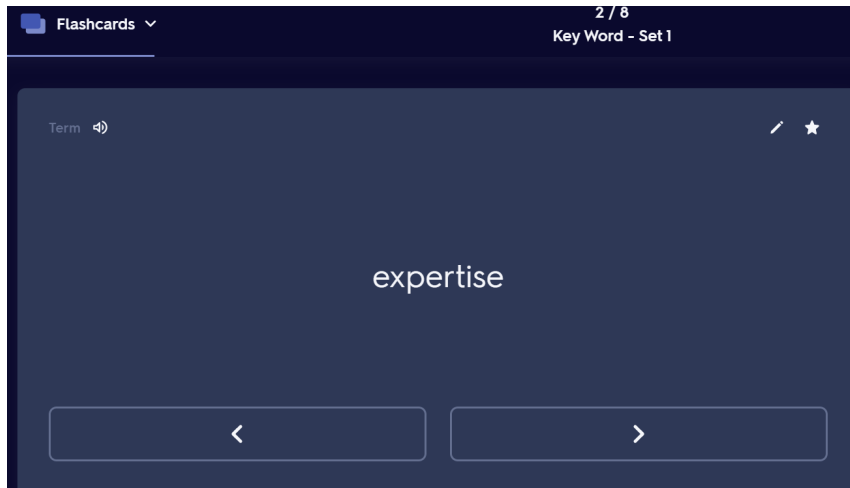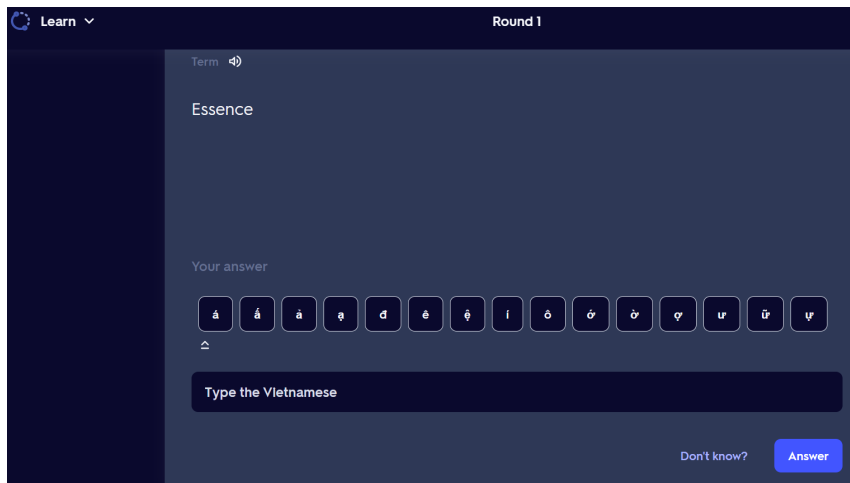

Fig. 2. *Flashcards* feature
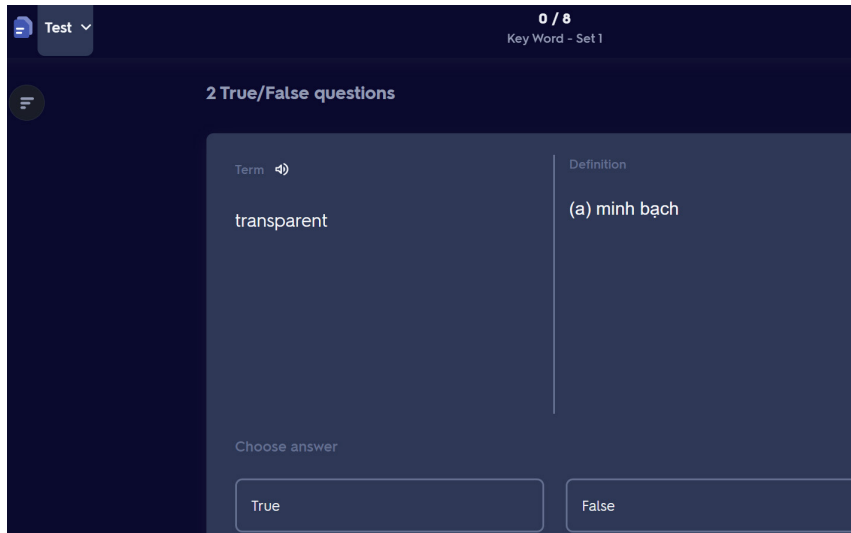

Fig. 3. *Learn* feature
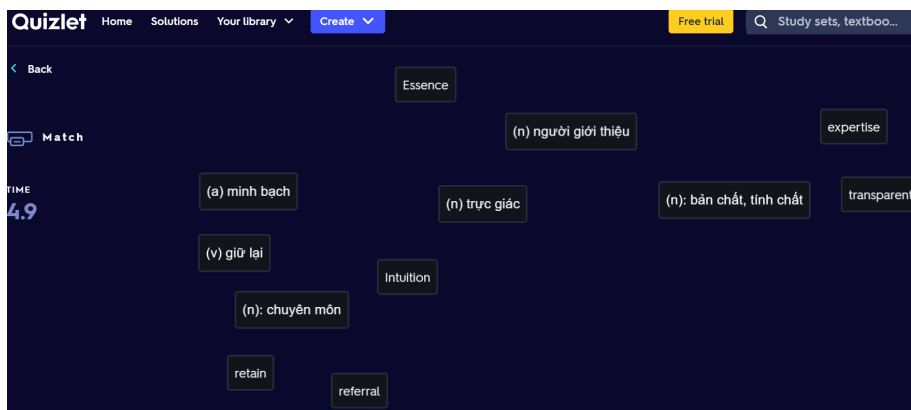
Fig. 4. *Test* feature

Fig. 5. *Match* feature

In week six, the researchers went to each class to conduct the posttest on paper, without prior notice to the students. No discussions or extra materials were allowed during the test. Upon completion, the students submitted their papers to the researchers.

The whole procedure is summarized in Table 1 below:

Table 1. Data collection procedure

Week	The Experimental Group	The Control Group
1	Took the pretest on papers Trained normally by their teacher	
2	Friday: reviewed vocabulary Set 1 using Quizlet	Friday: reviewed vocabulary via gap-filling or multiple-choice tasks
3	Friday: reviewed vocabulary Set 2 using Quizlet	
4	Friday: reviewed vocabulary Set 3 using Quizlet	
5	Friday: reviewed vocabulary Set 4 using Quizlet	
6	Took the posttest on papers without prior notice	

3.4 Statistical analysis

As the pretest only contained items that none of the participants had previously known, only the scores in the posttest were used for analysis. The two researchers marked the posttest papers independently, with 1 for the correct answers (related or relevant to the words' L1 meanings) and 0 for the incorrect ones (irrelevant to the words' core meanings). After that, Cohen's Kappa test was used to check the inter-rater reliability. The value $k = .98$ demonstrated that there was a strong agreement between the two raters. Following this, the researchers discussed all the differences in grading, if any, to reach the final scores for each participant.

The posttest scores were input manually into Microsoft Excel prior to further analysis via R software [32]. First, the Shapiro-Wilk tests were used to examine the distribution of the posttest scores in two groups. The results revealed that they were not normally distributed, either in the experimental group ($W = .606$, $p < .001$) or in the control group ($W = .625$, $p < .001$). As the scores were not normally distributed, conventional parametric tests such as t-tests could not be used. Thus, the Generalized Linear Mixed Model was employed to investigate the effect of Quizlet on students' lexical gains. The GLMM was helpful as it could cope with data of non-normal distribution as well as the random effects (i.e., individual differences) [33]. Moreover, it could avoid the problems of Type I and II errors that t-tests and ANOVA may produce [34].

In the present study, the dependent variable was the posttest scores, the groups (Quizlet use vs no Quizlet use) were treated as the independent variables (or fixed effects). The random effects were the participants as well as the lexical items (32 words). Furthermore, the family type was chosen as "binomial" because the scores were in a binary format (1 and 0). Consequently, the fitted model was formulated, run in R using the *lme4* package [35], as follows:

Scores ~ Groups + (1| participant) + (1| item)

4 Results

4.1 Research question 1: Is Quizlet effective in improving learners' lexical retention?

Table 2. Descriptive statistics for pretest and posttest

Group	Pre-Test			Post-Test		
	Mean	**SD**	**95% CI**	**Mean**	**SD**	**95% CI**
Control (n = 28)	0	0	0	0.29	0.15	[0.26–0.32]
Experimental (n = 31)	0	0	0	0.41	0.15	[0.38–0.44]

Table 2 shows that the participants in both groups got 0 in the pretest. This was because the researchers intentionally discarded all familiar items, only keeping the unknown words. In the posttest, the participants in the control and experimental groups achieved lexical gains compared to the pretest. With $M = .41$, much higher than the pretest value, it could be concluded that Quizlet was an effective tool to promote learners' memorization of unfamiliar words.

Although the experimental group ($M = .41$) achieved higher than the control group ($M = .29$), whether this difference was significant or not required further analysis using the GLMM.

4.2 Research question 2: To what extent is lexical retention of learners using Quizlet different from that of those who do not?

Table 3. Fixed effects from GLMM

	β	**SE**	**z**	**p**
Intercept	0.1138	0.2072	0.549	0.583
Control Group	−0.5216	0.1283	−4.065	*<.001****

Note: ***p value is significant at .01.

Table 3 represents a statistical significance in vocabulary retention between the two groups. In particular, students in the control group scored significantly lower than those in the experimental group ($β = −.5216$, $p < 0.01$), indicating that their learning technique (normal training) was less effective in memorizing L1 meanings of new words compared to the experimental technique (Quizlet). Overall, lexical retention of learners utilizing Quizlet was considerably better than those who did not.

5   Discussion

The quantitative analysis using a modern statistical method, the GLMM, in the present study has led to two major findings. First, it was found that reviewing vocabulary via Quizlet could enhance learners' retention of unfamiliar words. This aligns with past studies on the effectiveness of Quizlet as a vocabulary learning tool [20, 29]. There are a multitude of possible explanations for this consistency. As Quizlet learning sets were designed in the format of quizzes, some under time limits, the *testing effect* might have helped learners recognize their knowledge gaps and thus endeavored to memorize the words to fill in the missing information [21–22]. Another explanation is due to the *distributed learning* theory [18–20] which argues that lexical items should be taught and learned over a long period of time. In this study, the participants learned and practiced the words in four small sets on a weekly basis, which might lead to their improvements in vocabulary acquisition. Additionally, the *involvement load hypothesis* could have played an important role [23]. In fact, faced with a problem (quizzes or time limits), learners had the tendency (need) to find a way to solve the problem (search), assess its possibility (evaluate), and choose the most appropriate one. Via this process, their memorization of unfamiliar words might have been strengthened.

Second, the GLMM results showed that those who had vocabulary revision on Quizlet scored substantially higher than those who did not. This finding was in line with Phi [28] and Dizon [12]. The reason could be that learning via Quizlet was fun and enjoyable. This is evident through the interviews with students using Quizlet in previous studies, which demonstrated a positive outlook on Quizlet use [14, 25, 28, 36]. One more possible explanation is due to the game-like design of the activities on this platform [15]. There are a variety of tasks which are created in an intriguing way on Quizlet such as *Flash Cards, Learn, Test*, and *Match* to boost learners' motivation to study. This could also be the reason why Quizlet has become more popular with language learners around the world [24].

From a pedagogical perspective, there are two essential implications that can be drawn from the present study. For one thing, it is highly recommended that technological tools, such as Quizlet, be integrated into class sessions to spur students' vocabulary acquisition and memorization. As proved, Quizlet not only promotes higher lexical gains but also brings an enjoyable and interesting learning atmosphere for learners. In addition, teachers should instruct their students to learn vocabulary in small sets, with regular practice on Quizlet rather than trying to remember a long list of words over a short period of time. Despite its effectiveness, this learning tool should be utilized in moderation because frequent repetition may cause boredom [28, 36]. Finally, when implementing technology in the classroom, teachers should observe their students' use of laptops and mobile phones. This is to make sure that the students do not use those devices for private work which digresses them from the lessons.

6   Conclusion

The present study aims to examine the effectiveness of Quizlet in spurring L2 learners' vocabulary acquisition and retention. Via a quasi-experimental design including a pretest and a posttest with the participation of 59 Vietnamese undergraduates, it

was found that using Quizlet for vocabulary revision on a weekly basis significantly improved learners' lexical gains. Additionally, the participants who reviewed vocabulary on Quizlet enjoyed substantially higher gains than those who followed the conventional instructional method. Based on the findings, it is recommended that institutional leaders and teachers should endorse Quizlet as a learning tool into the classroom. Furthermore, lexical items need to be learned and practiced gradually, not altogether at once. Also, Quizlet should be used in moderation as the overuse may lead to boredom. Such findings make significant contributions to the existing literature because previous empirical research on Quizlet is relatively limited. Moreover, the use of the GLMM in the present study yields more reliable results, shedding light on the doubt in past research. Nevertheless, there are several limitations that need to be addressed. First, this study only employs quantitative data, which means insights into learners' perceptions remain undiscovered. Second, the focus is only placed on L1 meanings, not on English meanings or the forms of the words. Therefore, future researchers should investigate the effect of Quizlet on learners' retention of such aspects, coupled with qualitative data such as interviews to bring more in-depth information on Quizlet effectiveness and learners' perspectives on this learning tool.

7 References

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