

The Effectiveness of Quizlet in Improving EFL Learners' Receptive Vocabulary Acquisition

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Abstract

This study compares the efficacy of a digital app, Quizlet, versus traditional paper flashcards in the second language (L2) vocabulary acquisition. These learning tools were examined in terms of L2 learners' receptive vocabulary development, linguistic environments, and perceptions. The study employed a pretest-posttest, quasi-experimental design whereby 121 English vocabulary items were taught to an intact class of 39 high school students in Vietnam over four weeks. In this study, the students were assigned into two groups: Group A used Quizlet while group B, paper flashcards (PFs) for the first two weeks. Then, they swapped the learning tools in the following two weeks. Data consists of their test scores, questionnaire responses, and audio-visual recordings of six randomly selected participants' individual learning activities during interventions. Results suggest that both Quizlet and PFs enhanced L2 vocabulary learning; however, Quizlet did so more effectively than PFs. The findings can be explained by Moreno's and Mayer's Cognitive-Affective Theory of Learning with Media, the different linguistic environments created by the instruments, and the participants' perceptions of the tools.

Keywords

EFL (English as a foreign language), vocabulary learning, Quizlet, digital app, paper flashcards

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Introduction

Lexical learning is central to L2 (second language) learning. L2 learners need to develop a rich L2 vocabulary to attain high proficiency as, according to Levelt's lexical hypothesis, words play the central role in generating utterances (17). Therefore, a number of vocabulary learning strategies have been developed to facilitate the memorisation of L2 vocabulary. Among them, PFs (paper flashcards) have been traditionally used in language classrooms due to their usability and effectiveness in increasing vocabulary size (Elgort and Nation 101). On the other hand, rapid advances in information communication technologies (ICT) in recent years have provided alternatives to traditional learning methods. One of them is Quizlet – a popular flashcard app with 40 million users every month (Dizon 45). Pedagogically sound digital tools should, however, incorporate learning principles supported by current research in education and cognitive science. Moreover, given the importance of receptive vocabulary to ensure the comprehension of natural texts, this study investigates the efficacy of Quizlet as compared with traditional PFs in the learning of L2 receptive vocabulary.

The theoretical framework of the research is the Cognitive Affective Theory of Learning with Media (CATLM, Moreno and Mayer 313). According to CATLM, “humans have separate channels for processing different information modalities” (313), and the channels operate on limited working memory capacity. The theory also suggests that affective factors such as attitude and motivation can determine the amount of cognitive effort devoted to a learning task (Moreno and Mayer 313). Thus, CATLM is used to interpret the efficacy of Quizlet and PFs in the current study. Additionally, the study followed Miyamoto's digital project evaluation framework for learning tools from three viewpoints: (i) learners' linguistic development, (ii) linguistic environments the tools created; and (iii) learners' perceptions of the tools (qtd. in Kawaguchi 441). Many digital tools have become available in recent years, and educators try to incorporate such tools in their teaching. Adopting a specific digital tool tends to depend on the tool's availability and innovativeness rather than educational effectiveness. It is, however, essential to evaluate the educational values of the tool. Quizlet has become popular for vocabulary learning, but is Quizlet truly better than the traditional PFs in all three viewpoints above? In order to investigate the effectiveness of Quizlet, the following research questions (RQ) will guide this research:

RQ1: Do Vietnamese high school students achieve significant vocabulary gains with Quizlet and PFs?

RQ2: Is there any significant difference in the learners' vocabulary gains through their using either of these two tools?

RQ 3: Are there any critical differences between the multimodal linguistic environments created by Quizlet and PFs?

RQ4: What are Vietnamese high school students' perceptions of these two tools?

L2 vocabulary acquisition and form-meaning connections

Vocabulary knowledge includes knowledge of receptive and productive vocabulary. Receptive vocabulary refers to the words that language learners can comprehend when they listen to or read them, while productive vocabulary refers to the words that the learners use when speaking or writing (Webb 79). Laufer's study suggests that L2 learners with the most frequent 3,000-word families' receptive knowledge are able to comprehend most authentic reading texts (131).³ Additionally, if an L2 learner has a receptive vocabulary size of 6,000 to 7,000 word-families, they can understand 98% of the words in spoken texts (Nation, "How" 77). Thus, L2 learners need to increase their L2 receptive vocabulary size to develop their receptive skills and overall proficiency in L2.

Every vocabulary item contains several aspects that L2 learners need to acquire. Among them, the written and spoken forms, and their meaning, are basic knowledge that people usually acquire in early stages of vocabulary acquisition. These can be "stored, manipulated and learned separately" and "a form can be recognised, but not linked to a fully elaborated meaning and vice versa" (Juffs 185-186). However, whether a language learner can make word-form connections will "determine how readily the learner can retrieve the meaning when seeing or hearing the word form, and retrieve the word form when wishing to express the meaning" (Nation, *Learning* 73). Therefore, it is worth investigating vocabulary learning methods that facilitate the establishment of form-meaning connections.

Information communication technology (ICT) and multimodality in second language acquisition (SLA)

The digital era has seen a marked increase in the use of ICT in teaching and learning second languages. This is mainly due to the substantial resource provided by the technologies which can be used to develop L2 proficiency (Levy 777). As stated by Kenning, thanks to satellite televisions and the Internet, "exposure to, and communication in, a foreign language no longer entail travelling to the extent that they used to do" (159). Thus, advances in ICT can give solutions to the lack of L2 input, interaction, and output, all of which are essential to L2 acquisition (Krashen; Long; Swain). Several studies have suggested the efficacy of ICT in L2 acquisition (Awada et al.; Bower and Kawaguchi; Fukui and Kawaguchi; Ngo and Lee; Nicolas and El-aly; Qian and McCormick; Smith; Thang et al.; Yanagisawa et al.). In addition, ICT has enabled L2 learners to learn the target language via various modalities. For example, when watching videos in L2 subtitles, they practice their listening skills and acquire new words in the language. According to

³An example of a work family of the word *approach* includes *approaches*, *approaching*, *approached*, *approachable*, *approachability*, and *unapproachable*.

Kress and Leeuwen, multimodality is “the use of several semiotic modes in the design of a semiotic product or event, together with the particular way in which these modes are combined” (20). Other studies have shown that the multimodal learning environment benefits L2 vocabulary acquisition (Mohsen; Khezrlou et al.).

Cognitive Affective Theory of Learning with Media (CATLM, Moreno and Mayer 313) provides several explanations for the effects of multimodality in education. According to CATLM, humans process auditory and verbal information within the auditory channel, and visual and pictorial information in the visual channel. Another assumption of the theory is the limited capacity for cognitive processing of the channels (Moreno and Mayer 313). Thus, presenting information via both auditory and visual modalities enables it to be processed within two channels, preventing cognitive overload. The multimodal presentation, in other words, allows the learner to take advantage of both channels’ cognitive processing capacity. Additionally, according to CATLM, affective factors can influence learning (Moreno and Mayer 313). For instance, if a student is more cognitively engaged in a lesson because it relates to their interest, this would, in turn, promote better learning outcomes. Therefore, the theory is suitably applied to the investigation of the effects of multimodality in SLA.

Paper flashcards (PFs) and Quizlet as vocabulary learning tools

Paper flashcards (PFs) are a popular, traditional tool for deliberate vocabulary learning. Typically, they are “doubled-sided cards” which learners can use to “practise form-to-meaning and meaning-to-form recall in repeated retrieval of L2 words, by flipping the front and backsides of the cards” (Hung 107). According to Elgort, deliberately learning vocabulary activities, e.g., with PFs, can result in the “establishment of formal-lexical and lexical-semantic representations of L2 vocabulary items” (395). Furthermore, since the tool “triggers the acquisition of functional aspects of vocabulary knowledge,” L2 learners can automatically access and use the vocabulary in communication (397).

Learners’ deliberate attention to word form and meaning connections, triggered by PFs, may then speed up vocabulary acquisition. Additionally, the tool allows retrieval practice. The effort users make when they retrieve the form and meaning of a word can help them memorise and retain it (Barcroft 37). Moreover, L2 learners can use PFs to practice spaced repetition given that recalling “spaced items” can give them some challenges, and, according to Nation, “successful but difficult retrievals are better for memory than successful but easy retrievals” (*Learning* 454).

With the advent of ICT, L2 learners can learn vocabulary with not only paper flashcards (PFs) but also digital flashcards (DFs). Currently, one of the most popular digital flashcard apps is Quizlet, with 40 million users every month (Dizon 45). DFs on Quizlet are similar to PFs as they include pictures, forms,

and meaning of a word on two sides. The notable difference between them is that DFs, but not PFs, enable learners to listen to the pronunciation of the word thanks to text-to-speech technology. Figure 1 illustrates the home page of Quizlet.

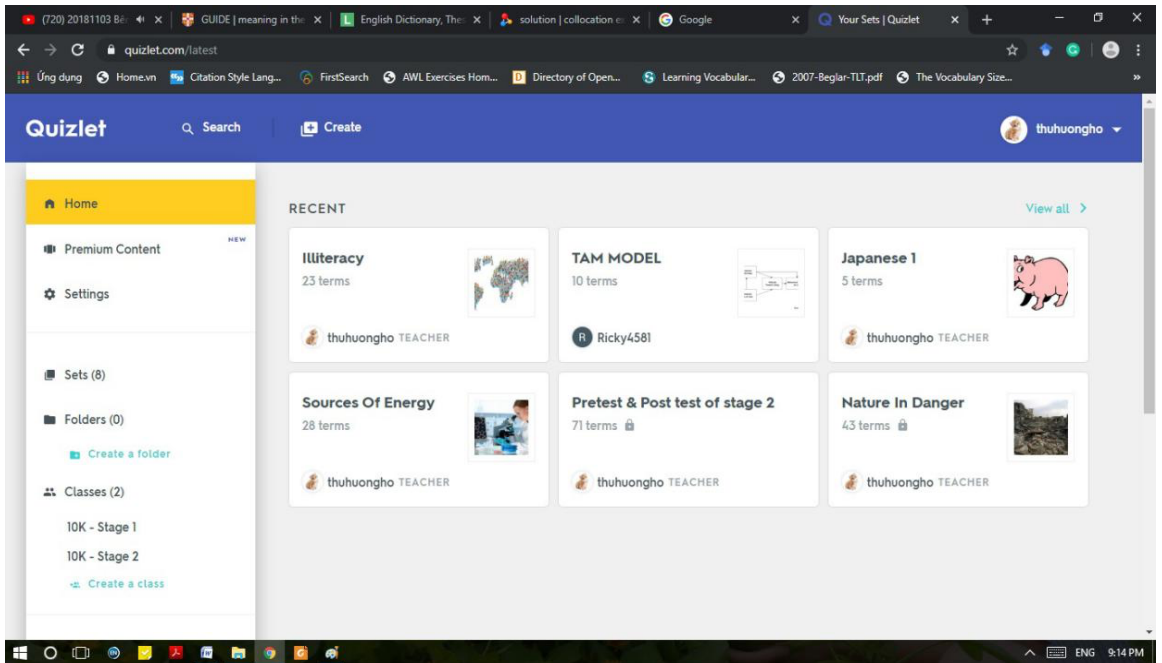


Fig. 1. Quizlet home page

Quizlet users can create their own DFs and use a variety of learning activities with the app. Activities are categorised as either Study or Play modes. Study modes include Flashcards, Learn, Write, Spell, and Test functions. In addition to DFs in Flashcards, the users can answer questions about written forms and meanings of words in Learn, Write, and Test. Besides, they must type written forms of the words that they hear in Spell. Play modes (i.e., games) include, on the other hand, Match, Gravity, and Live. When playing Match, users need to match words with their meanings. In Gravity, they must type correct answers to questions about written forms and meanings of words to prevent asteroids from falling. Both of the games are for individual use. In contrast, Live is a group game. Users are required to work in groups and answer multiple-choice questions about written forms and meanings of words.

A number of studies have compared the effectiveness of PFs with that of DFs in facilitating L2 vocabulary acquisition (Ashcroft et al.; Azabdaftari and Mozaheb; Başoğlu and Akdemir; Kiliçkaya and Krajka; Lees; Nikoopour and Kazemi; Sage et al.). According to Azabdaftari and Mozaheb, Başoğlu and Akdemir, Kiliçkaya and Krajka, DFs were more effective than PFs in developing L2 vocabulary. On the other hand, the other studies suggested that there was no significant difference between the efficacy of DFs and PFs in L2 vocabulary acquisition. Possible reasons for this result are limited Internet access and learners' preferences for PFs (Ashcroft et al.; Lees; Nikoopour and Kazemi; Sage et al.).

Despite the mixed findings, all the previous studies are similar in several ways. Firstly, all of them examined only group values (i.e., one group using PFs and another DFs) but did not investigate individual performance. However, "individual analysis" is crucial to research on ICT-assisted learning, since individual learners' considerable control over digital learning activities can determine the effectiveness of the activities (Kawaguchi 440). Secondly, in those studies, the linguistic environments created by DFs and PFs were not examined, although input, output, and interaction are key factors contributing to language acquisition (Krashen; Long; Swain). From the literature review, there is a clear research gap in aspects such as the relationship between L2 learners' linguistic development (i.e., vocabulary gains), the different linguistic environments provided by PFs and DFs, and the learners' perceptions of the tools. The current study examines these three aspects concerning PFs and Quizlet in order to identify possible reasons for the tools' effectiveness.

Methodology

Participants

This study involved an intact class of thirty-nine grade ten students (thirty-six female and three male) in a public high school in Vietnam. All of the participants are Vietnamese and have been living in Vietnam since birth. They have been learning English for more than seven years and currently attend three compulsory 45-minute English lessons weekly. All of them have smartphones and computers connected to the Internet, so they would not encounter any problem with accessing Quizlet. Also, they participated in the study voluntarily. Signed consent forms were obtained from them before the commencement of the research.

Learning materials and tools

Four reading texts were selected from *Tiếng Anh 11* (Hoàng et al. 47-125) - English textbooks for grade 11 students in Vietnam. These four texts were used as learning materials for participants during the experiment. One hundred twenty-one vocabulary items selected from the passages were identified as the target (see

Appendix A). The students used PFs and Quizlet to acquire target vocabulary. All the learning tools were prepared by the project's researchers.

Quizlet: The researchers created 121 DFs on the app. Each flashcard contained, on the front side, a target word, its word category, a sentence example including the target word, and a speaker icon so that participants could listen to the target word when clicking on it. On the back of the flashcard, there was the L1 (Vietnamese) translation of the target word. The L1 translation makes learners focus fully on the word itself. This facilitates memorisation of new words more effectively than L2 definitions (Laufer and Shmueli 103). Additionally, when the word could be represented by an image, the flashcard included such image on the back as according to Nation, pictures “may result in a deeper type of processing” (*Learning* 449). Apart from DFs, participants could use the other available Study and Play modes to memorise target vocabulary.

PFs: Researchers created 39 sets of 121 PFs (4.25 x 5.5 cm) for participants and 121 PFs (21 x 29.7 cm) for teaching. The PFs sets have all the same 121 target words, each flashcard with their L1 (Vietnamese) translation, an example sentence and pictorial representation just like the DFs on Quizlet. However, due to their *paper* nature, learners are not able to listen to target word. Instead, the front of each PF contained the phonetic transcription of the target word. Participants could use it to revise the words' pronunciation because they had already learned, in class, the International Phonetic Alphabet (Hoàng10). Regarding individual learning activities, participants could use PFs to retrieve forms and meanings of target words.

Intervention procedure, recordings of individual learning activities and questionnaire

At the beginning of the study, participants were required to take the Vietnamese bilingual version of the English Vocabulary Size Test (Nation and Beglar; Nguyen and Nation) as the baseline test in one hour. This test was used to measure only their vocabulary size since, given that all the test item choices were written in Vietnamese (the participants' L1) neither their English grammar nor their reading comprehension were tested (Nguyen and Nation 90). Participants were divided into two equivalent groups based on the test results: group A had 20 participants, coded A1 to A20 to protect anonymity and confidentiality, and group B had 19 participants (coded B1 to B19). The English vocabulary size of participants in each group ranged from 1,000 to 2,900 words. On the same day of their vocabulary size test (VST), all participants were instructed on how to use PFs and Quizlet for vocabulary learning.

After that, they were required to participate in a quasi-experiment (see Figure 2) with pre-tests and post-tests over approximately two months. The experiment was conducted at their school during after school hours so that they did not have any problems following their ordinary lessons. During the

experiment, the participants were taught 50 target words in intervention 1 (over two weeks) and 71 target words in intervention 2 (over two weeks). Group A used PFs, and group B Quizlet in intervention 1. They swapped the learning tools in intervention 2. Therefore, both groups were given equal opportunities to learn vocabulary with Quizlet and PFs. This method was adopted to counterbalance the order effect.

During the experimental period, each group attended two 60-minute teaching sessions each week over four weeks. The lessons were delivered in both Vietnamese and English to ensure that, the students could understand the teacher's instructions adequately. Each lesson followed a set routine. Firstly, the teacher used, depending on the group, either Quizlet or PFs to teach target vocabulary. Next, the participants were required to read the reading passage in seven minutes. Following that, they had to tell which sentences contained target words. Then, the teacher used these sentences to explain collocations and parts of speech of the words to the participants. After this, they used either Quizlet or PFs to learn target words individually in ten minutes. The last activity was group-based. In the lesson with PFs, participants in small groups had to group the cards containing the target words with the ones having their L1 translations. In the lesson with Quizlet, the group activity was Live.

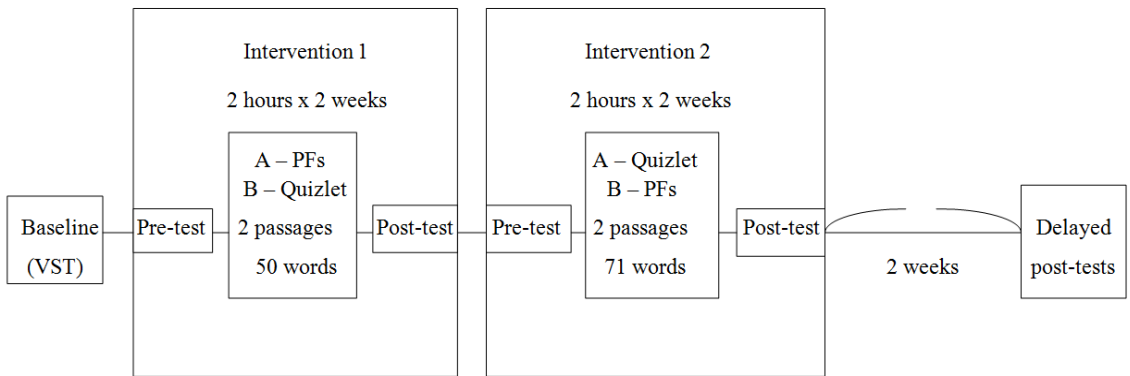


Fig. 2. Graphic presentation of the experiment flowchart

Pre-tests, immediate post-tests and delayed post-tests

The current study aimed to compare the efficacy of Quizlet versus PFs to L2 receptive vocabulary acquisition. Thus, participants took two pre-tests, two immediate post-tests, and two delayed post-tests (see Appendix A), so that their vocabulary gains can be measured individually and as a group. The tests were all paper-based, and each of them included a listening section and a multiple-choice one. The listening section aimed to quantify participants' word-form gains, while

the multiple-choice section was used to quantify the learners' word-meaning gains. Participants' vocabulary gains refer to word-form and word-meaning gains.

In the listening section, test takers listened to one target word at a time and spelled it out. The multiple-choice section was modelled on the Vocabulary Size Test (Nation and Beglar) and consisted of multiple-choice questions. Each of the questions included a target word, a simple non-defining sentence including the word, and four choices. All the choices in the tests were written in participants' L1 (Vietnamese), so the vocabulary tests assessed their knowledge of target vocabulary, not English grammar and reading skills (Nguyen and Nation 90). Immediate post-test 1 and delayed post-test 1 were the same as pre-test 1. Each of the tests consisted of a total of one-hundred questions about the target words taught during intervention 1, and lasted forty-five minutes. Also, immediate post-test 2 and delayed post-test 2 were similar to pre-test 2. Each of these had a total of 142 questions about the vocabulary items taught in intervention 2 and lasted one hour.

The pre-test was taken one day before the lesson in order to investigate whether participants already knew the target words taught in each intervention or not. The immediate post-test was used to test how many words participants learned after the intervention and was administered one day after the last teaching session of the intervention. The delayed post-test was taken two weeks after the intervention and aimed to examine whether participants retained target words after a certain period of time (see Figure 2 for the testing schedule).

The multimodal linguistic environments created by PFs and Quizlet: Recordings of individual learning activities

Another aim of the current study was to investigate the multimodal linguistic environments created by PFs and Quizlet. Therefore, three participants in each group (A1, A10, A17, B6, B14 and B34) were randomly selected, and each of them was recorded twice: while individually learning target vocabulary with PFs (video recording) and while doing that on Quizlet (screen-capture recording). Each of the video recordings lasted approximately 10 minutes.

Questionnaire about students' perceptions of Quizlet and PFs

All participants completed an online questionnaire through Survey Monkey (see Appendix B) one week after intervention 2. The questionnaire was written in Vietnamese and included eight questions. Questions one and two asked participants to report how often they learned target vocabulary with either PFs or Quizlet outside the classroom. The next two questions were about the length of each self-study session the participant spent. Questions five and six were in the Likert format. They included two question items about the enjoyment of learning vocabulary with the tools. Additionally, according to Davis's technology acceptance model, a person's "behavioral intention" of using a technology can be

predicted by his or her “perceived usefulness” and “ease of use” of the technology (333). Thus, other question items in questions five and six asked about participants’ perceptions of the effectiveness of Quizlet and PFs in developing vocabulary and the ease of using them.

Data analysis

In the pre- and post-tests, each question was worth one score. The researchers marked all of them manually, and then analysed participants’ scores with t-tests. The dependent t-test was used to identify statistical significance of participants’ gains after learning target words with PFs and Quizlet in each intervention. The independent t-test was employed to compare vocabulary gains of groups A and B. As for the multimodal linguistic environments created by PFs and Quizlet, the data collected from video recordings and screen captures were analysed to find out the input, output producing opportunities, and feedback provided by the tools. Regarding students’ perceptions of the two tools, participants’ responses to the questionnaire were analysed using descriptive statistics. Additionally, keyword analysis was performed using KWIC Concordance software (Tsukamoto) to evaluate the students’ open comments in the questionnaire.

Results and Discussion

Vocabulary gains with either PFs or Quizlet

One research question of the current study is whether participants achieved substantial vocabulary gains using either PFs or Quizlet. Vocabulary gains refer to word-form gains and word-meaning gains, measured respectively through listening and multiple-choice sections of pre-tests, immediate post-tests, and delayed post-tests. Paired t-tests were used to compare participants’ scores in the tests with two tools. Also, the Bonferroni correction is applied to offset the chances of a Type 1 error for the analyses, so the level of statistical significance was set at $p < 0.0167$ ($0.05/3$).

Word-form gains: Tables 1 and 2 illustrate the results of dependent t-tests on group A and group B scores in listening sections respectively. Each table includes total scores (N), mean scores (Mean), percentages of the target words that the learners knew or remembered on average, range values (Range), and standard deviations (SD).

Table 1

Dependent t-tests of group A scores in listening sections

	Intervention 1 (PFs)			Intervention 2 (Quizlet)		
	Pre-test1	Immediate post-test1	Delayed post-test1	Pre-test2	Immediate post-test2	Delayed post-test2
N	50	50	50	71	71	71

Mean	1.15 (2.3%)	14.90 (29.8%)	4.25 (8.5%)	13.00 (18.3%)	32.80 (46.2%)	27.35 (38.5%)
Range	0-6	9-21	1-8	6-20	16-62	10-49
SD	1.53	3.35	2.20	3.93	13.85	11.22

/: percentage of target words that participants knew or remembered on average

Group A obtained significantly higher scores in the listening sections of immediate post-test 1 ($t = 15.3289, p < 0.0001, \text{Cohen's } d = 3.428, df = 19$) and delayed post-test 1 ($t = 5.0393, p < 0.0001, \text{Cohen's } d = 1.127, df = 19$) than in the listening section of pre-test 1. Additionally, their scores in listening sections of immediate post-test 2 ($t = 6.0942, p < 0.0001, \text{Cohen's } d = 1.363, df = 19$) and delayed post-test 2 ($t = 5.4376, p < 0.0001, \text{Cohen's } d = 1.216, df = 19$) were markedly better than those in their listening section of pre-test 2. However, they showed significantly lower scores in the listening section of delayed post-test 1 than in the listening section of immediate post-test 1 ($t = 25.4488, p < 0.0001, \text{Cohen's } d = 5.689, df = 19$). Similarly, their scores in the listening section of delayed post-test 2 were significantly lower than those in their listening section of immediate post-test 2 ($t = 4.12, p = 0.0006, \text{Cohen's } d = 0.923, df = 19$).

Table 2

Dependent t-tests of group B scores in listening sections

	Intervention 1 (PFs)			Intervention 2 (Quizlet)		
	Pre-test1	Immediate post-test1	Delayed post-test1	Pre-test2	Immediate post-test2	Delayed post-test2
N	50	50	50	71	71	71
Mean	0.11 (0.22%)	37.47 (74.9%)	15.11 (30.2%)	13.63 (19.2%)	28.47 (40.1%)	18.89 (26.6%)
Range	0-1	30-44	8-26	2-29	13-58	10-34
SD	0.32	4.71	4.59	5.48	14.63	7.18

/: percentage of target words that participants knew or remembered on average

Group B performed significantly better in listening sections of immediate post-test 1 ($t = 35.3384, p < 0.0001, \text{Cohen's } d = 8.105, df = 18$) and delayed post-test 1 ($t = 14.4999, p < 0.0001, \text{Cohen's } d = 3.327, df = 18$) than in the listening section of pre-test 1. Similarly, they obtained significantly higher scores in listening sections of immediate post-test 2 ($t = 4.2895, p = 0.0004, \text{Cohen's } d = 0.984, df = 18$) and delayed post-test 2 ($t = 3.2892, p = 0.0041, \text{Cohen's } d = 0.754, df = 18$) than in the listening section of pre-test 2. However, they obtained significantly lower scores in the listening section of delayed post-test 1 than in the listening section of immediate post-test 1 ($t = 26.5683, p < 0.0001, \text{Cohen's } d = 6.095, df = 18$). Additionally, their scores in the listening section of delayed post-

test 2 were significantly lower than those in their listening section of immediate post-test 2 ($t = 3.9506$, $p = 0.0009$, Cohen's $d = 0.907$, $df = 18$).

Word-meaning gains: Tables 3 and 4 represent dependent t-tests of group A and group B scores in multiple-choice sections, respectively.

Table 3

Dependent t-tests of group A scores in multiple-choice sections

	Intervention 1 (PFs)			Intervention 2 (Quizlet)		
	Pre-test1	Immediate post-test1	Delayed post-test1	Pre-test2	Immediate post-test2	Delayed post-test2
N	50	50	50	71	71	71
Mean	32.20 (64.4%)	38.60 (77.2%)	36.10 (72.2%)	30.95 (43.6%)	58.75 (82.7%)	43.15 (60.8%)
Range	20-40	30-46	27-43	13-58	35-71	28-54
SD	5.66	4.56	4.32	11.49	12.46	8.16

%.: percentage of target words that participants knew or remembered on average

Group A performed significantly better in multiple-choice sections of immediate post-test 1 ($t = 6.3600$, $p < 0.0001$, Cohen's $d = 1.422$, $df = 19$) than in the multiple-choice section of pre-test 1. In addition, their scores in multiple-choice sections of immediate post-test 1 and delayed post-test 1 were not significantly different ($t = 1.7855$, $p = 0.0902$, Cohen's $d = 0.399$, $df = 19$). Moreover, their scores in the multiple-choice section of delayed post-test 1 ($t = 2.3877$, $p = 0.0275$, Cohen's $d = 0.534$, $df = 19$) were not significantly higher than those in their multiple-choice section of pre-test 1. Besides, their scores in multiple-choice sections of immediate post-test 2 ($t = 9.9276$, $p < 0.0001$, Cohen's $d = 1.633$, $df = 19$) and delayed post-test 2 ($t = 3.6527$, $p = 0.0017$, Cohen's $d = 0.817$, $df = 19$) were significantly higher than those in their multiple-choice in pre-test 2. However, the group obtained significantly lower scores in the multiple-choice section of delayed post-test 2 than in the multiple-choice section of immediate post-test 2 ($t = 6.2064$, $p < 0.0001$, Cohen's $d = 1.387$, $df = 19$).

Table 4

Dependent t-tests of group B scores in multiple-choice sections

	Intervention 1 (PFs)			Intervention 2 (Quizlet)		
	Pre-test1	Immediate post-test1	Delayed post-test1	Pre-test2	Immediate post-test2	Delayed post-test2
N	50	50	50	71	71	71

Mean	31.05 (62.1%)	48.37 (96.7%)	39.58 (79.2%)	27.95 (39.4%)	57.63 (81.2%)	34.74 (48.9%)
Range	16-40	45-50	30-47	12-39	40-71	26-47
SD	6.70	1.67	4.43	6.84	9.74	6.55

%; percentage of target words that participants knew or remembered on average

Similarly, group B scores in multiple-choice sections of immediate post-test 1 ($t = 10.4887$, $p < 0.0001$, Cohen's $d = 2.407$, $df = 18$) and delayed post-test 1 ($t = 6.5544$, $p < 0.0001$, Cohen's $d = 1.504$, $df = 18$) were remarkably better than those in their multiple-choice section in pre-test 1. Also, the group obtained higher scores in multiple-choice sections of immediate post-test 2 ($t = 12.2252$, $p < 0.0001$, Cohen's $d = 2.615$, $df = 18$) and delayed post-test 2 ($t = 4.3500$, $p = 0.0004$, Cohen's $d = 0.998$, $df = 18$) than in the multiple-choice section of pre-test 2. However, the group showed significantly lower scores in the multiple-choice section of immediate post-test 1 ($t = 8.261$, $p < 0.0001$, Cohen's $d = 1.896$, $df = 18$) than in the multiple-choice section of delayed post-test 1. Also, their scores in the multiple-choice section of immediate post-test 2 ($t = 8.7159$, $p < 0.0001$, Cohen's $d = 1.999$, $df = 18$) were significantly lower than those in their multiple-choice section of delayed post-test 2.

To summarise, since groups A and B obtained higher scores in immediate post-tests and delayed post-tests than in pre-tests, they made considerable vocabulary gains after learning target vocabulary with both PFs and Quizlet. Thus, both Quizlet and PFs are effective in developing L2 vocabulary. The finding is in line with previous research into these tools (Ashcroft et al.; Azabdaftari and Mozaheb; Başoğlu and Akdemir; Kiliçkaya and Krajka; Lees; Nikoopour and Kazemi; Sage et al.). However, participants in both groups experienced attrition with the target vocabulary as shown in the delayed posttest. This result indicates that the newly learned vocabulary items should be revised regularly for vocabulary retention.

Vocabulary gains comparison between groups using PFs and those using Quizlet

Another research question is the efficacy of Quizlet versus PFs. The two groups' word-form gains (i.e., scores in listening sections of pre-tests, immediate post-tests and delayed post-test) and word-meaning gains (i.e., scores in multiple-choice sections of pre-tests, immediate post-tests, and delayed post-test) were then compared by independent t-tests. The Bonferroni correction is applied to offset the chances of a Type 1 error for the analyses, so the level of statistical significance was set at $p < 0.0167$ ($0.05/3$).

Word-form gains: In the listening section of pre-test 1 group A performed significantly better than group B ($t = 2.9140$, $p = 0.0060$, Hedges' $g = 0.93$, $df = 37$). However, the actual advantage of group A students' word knowledge at pre-test 1 was only 1.04 words out of fifty. Therefore, before intervention 1, their

knowledge about the forms of target words taught during the intervention was roughly equivalent. In the listening section of immediate post-test 1, group B (i.e., the group using Quizlet) performed significantly better than group A (i.e., the group using PFs) ($t = 17.3180$, $p < 0.0001$, Hedges' $g = 5.55$, $df = 37$). Similarly, group B scores in the listening section of delayed post-test 1 were noticeably higher than group A ($t = 9.4916$, $p < 0.0001$, Hedge' $g = 3.04$, $df = 37$). An independent t-test ($t = 0.4151$, $p = 0.6804$, $df = 37$) indicated that group A and group B knowledge about forms of target words taught in intervention 2 before its beginning was statistically not different. Similarly, although group A on average obtained higher scores than group B in the listening section of immediate post-test 2, their gap was not significant ($t = 0.9485$, $p = 0.349$, $df = 37$). Nevertheless, group A performed significantly better than group B in the listening section of delayed post-test 2 ($t = 2.7861$, $p = 0.0084$, Hedges' $g = 0.89$, $df = 37$) (see Appendix D).

Word-meaning gains: Participants in groups A and B had approximately the same knowledge about meanings of target words taught in intervention 1 before it commenced ($t = 0.5789$, $p = 0.5662$, $df = 37$). However, group B (i.e., group using Quizlet) performed significantly better than group A (i.e., group using PFs) in the multiple-choice section of immediate post-test 1 ($t = 8.7902$, $p < 0.0001$, Hedges' $g = 2.82$, $df = 37$). In contrast, group B scores in the multiple-choice section of delayed post-test 1 were not significantly higher than group A scores ($t = 2.4853$, $p = 0.0176 < 0.0167$, $df = 37$). Groups A and B scores in the multiple-choice section of pre-test 2 were not significantly different ($t = 0.9847$, $p = 0.3312$, $df = 37$). Also, their scores in the multiple-choice section of immediate post-test 2 were not markedly different ($t = 0.3112$, $p = 0.7574$, $df = 37$), though group A (i.e., the group using Quizlet) has a higher mean score than group B (i.e., the group using PFs). On the other hand, group A performed significantly better than group B in the multiple-choice section of delayed post-test 2 ($t = 3.5383$, $p = 0.0011$, Hedges' $g = 1.13$, $df = 37$) (see Appendix D).

All things considered, scores of the groups using Quizlet were considerably higher than those using PFs. In other words, when the groups used Quizlet their vocabulary gains were significantly higher than those using PFs. In general, Quizlet seems to help L2 learners acquire vocabulary more effectively than PFs. This is consistent with previous studies into the two tools (Başoğlu and Akdemir; Kiliçkaya and Krajka; Azabdaftari and Mozaheb). The findings can be understood by the different cognitive loads caused by learning vocabulary with PFs and Quizlet. With PFs participants must process aspects of the word (i.e., written form, spoken form, meaning, and syntactic category) within the visual channel. The learning loads might easily exceed the limited working memory capacity of the channel, which leads to cognitive overload and impedes meaningful learning (Mayer and Moreno 45). In contrast, when using Quizlet, the students can process the spoken form of the word in the auditory channel and

visual aspects in the visual channel. Thus, the channels are less likely to be overloaded by having to process all of the required information. Our findings, therefore, support the CATLM assumptions about two separate information processing channels (i.e., auditory and visual channels) each with limited cognitive processing capacity sharing, in parallel, the cognitive load (Moreno and Mayer 313).

Linguistic environments created by Quizlet and PFs

We observed six randomly selected participants through video recordings (PFs) and screen captures (Quizlet) while they were carrying out their individual learning activities. Due to the *paper* nature of PFs, learners received only visual input (i.e., written forms, meanings, syntactic categories, example sentences and phonetic transcriptions of target words, and pictures) from learning activities with the tool. On the other hand, when using Quizlet, almost all learners received both visual and audio input. Curiously, one learner (B34) used only the modes that provide only visual input (i.e., Test, Match and Gravity) and consequently this participant, unlike the other Quizlet users, did not get auditory input from the app.

Regarding spoken output, three learners (i.e., A10, A17 and B14) pronounced target words when looking at the word's phonetic transcription on PFs, although producing spoken output was not required and audio input was not provided by the tool. In contrast, despite a great amount of audio input provided by Quizlet, only B14 produced spoken output when using the tool. In terms of written output, the participants, except A17, all produced the output as almost all the modes on Quizlet required it. Three of them also produced written output when doing individual learning activities with PFs, though it was not compulsory.

Concerning interaction, PFs are relatively limited in providing feedback. According to video recordings, participants had to manually flip the cards to check whether they remembered correctly the form or meaning of a word. On the other hand, thanks to its *digital* nature, Quizlet provides immediate corrective feedback. For example, the recording of A1's performance on the app showed that when the student mistyped the word *illiterate*, its correct written form was given immediately, and A1 had to type it again.

In conclusion, participants were provided with more substantial input, feedback and output opportunities by Quizlet than PFs. The findings show that when participants used Quizlet they attained, on average, higher scores in all immediate post-tests and delayed post-tests than when they learned their vocabulary with PFs. In other words, Quizlet is more effective than PFs in developing L2 vocabulary because the linguistic environment created by the app offers greater advantages for vocabulary acquisition.

However, it is worth noting that despite the lack of spoken input, PFs encouraged the students to produce spoken output more successfully than Quizlet. The difference in participants' behaviours might result from the different characteristics of learning activities on Quizlet and PFs. With Quizlet, learners must follow guidance and complete tasks created by the app, making the participants more focused on memorising written and aural forms, and meaning of the target words, but it does not require speaking the target words. By contrast, the learners had full control of learning activities with PFs. Additionally, phonetic transcriptions of target words, available on the cards, might stimulate their pronunciation by the student. However, the pronunciations were not guaranteed to be target-like.

Listening to and repeating new words are a recommended strategy for remembering their pronunciations. The reason is that learners, especially those at the early stage of learning second languages, having limited vocabulary knowledge in the L2, mainly rely on the phonological representations of new words stored in working memory to remember their spoken forms (Gathercole et al. 403). Thus, the repetition of new vocabulary items extends the periods during which their phonological forms exist in working memory, which lead to their retention in long-term memory (Baddeley et al. 158; Ellis and Beaton 535). Therefore, a Quizlet module that requires users to pronounce vocabulary items and gives feedback on their pronunciations would be beneficial for L2 learners.

Learners' perceptions of PFs and Quizlet

All participants stated that learning vocabulary on Quizlet was enjoyable, while 82% agreed on the enjoyment of PFs. Also, no one disagreed about the usability of Quizlet, and three participants did not think that PFs were user-friendly. Additionally, the number of learners who agreed that Quizlet increased their vocabulary learning speed (87.2%) was slightly higher than the number of those reporting that PFs enabled them to acquire vocabulary quickly (82.1%). On the other hand, slightly more participants thought that PFs helped them improve and retain vocabulary than those who agreed about Quizlet. However, according to their self-reports, the number of participants learning vocabulary on Quizlet very frequently (i.e., at least four times a week, which amounts to 43.6%) was nearly double the number of those doing so with PFs (23.1%; see Appendix C).

Participants' responses to the online survey revealed, moreover, that the majority (56.41%) preferred Quizlet as against those who favoured PFs (43.59%). KWIC Concordance software (Tsukamoto) was applied to analyse key words appearing in their reasons for the preferences. The word *remember* was mentioned thirteen times by the students preferring Quizlet, and nine times by those preferring PFs. Participants stated that the tools helped them remember new words faster. The word *interesting* appeared ten times in reasons for preferring Quizlet and six times in those favouring PFs. Also, participants stated that they

favoured the tools due to their usability and convenience. The words *user-friendly* and *convenient* were mentioned five times each by participants preferring Quizlet, and six and seven times, respectively, by those favouring PFs.

All things considered, most of the participants had positive perceptions of both Quizlet and PFs, and used the tools to learn vocabulary regularly. Besides, more learners agreed about the usability, enjoyment, and positive effect of Quizlet on their vocabulary learning speed. The finding from participants' perceptions helps explain the efficacy of Quizlet versus PFs to vocabulary acquisition. Also, it supports CATLM's assumptions concerning the influence of affective factors and motivation on learning (Moreno and Mayer 313).

Conclusion

The study investigated the effectiveness of Quizlet and PFs for vocabulary acquisition within the theoretical framework of CATLM (Moreno and Mayer 313) and Miyamoto's evaluation framework of digital learning tools (qtd. in Kawaguchi 441). The study posed four research questions. The first asked whether Vietnamese high school students achieved significant vocabulary gains with Quizlet and PFs. According to statistical analyses, students made significant vocabulary gains regardless of which tool they used in each intervention. Thus, our research suggests that both Quizlet and PFs should be utilised in classroom settings as they have positive effects on the acquisition of L2 vocabulary. The second question asked whether there are any significant differences in vocabulary gains depending on each of these two tools. Our analyses suggested that when the groups used Quizlet they had more significant vocabulary gains from pre-tests to immediate post-tests and from pre-tests to delayed post-tests. Therefore, Quizlet promotes vocabulary acquisition more effectively than PFs.

Statistical tests suggest that Quizlet, which includes both auditory and visual inputs, has more significant potential to develop L2 vocabulary than PFs, which only include visual input. This is in line with the assumptions of CATLM (Moreno and Mayer 313) and is supported by our findings concerning the linguistic environments created by Quizlet and PFs, as well as learners' perceptions of the tools. Thus, teachers should consider the advantages offered by ICT to facilitate L2 vocabulary acquisition and engage students in the classroom. The third question relates to the differences between the linguistic environments created by two tools. Data analysis revealed that the multimodal linguistic environment created by Quizlet offers more input, learning activities, output opportunities, and detailed feedback than the one created by PFs. The last question concerns Vietnamese high school students' perceptions of these two tools. According to their responses to the questionnaire, they were cognitively, behaviourally, and emotionally engaged in vocabulary learning activities with both tools. However, Quizlet encouraged them to engage in vocabulary learning with a greater frequency than PFs. They also expressed a higher emotional engagement

in using Quizlet than PFs. They perceived Quizlet as user-friendlier. They also stated that the app helped them to acquire vocabulary faster than PFs. On the other hand, PFs were considered to be more effective in vocabulary memorisation and development.

On completion of this study, we have a couple of recommendations for Quizlet to strengthen its effectiveness. As listening to and repeating new words reinforce memorisation of their spoken forms, a mode should be added on Quizlet that encourages users to practice pronouncing words. This mode should include diagnostic feedback on pronunciation. We believe that current digital technologies have this capacity and such an addition would benefit EFL learners enormously, particularly in countries like Vietnam where there are few opportunities to receive English native speakers' input.

The present study has several limitations. First, we investigated only one high school in Hai Duong, Vietnam. It would be important to confirm (or otherwise) our results with other schools in other provinces in Vietnam, or in other countries. Another limitation is that the sample size is relatively small. This study involved only one intact class at high school level. It would be necessary for future studies to examine a larger sample size to support the generalisability of the current research findings. Also, the duration of the experimental study was relatively short, which may have not been long enough to observe whether participants were able to retain in memory the target words.

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Appendix A – Target Vocabulary and Tests

1. Pre-test 1, immediate post-test 1 and delayed post-test 1

I. Listen and write words (Nghe và viết lại từ)

1)

2)

....

50)

(There are 50 words in this section)

II. Select the correct meanings of bolded words (Chọn định nghĩa chính xác của từ đã cho)

1. **Nation:** If you want to know a nation, you must learn its history.
A. Educational institution after secondary school (trường đại học / cao đẳng)
B. art (nghệ thuật)
C. country (đất nước)
D. sport (thể thao)
2. **Take care of:** He has to take care of his sister.
A. live with (sống cùng)
B. teach (dạy)
C. look after (chăm sóc)
D. turn against (trở mặt)
3. **College:** I met my best friend for the first time when we were at college.
A. airport (sân bay)
B. school (trường cao đẳng / trường đại học)
C. post office (bưu điện)
D. restaurant (nhà hàng)
4. **Volunteer:** Many volunteers work for the charity
A. unpaid worker (tình nguyện viên)
B. part-time worker (người làm công việc bán thời gian)
C. full-time worker (người làm việc toàn thời gian)
D. freelancer (người làm nghề tự do)
5. **Orphanage:** He grew up in an orphanage.
A. reform school (trại giáo dưỡng)
B. summer school (trường hè)
C. place for children without parents (trại trẻ mồ côi)
D. jail (trại giam)
6. **Home for the aged:** He sends his mother to a home for the aged.
A. pagoda (chùa)
B. nursing home (trại dưỡng lão)

- C. entertainment center (trung tâm giải trí) D. shopping mall (trung tâm mua sắm)
7. **Clean up:** I often clean up my room.
A. decorate (trang trí) B. paint (sơn)
C. mess up (làm bừa bộn) D. tidy up (dọn dẹp)
8. **Mow the lawn:** I cannot mow the lawn if it is wet.
A. cut the grass (cắt cỏ) B. iron the dress (là váy)
C. wear the scarf (quàng khăn) D. shear the sheep (cạo long cừu)
9. **Baseball:** He likes playing baseball.
A. chess (cờ vua) B. video games (trò chơi điện tử)
C. ballgame played between two teams (bong chày) D. guitar (đàn ghita)
10. **Take part:** Some of the children will take part in the film.
A. hate (ghét) B. like (thích)
C. be frightened by (sợ) D. join in (tham gia)
11. **Disadvantaged:** The group gives houses away to disadvantaged people.
A. famous (nổi tiếng) B. underprivileged (thiệt thòi)
C. talented (tài năng) D. lucky (may mắn)
12. **Handicapped:** He goes to a school for handicapped children.
A. disabled (tàn tật) B. good (giỏi)
C. gifted (có năng khiếu) D. poor (nghèo)
13. **Care:** The children receive lots of care.
A. training (sự đào tạo) B. neglect (sự lơ đãng)
C. protection and provision of necessities (sự chăm sóc) D. opposition (sự đối địch)
14. **Comfort:** The doctor's words brought some comfort to his patient.
A. sorrow (sự đau khổ) B. sadness (nỗi buồn)
C. anxiety (sự lo lắng) D. consolation (sự an ủi)
15. **Overcome:** He could not overcome his fear.
A. voice (phát biểu) B. face (đối mặt)
C. be able to control (vượt qua) D. show (thể hiện)

16. **Difficulty:** He had to deal with the difficulties.
 A. shame (sự xấu hổ) B. hardship (sự khó khăn)
 C. feeling (cảm giác) D. crisis (khủng hoảng)
17. **Participate:** He never participates in any conversation at his workplace.
 A. avoid (tránh) B. stop (dừng)
 C. dominate (chi phối) D. join (tham gia)
18. **Suffer:** He might suffer after his mother's death.
 A. live happily (sống hạnh phúc) B. experience hardship (chịu thiệt thòi)
 C. earn money (kiếm tiền) D. go shopping (đi mua sắm)
19. **Natural disaster:** The last natural disaster killed thousands of people.
 A. catastrophic event caused by nature B. house fire (cháy nhà)
 (thiên tai)
 C. traffic accident (tai nạn giao thông) D. electric shock (điện giật)
20. **Summer vacation:** She took several overseas trips during her last summer vacation.
 A. students' and teachers' holiday in the summer (kì nghỉ hè)
 B. maternity leave (kì nghỉ thai sản)
 C. sick leave (nghỉ ốm) D. stopover (nghỉ giữa chặng)
21. **Remote:** He lives in a remote district.
 A. busy (nhộn nhịp) B. faraway (xa xôi, hẻo lánh)
 C. central (trung tâm) D. urban (thuộc đô thị)
22. **Mountainous:** The land is mountainous and high above sea level.
 A. flat (bằng phẳng) B. hilly (nhiều đồi núi)
 C. dry (khô cằn) D. rich (màu mỡ)
23. **Provide:** They may provide these services
 A. offer (cung cấp) B. use (sử dụng)
 C. complain about (phê phán) D. improve (cải thiện)
24. **Education:** He received no education.
 A. treatment (điều trị) B. prize (giải thưởng)
 C. compensation (đền bù) D. teaching (sự dạy dỗ)

25. **Organise:** They are going to organise a meeting tomorrow.
A. arrange (tổ chức) B. cancel (hoãn)
C. disrupt (làm gián đoạn) D. close (kết thúc)
26. **Trip:** His overseas trip will last one week.
A. wedding (đám cưới) B. business (công tác)
C. internship (thực tập) D. journey (chuyến đi)
27. **Place of interest:** There are some places of interest in the area.
A. tourist attraction (địa điểm du lịch được ưa chuộng) B. construction site (công trường xây dựng)
C. industrial zone (khu công nghiệp) D. complex (chung cư)
28. **Province:** More than one thousand people live in the province.
A. city (thành phố) B. capital (thủ đô)
C. downtown (khu buôn bán) D. non-metropolitan area (khu vực nông thôn)
29. **Programme:** The programme aims to increase social equality.
A. country (đất nước) B. scheme (kế hoạch)
C. company (công ty) D. association (hiệp hội)
30. **Highlands:** Villages in the highlands are connected by roads.
A. districts (huyện) B. lowlands (đồng bằng)
C. countries (đất nước) D. uplands (cao nguyên)
31. **Illiterate:** Some people in small towns are illiterate.
A. blind (mù) B. unlettered (mù chữ)
C. dumb (câm) D. deaf (điếc)
32. **Effective:** He found an effective method to learn English.
A. bad (tồi tệ) B. new (mới)
C. successful (hiệu quả) D. simple (đơn giản)
33. **Decrease:** The number of students in the school may decrease next year.
A. become greater (tăng lên) B. remain the same (giữ nguyên)
C. double (gấp đôi) D. become smaller (giảm đi)
34. **Gradually:** Gradually she realized that he lied to her.
A. finally (cuối cùng) B. quickly (1 cách nhanh chóng)

C. slowly (dần dần)

D. initially (ngay từ đầu)

35. **Expand:** Their business will expand.

A. grow (mở rộng)

B. shrink (thu nhỏ lại)

C. fail (sụp đổ)

D. shut down (đóng cửa)

36. **Eradicate:** It is difficult to eradicate the disease.

A. spread (lan truyền)

B. discover (phát hiện)

C. diagnose (chẩn đoán)

D. stamp out (trừ diệt / xóa bỏ)

37. **Population:** Most of the population of the country lived in the countryside.

A. stray dogs (chó hoang)

B. exotic animals (động vật kỳ lạ)

C. feral pigs (lợn hoang)

D. residents (dân cư / dân số)

38. **Relevant:** What he talked about was relevant to us.

A. new (mới)

B. important (liên quan / quan trọng)

C. unrelated (không liên quan)

D. strange (lạ)

39. **Material:** They needed to buy reading materials.

A. lights (đèn)

B. documents (tài liệu)

C. desks (bàn)

D. glasses (kính)

40. **Campaign:** There is a campaign against killing dogs for food in the country.

A. crusade (chiến dịch)

B. resistance (sự chống đối)

C. criticism (sự phê phán)

D. rule (luật)

41. **Ethnic minority:** Ethnic minorities often live in mountain regions.

A. group of people with cultural traditions which are different from those of the main population (dân tộc thiểu số)

B. group of poor people (người nghèo)

C. group of disabled people (người tàn tật)

D. group of unemployed people (người thất nghiệp)

42. **Home village:** Next month I will come back to my home village.

A. nearby place (nơi ở gần)

B. marketplace (nơi buôn bán)

C. place of origin (quê hương)

D. hiding place (nơi trú ẩn)

43. **Fight:** There was a fight for women's rights in the country.

A. battle (cuộc chiến)

B. organisation (tổ chức)

C. argument (cuộc tranh luận)

D. hope (hi vọng)

44. **Farming techniques:** Some people in my village adopted new farming techniques.

A. ways of building bridges (phương pháp xây cầu)

B. ways of building houses (phương pháp xây nhà)

C. ways of growing crops and raising animals (phương pháp trồng trọt, chăn nuôi)

D. ways of building roads (phương pháp làm đường)

45. **Family planning:** People today are more concerned about family planning than ever before.

A. making new friends (kết bạn)

B. finding jobs (tìm việc)

C. birth control (kế hoạch hóa gia đình)

D. buying houses (mua nhà)

46. **Struggle:** There was a struggle for freedom in the country.

A. need (sự cần thiết)

B. desire (sự khao khát)

C. hope (hi vọng)

D. battle (cuộc chiến)

47. **Vietnam Society of Learning Promotion:** The Vietnam Society of Learning Promotion was founded in 2000.

A. an association which aims to improve residents' literacy levels (hội khuyến học)

B. an association which aims to improve social security (hội đảm bảo an toàn trật tự xã hội)

C. an association which aims to develop economy (hội phát triển kinh tế)

D. an association which aims to promote exports (hội tăng cường xuất khẩu)

48. **Illiteracy Eradication:** A project called Illiteracy Eradication will be run next month.

A. a project which aims to teach reading and writing to people who lack these skills (chiến dịch xóa mù chữ)

B. a project which aims to eliminate poverty (chiến dịch xóa đói giảm nghèo)

C. a project which aims to improve foreign language skills (chiến dịch nâng cao khả năng ngoại ngữ)

D. a project which aims to raise people's awareness of global warming (chiến dịch nâng cao ý thức về hiện tượng nóng lên toàn cầu)

49. **Universalisation of Primary Education:** Universalisation of Primary Education aims at all people in the society.

- A. a plan to educate everybody to primary level at least (dự án phổ cập giáo dục)
B. a plan to build primary schools (dự án xây trường tiểu học)
C. a plan to train primary teachers (dự án đào tạo giáo viên tiểu học)
D. a plan to increase primary teachers' salaries (dự án nâng lương cho giáo viên tiểu học)

50. **Honorable:** The soldier's death was honorable.

- A. mysterious (bí ẩn)
B. terrible (khủng khiếp)
C. glorious (vinh quang / vinh dự)
D. quick (nhanh chóng)

2. Pre-test 2, immediate post-test 2 and delayed post-test 2

I. Listen and write the words (Nghe và viết lại từ)

1)

2)

.....

71)

(There are 71 words in this section)

II. Select the correct meanings of bolded words (Chọn định nghĩa chính xác của từ đã cho)

- Human race:** Many problems are facing the human race.
A. kind of reptile (loài bò sát)
B. kind of insect (loài côn trùng)
C. kind of bird (loài chim)
D. mankind (loài người)
- Species:** The species may die out soon.
A. a group of plants or animals with similar characteristics (loài động vật / loài thực vật)
B. a group of animals and plants living in the same area (nhóm động thực vật sống trong cùng một khu vực)
C. newly discovered animal (động vật mới được phát hiện)
D. new hybrid plant (thực vật lai tạo mới)
- Exist:** The animals may exist there.
A. live (tồn tại)
B. die (chết)
C. be ill (bị ốm)
D. be hunted (bị săn)
- Planet:** We will have to move to another planet.

- A. a territory with its own borders as well as total sovereignty over its territory and residents (đất nước)
B. a large building with various connected rooms (chung cư)
C. a place which is larger than a village and smaller than a city (thị trấn)
D. a large, round object moving around a star in space (hành tinh)
5. **Human being:** A small amount of the poison can kill a human being.
A. chimpanzee (tinh tinh) B. horse (ngựa)
C. person (con người) D. whale (cá voi)
6. **Influence:** Her influence on my writing is great.
A. effect (sự ảnh hưởng) B. dependence (sự phụ thuộc)
C. advice (lời khuyên) D. focus (sự tập trung)
7. **Environment:** The teacher is teaching his students about the environment.
A. culture of a country (văn hóa) B. natural world (môi trường)
C. system of government of a country (hệ thống chính quyền) D. history of a country (lịch sử)
8. **Affect:** They may affect the project.
A. run (điều hành) B. approve (phê chuẩn)
C. influence (ảnh hưởng) D. fund (cấp vốn)
9. **Water supply:** The water supply is unsafe.
A. water source (nguồn cung cấp nước) B. water temperature (nhiệt độ của nước)
C. water power (năng lượng từ nước) D. water bottle (chai nước)
10. **Industry:** The industry is growing fast.
A. plant (cây) B. manufacturing (công nghiệp, sự sản xuất)
C. army (quân đội) D. population (dân số)
11. **Agriculture:** Developing countries have to depend on agriculture.
A. farming (nông nghiệp) B. tourism (du lịch)
C. exports (xuất khẩu) D. imports (nhập khẩu)
12. **Conditions:** Working conditions here have changed.

- A. hours (giờ) B. circumstances (hoàn cảnh, tình hình)
C. ages (tuổi) D. relationships (mối quan hệ)
13. **Cut down:** They may cut down some trees to make room for a parking space.
A. uproot (nhổ rễ) B. climb into (trèo)
C. chop down (chặt) D. plant (trồng)
14. **Destroy:** Drinking can destroy young people's lives.
A. save (cứu) B. prolong (kéo dài)
C. take over (kiểm soát) D. ruin (phá hủy)
15. **Pollutant:** There is a great amount of the pollutant in the river.
A. substance that pollute the environment (chất gây ô nhiễm)
B. valuable, shiny, yellow metal that is often used to make jewelry (vàng)
C. substance that consists of very small grains of rock (cát)
D. earth mixed with water (bùn)
16. **In all respects:** They appear in all respects identical.
A. partially (một phần) B. nearly (gần như)
C. not necessarily (không nhất thiết) D. absolutely (toàn bộ, về mọi mặt)
17. **Habit:** Tom was asked about his shopping habit.
A. practice (thói quen) B. bag (túi)
C. list (danh sách) D. trip (chuyến đi)
18. **Result in:** A change in temperature may result in rain.
A. prevent (ngăn chặn) B. threaten (đe dọa)
C. cause (gây ra) D. stop (dừng)
19. **Serious:** I have made a serious mistake.
A. little (nhỏ) B. common (thông thường)
C. terrible (nghiêm trọng) D. stupid (ngu ngốc)
20. **Consequence:** They accepted the consequence.
A. result (hậu quả) B. proposal (đề án)
C. help (sự giúp đỡ) D. punishment (hình phạt)
21. **Rare:** I saw some rare birds at the park.
A. migratory (di trú) B. game (khổng lồ)

- C. predatory (săn mồi) D. unusual (hiếm)
22. **In danger:** The river is in danger of drying.
A. at risk (có nguy cơ) B. at the end (ở giai đoạn cuối)
C. in need (cần) D. at the beginning (ở giai đoạn mở đầu)
23. **Extinct:** Some animals are extinct.
A. discovered (được phát hiện) B. tamed (được thuần hóa)
C. bred (được gây giống) D. vanished (bị tuyệt chủng)
24. **Disappear:** The traditional way of life may disappear.
A. be maintained (được gìn giữ) B. be restored (được khôi phục)
C. be recognised (được công nhận) D. die out (biến mất)
25. **Effort:** It took them one year to build the bridge, but it was worth the effort.
A. money (tiền) B. time (thời gian)
C. attempt (sự cố gắng) D. risk (rủi ro)
26. **Protect:** He tried to protect his friend.
A. keep safe (bảo vệ) B. persuade (thuyết phục)
C. neglect (lờ đi) D. harm (gây hại)
27. **Scientist:** Her mother is a scientist.
A. expert in science (nhà khoa học) B. teacher (giáo viên)
C. singer (ca sĩ) D. businesswoman (doanh nhân)
28. **Endangered species:** Some endangered species live in the forest.
A. native species (loài bản địa) B. alien species (loài ngoại lai)
C. dominant species (loài chiếm ưu thế) D. threatened species (loài có nguy cơ bị tuyệt chủng)
29. **Save:** They did everything they could to save her.
A. please (làm hài lòng) B. deceive (lừa)
C. rescue (cứu) D. attack (tấn công)
30. **Set up:** He is going to set up a company next year.
A. work for (làm việc cho) B. take over (tiếp quản)
C. dissolve (giải thể) D. establish (thành lập)
31. **Funds:** We are short of funds now.

- A. money (tiền) B. information (thông tin)
C. time (thời gian) D. food (thức ăn)
32. **Raise:** They will raise £100,000 to build a school in the area.
A. borrow (mượn) B. invest (đầu tư)
C. collect (thu góp) D. be paid (được trả)
33. **National park:** The national park will be extended by 500,000 ha.
A. a park for conservation purposes (công viên quốc gia) B. a park serving as a social and recreational focal point for a neighbourhood (công viên địa phương)
C. a park for the purpose of industrial development (khu công nghiệp) D. a commercially operated park having various devices for entertainment (công viên giải trí)
34. **Establish:** They helped to establish the school.
A. run (điều hành) B. repair (sửa chữa)
C. found (thành lập) D. decorate (trang trí)
35. **Law:** There is a law against drinking in the street.
A. prejudice (định kiến) B. argument (sự tranh luận)
C. march (cuộc diễu hành) D. rule (luật)
36. **Introduce:** The government may introduce the rule next year.
A. issue (ban hành) B. bend (luồn lách)
C. tighten (thắt chặt) D. end (chấm dứt)
37. **Prohibit:** The government will prohibit selling monkeys next month.
A. permit (cho phép) B. encourage (khuyến khích)
C. invest in (đầu tư) D. ban (cấm)
38. **Destruction:** People are concerned about the destruction of forests.
A. sale (sự bán) B. harvest (sự thu hoạch)
C. plantation (sự trồng trọt) D. devastation (sự tàn phá)
39. **Interference:** I could not tolerate their interference.
A. insolence (sự xấc láo) B. intrusion (sự can thiệp)
C. thoughtlessness (sự vô ý) D. carelessness (sự bất cẩn)
40. **Survive:** The animal may survive in hot weather.

- A. be sick (bị ốm) B. die (chết)
C. remain alive (sống sót) D. breed (sinh)

41. **Produce:** The cat may produce kittens.

- A. bear (đẻ) B. lick (liếm)
C. scratch (cào) D. bite (cắn)

42. **Offspring:** The animal has a lot of offspring.

- A. young (con) B. fur (lông)
C. legs (chân) D. spines (gai nhọn)

43. **Peacefully:** He lives peacefully alongside his neighbors.

- A. modestly (khiêm nhường) B. tranquilly (hòa bình)
C. fearfully (sợ hãi) D. quietly (yên lặng)

44. **Energy:** The price of energy increased.

- A. farmland (đất canh tác) B. food (đồ ăn)
C. labor (nhân công) D. power (năng lượng)

45. **Fossil fuel:** The fossil fuel was formed millions of years ago.

- A. natural fuel formed underground from plant and animal remains (nhiên liệu hóa thạch) B. fuel produced from a wide variety of renewable sources (nhiên liệu tái tạo)
C. fuel that is produced through contemporary biological processes (nhiên liệu sinh học) D. fuel used in a nuclear reactor to sustain a nuclear chain reaction (nhiên liệu hạt nhân)

46. **Reserve:** There is an oil reserve in the region.

- A. drum (thùng) B. refinery (nhà máy)
C. tanker (tàu) D. reservoir (trữ lượng)

47. **Limited:** The choices are limited.

- A. wide (nhiều) B. good (tốt)
C. abundant (thừa thãi) D. restricted (hạn chế)

48. **Power:** Trash can be turned into power.

- A. food (đồ ăn) B. fresh water (nước sạch)
C. gold (vàng) D. energy (năng lượng)

49. **Demand:** These machines are in demand.

- A. production (sự sản xuất) B. good condition (tình trạng tốt)

- C. use (sự sử dụng) D. request (sự yêu cầu)
50. **Rapidly:** The grass grows rapidly.
A. slowly (chậm) B. thickly (dày)
C. steadily (từ từ) D. quickly (nhanh chóng)
51. **Exhausted:** The water may be exhausted in the future.
A. purified (được lọc) B. frozen (đóng băng)
C. used up (cạn kiệt) D. contaminated (bị ô nhiễm)
52. **Relatively:** The house is relatively clean.
A. surprisingly (đáng ngạc nhiên) B. extremely (cực kỳ)
C. comparatively (tương đối) D. slightly (hơi, nhẹ nhàng)
53. **Alternative source of energy:** The alternative source of energy will never run out.
A. energy source that is an alternative to fossil fuel (nguồn nhiên liệu thay thế)
B. energy source formed underground from animal and plant remains (nguồn nhiên liệu hóa thạch)
C. energy source that may do harm to the environment (nguồn nhiên liệu gây hại cho môi trường)
D. energy source providing dirty energy (nguồn cung cấp nhiên liệu bẩn)
54. **Nuclear energy:** Nuclear energy is clean and safe.
A. energy captured from ocean surface waves (nhiên liệu từ sóng biển)
B. energy captured from the movement of air (nhiên liệu từ gió)
C. energy held in the nucleus of an atom (nhiên liệu hạt nhân)
D. energy emitted by the sun. (nhiên liệu mặt trời)
55. **Electricity:** He lived on an island with no electricity.
A. form of energy (điện) B. hi-tech device (thiết bị công nghệ cao)
C. mean of transport (phương tiện giao thông) D. tap water (nước sạch)
56. **Needs:** Housing and education are everyone's needs.
A. rights (quyền lợi) B. necessities (nhu cầu thiết yếu)
C. desires (sự mong ước) D. concerns (mối lo ngại)

57. **Geothermal heat:** Geothermal heat has been used for many years in some countries.

- A. heat inside the Earth (địa nhiệt)
B. heat of the sun (nhiệt từ mặt trời)
C. heat of the fire (nhiệt từ đám cháy)
D. heat produced when lime reacts with water (nhiệt tỏa từ phản ứng giữa vôi sống và nước)

58. **Available:** Fresh food is not available here.

- A. expensive (đắt)
B. popular (được ưa chuộng)
C. obtainable (có sẵn)
D. cheap (rẻ)

59. **Windmill:** It is the biggest windmill on the hill

- A. a high building giving people a good view of the area that they are in (chòi canh)
B. a large building where royals live (lâu đài)
C. a building with vanes that turn in the wind (cối xay gió)
D. a building in which the bodies of dead people are buried (mộ)

60. **Sailboat:** He gets onto a sailboat.

- A. a small round boat made of wickerwork that is propelled with a paddle (thuyền thúng)
B. a narrow boat with pointed ends that is propelled with paddles (thuyền độc mộc)
C. a small boat with sails (thuyền buồm)
D. a small boat powered by an engine (thuyền máy)

61. **Dam:** The dam was built last month.

- A. barrage (đập)
B. road (đường)
C. bridge (cầu)
D. house (nhà)

62. **Release:** They may release many balloons in the event.

- A. blow up (thổi bay)
B. buy (mua)
C. let go of (thả, thả ra)
D. sell (bán)

63. **Solar panel:** The factory produces solar panels.

- A. device for producing a current of air (quạt điện)
B. device for checking electrical circuits (bút thử điện)
C. device for measuring blood pressure (máy đo huyết áp)
D. device for generating electricity from solar energy (máy phát điện từ năng lượng mặt trời)

64. **Create:** They will create a poster tomorrow.
A. print (in) B. take down (bỏ xuống)
C. make (tạo ra) D. display (trưng bày)
65. **Heat:** You should heat the soup.
A. season (nêm gia vị) B. stir (khuấy)
C. eat (ăn) D. warm (làm nóng)
66. **Cool:** You need to cool the cake.
A. chill (làm lạnh) B. bake (nướng)
C. cut (cắt) D. decorate (trang trí)
67. **Plentiful:** Fruits are plentiful in the summer.
A. scarce (hiếm) B. abundant (phong phú)
C. expensive (đắt) D. cheap (rẻ)
68. **Infinite:** She bathed the baby with infinite care.
A. extremely great (vô hạn, rất nhiều) B. little (ít)
C. special (đặc biệt) D. proper (đủ, hợp lý)
69. **Disadvantage:** The app has just one disadvantage.
A. version (phiên bản) B. strong point (điểm mạnh)
C. weak point (điểm bất lợi) D. feature (tính năng)
70. **Make use of:** He tries to make use of the machine.
A. repair (sửa) B. install (cài đặt)
C. unplug (rút phích cắm) D. use (sử dụng)
71. **Researcher:** She is a leading researcher in the field.
A. someone whose job is to ensure security of society (công an) B. someone whose job is to treat diseases (bác sĩ)
C. someone whose job is to grow plants and raise animals (nông dân) D. someone whose job is to study a subject carefully (nhà nghiên cứu)

Appendix B – Questionnaire

Question 1. How often did you study English vocabulary with paper flashcards outside the classroom?

- I did not study
- Once – 3 times a week
- 4 – 6 times a week
- Every day

Question 2. How often did you study English vocabulary with Quizlet outside the classroom?

- I did not study
- Once – 3 times a week
- 4 – 6 times a week
- Every day

Question 3. How much time per session did you spend studying English vocabulary with paper flashcards outside the classroom?

- I did not study
- Less than 20 minutes
- 20 - 40 minutes
- 40 - 60 minutes
- More than 60 minutes

Question 4. How much time per session did you spend studying English vocabulary with Quizlet outside the classroom?

- I did not study
- Less than 20 minutes
- 20 – 40 minutes
- 40 – 60 minutes
- More than 60 minutes

Question 5. Please give your opinions about the below statements

	Strongly disagree	Disagree	Slightly disagree	Slightly agree	Agree	Strongly agree
Paper flashcards help me learn English vocabulary quickly.						

Paper flashcards help me memorise English vocabulary in a longer term.						
Using paper flashcards helps me improve my English vocabulary.						
Learning English vocabulary via paper flashcards is enjoyable.						
It is easy to use paper flashcards to learn English vocabulary.						

Question 6. Please give your opinions about the below statements

	Strongly disagree	Disagree	Slightly disagree	Slightly agree	Agree
Quizlet helps me learn English vocabulary quickly.					
Quizlet helps me memorise English vocabulary in a longer term.					
Using Quizlet helps me improve my English vocabulary.					
Learning English vocabulary via Quizlet is enjoyable.					
It is easy to use Quizlet to learn English vocabulary.					

Question 7. Do you prefer learning English vocabulary with paper flashcards or Quizlet?

Question 8. Why do you prefer learning English vocabulary with paper flashcards or Quizlet?

Appendix C –Participants’ Perceptions of Quizlet and PFs

Table

Participants’ perceptions of PFs

	Strongly disagree	Disagree	Slightly disagree	Slightly agree	Agree
PFs help me learn English vocabulary quickly.	0%	7.69%	10.26%	20.51%	38.46%
PFs help me memorise English vocabulary in a longer-term.	5.13%	2.56%	7.69%	28.21%	33.33%
Using PFs helps me improve my English vocabulary.	0%	0%	2.56%	12.82%	48.72%
Learning English vocabulary via PFs is enjoyable.	0%	2.56%	15.38%	28.21%	33.33%
It is easy to use PFs to learn English vocabulary.	0%	5.13%	2.56%	20.51%	41.03%

Table
Participants' perceptions of Quizlet

	Strongly disagree	Disagree	Slightly disagree	Slightly agree	Agree
Quizlet helps me learn English vocabulary quickly.	0%	2.56%	10.26%	23.08%	38.46%
Quizlet helps me memorise English vocabulary in a longer-term.	7.69%	10.26%	20.51%	10.26%	30.77%
Using Quizlet helps me improve my English vocabulary.	0%	5.13%	2.56%	12.82%	43.59%
Learning English vocabulary via Quizlet is enjoyable.	0%	0%	0%	10.26%	38.46%
It is easy to use Quizlet to learn English vocabulary.	0%	0%	0%	12.82%	38.46%

Appendix D

Vocabulary gains comparison between groups using flashcards and those using Quizlet

Table

Group A and group B scores in listening sections of pre-test 1 and immediate post-test 1

	Pre-test1 (N=50)				Immediate post-test1 (N=50)			
	Mean	SD	Rang		Mean	SD	Rang	
Group A (PFs)	1.15 (2.3%)	1.5 3	0-6	6 p=0.00 t=2.91 4	14.90 (29.8%)	3.3 5	9-21	1 p<0.000 t=17.31 8
Group B (Quizlet)	0.11 (0.22%)	0.3 2	0-1		37.47 (74.9%)	4.7 1	30-44	

‰: percentage of target words that participants knew or remembered on average

Table

Group A and group B scores in listening sections of pre-test 1 and delayed post-test 1

	Pre-test1 (N=50)				Delayed post-test1 (N=50)			
	Mean	SD	Rang		Mean	SD	Rang	
Group A (PFs)	1.15 (2.3%)	1.5 3	0-6	6 p=0.00 t=2.91 4	4.25 (8.5%)	2.2	1-8	1 p<0.000 t=9.491
Group B (Quizlet)	0.11 (0.22%)	0.3 2	0-1		15.11 (30.2%)	4.5 9	8-26	6

‰: percentage of target words that participants knew or remembered on average

Table

Group A and group B scores in listening sections of pre-test 2 and immediate post-test 2

	Pre-test2 (N=71)				Immediate post-test2 (N=71)			
	Mean	SD	Rang		Mean	SD	Rang	
			e	p=0.68			e	p=0.34
Group A (Quizlet)	13 (18.3 %)	3.9	6-20	04	32.80 (46.2 %)	13.8	16-62	90
Group B (PFs)	13.63 (19.2 %)	5.4	2-29	1	28.47 (40.1 %)	14.6	13-58	5

#: percentage of target words that participants knew or remembered on average

Table

Group A and group B scores in listening sections of pre-test 2 and delayed post-test 2

	Pre-test2 (N=71)				Immediate post-test2 (N=71)			
	Mean	SD	Rang		Mean	SD	Rang	
			e	p=0.68			e	p=0.00
Group A (Quizlet)	13 (18.3 %)	3.9	6-20	04	27.35 (38.5 %)	11.2	10-49	84
Group B (PFs)	13.63 (19.2 %)	5.4	2-29	1	18.89 (26.6 %)	7.18	10-34	1

#: percentage of target words that participants knew or remembered on average

Table

Group A and group B scores in multiple-choice sections of pre-test 1 and immediate post-test 1

	Pre-test1 (N=50)				Immediate post-test1 (N=50)			
	Mean	SD	Rang		Mean	SD	Rang	
			e	p=0.566			e	p<0.000
Group A (PFs)	32.20 (64.4 %)	5.6	20-40	2	38.60 (77.2 %)	4.5	30-46	1
Group B (Quizlet)	31.05 (62.1 %)	6.7	16-40	9	48.37 (96.7 %)	1.6	45-50	2

#: percentage of target words that participants knew or remembered on average

Table
Group A and group B scores in multiple-choice sections of pre-test 1 and delayed post-test 1

	Pre-test1 (N=50)				Delayed post-test1 (N=50)			
	Mean	SD	Rang e		Mean	SD	Rang e	
Group A (PFs)	32.20 (64.4 %)	5.6 6	20- 40	p=0.566 t=0.578 2 9	36.10 (72.2 %)	4.3 2	27- 43	p=0.017 t=2.485 6 3
Group B (Quizlet)	31.05 (62.1 %)	6.7 0	16- 40		39.58 (79.2 %)	4.4 3	30- 47	

?: percentage of target words that participants knew or remembered on average

Table
Group A and group B scores in multiple-choice sections of pre-test 2 and immediate post-test 2

	Pre-test2 (N=71)				Immediate post-test2 (N=71)			
	Mean	SD	Rang e		Mean	SD	Rang e	
Group A (Quizlet)	30.95 (43.6 %)	11.4 9	13- 58	p=0.33 t=0.984 12 7	58.75 (82.7 %)	12.4 6	35- 71	p=0.75 t=0.311 74 2
Group B (PFs)	27.95 (39.4 %)	6.84	12- 39		57.63 (81.2 %)	9.74	40- 71	

?: percentage of target words that participants knew or remembered on average

Table
Group A and group B scores in multiple-choice sections of pre-test 2 and delayed post-test 2

	Pre-test2 (N=71)				Immediate post-test2 (N=71)			
	Mean	SD	Rang e		Mean	SD	Rang e	

Group A (Quizlet)	30.95 (43.6%)	11.4 9	13- 58	p=0.33 t=0.984	43.15 (60.8%)	8.1 6	28- 54	p=0.00 t=3.538
Group B (PFs)	27.95 (39.4%)	6.84	12- 39		34.74 (48.9%)	6.5 5	26- 47	

%. percentage of target words that participants knew or remembered on average