



# The Effect of Online Quizlet Flashcards and Student-Created Quizlet Flashcards on Learning and Retention of Productive and Receptive Vocabulary Knowledge of Elementary Iranian EFL Learners

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## ABSTRACT

Learning vocabulary seems to be a major focus of language instruction. The role of vocabulary knowledge in language learning has been studied by many researchers. The present study was conducted to investigate the effect of using online Quizlet flashcards and student-created Quizlet flashcards on learning and retention of receptive and productive vocabulary knowledge. Sixty Iranian elementary high school students who were randomly divided into 3 groups (twenty subjects per group) participated in this study. The materials and data collection instruments included the Quick Placement Test (QPT), the students' textbook, Top Notch1 from which the vocabulary items were selected, a pre-test, an immediate post-test, and a delayed post-test. It should be mentioned that the control group was taught the words through the conventional method while the first experimental group received the words using online flashcards and the next experimental group worked on developing their own Quizlet flashcards. The results showed that in terms of receptive vocabulary knowledge learning, the students of the online Quizlet flashcards group significantly outperformed students of the control group and online Quizlet flashcards. In learning of the productive vocabulary knowledge, the learners of the control group performed significantly better than other two experimental groups. The results on vocabulary retention revealed that students of the student-created Quizlet flashcards group significantly outperformed students of the control group in terms of retention of the receptive vocabulary knowledge, and in terms of the productive vocabulary knowledge retention there were no significant difference between the groups of the study. These findings will be advantageous for English language teachers to choose the teaching techniques which can facilitate the process of language teaching and learning.

**KEYWORDS:** Online flashcards; Student-created flashcards; Receptive vocabulary; Productive vocabulary; Vocabulary learning; Vocabulary retention

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## 1. Introduction

Mastery of target language necessitates learning many aspects of that language including grammar, pronunciation, writing, pragmatics, and so on, but there is no doubt that vocabulary is the most important aspect of a language that learners need to learn (Folse & Briggs, 2004). For the purpose of second or foreign language learning and the ability of communicating

successfully, one needs to learn the skills of listening, writing, reading, and speaking. The role of vocabulary is indisputable in developing four main skills (Farrokhi et al., 2021).

The advent of new technologies has brought many changes in the field of English teaching and English learning. The traditional methods are not adequate in the term of language learning, so applying new methods is required to enhance learners' motivations. The role of CALL in vocabulary learning is crucial since it provides students with metacognitive activities allowing for making inferences through contexts using imagery and semantic techniques (Köse et al., 2016).

As Schmitt (2010) states, an important way to convey new vocabulary is the use of learners' independent strategies. CALL materials encourage students to develop their independency, help them to find their needs in language learning (Lee, 2004). When teachers use CALL in the process of their teaching, learners get motivated highly and consider CALL as a profitable in term of language learning (Afshari et al., 2009). Many teachers look at students' independency as a threat to their authority in the class. They are more satisfied to hold all procedures in their hands.

The use of CALL among Iranian instructors is not an option. Unfortunately, a large portion of students and teachers are not trained enough to use these new technologies. Due to the fact that CALL is a newborn field in language teaching, comparing the traditional methods of teaching with these newly developed methods need more consideration. Besides, most of the previous papers and articles directed their attention toward teacher-made materials. Little attention has been given to the student-generated materials in CALL. Therefore, the present study tried to accomplish a twofold purpose; first, it was a general comparison between conventional methods of vocabulary learning. Second, this study tried to compare student-generated materials and teacher-developed materials in the field of CALL.

## 2. Literature review

### 2.1. Theoretical framework

#### 2.1.1. Flashcards

In order to discuss a term first we need to define it. Based on Hung (2015, p. 1) "Word cards are a set of double-sided cards designed for direct learning of vocabulary that allow learners to practice form-to-meaning and meaning-to-form recall in repeated retrieval of L2 words, by flipping the front and back sides of the cards."

Nicholson (1998) states that flashcards can be joyful and funny for learners in the process of learning. Flashcards can also have positive effects on the visual learning of learners because they are clear and colorful. The flashcards are used not only for teaching vocabulary meaning but also for teaching prepositions, articles, sentences structure, and phrasal verbs (Tan & Nicholson, 1997).

Assigned flashcards learning into decontextualized learning category. They also regard that despite their separation from context, the flashcards are popular among language learners, especially for those learners who needs a material for vocabulary self-testing.

While flashcards had been used by learners for a long time, recent advances in technology have lead learners and teachers to take advantage of using digital or online flashcards. Using flashcard can benefit the learners in two ways: First, the studies showed intentional learning takes less time in comparison to incidental learning which needs long-time exposure (Hung, 2015). Second, it can encourage learners to be autonomous in their learning.

#### 2.1.2. Receptive and productive vocabulary knowledge

Laufer (1998) determines that "the process of learning a second language has often been described as the learner's progress along the interlanguage continuum from a non-existent knowledge towards native-like competence without necessarily reaching it" (p.1). This suggests that language learning involves a gradual process. The development of vocabulary is not only a matter of expanding one's vocabulary size but also of deepening one's familiar words. Although the distinction between breadth of the words and depth of the words has been known, the studies on this area are still neglected (Verhallen & Schoonen, 1998).

Not all words that a learner hears in a lesson or other lessons become his active vocabulary knowledge. Some words in the process of vocabulary learning remain passive and learners will understand their meaning only when they hear them or read them, but they are not part of active vocabulary knowledge; that is, learners are not able to use them in their speaking or writing. The vocabulary should be presented and practiced systematically for active use (Finocchiaro, 1986).

The receptive/productive vocabulary knowledge distinction depends on the distinction between receptive skills of listening and reading, and productive skills of writing and speaking. The listening and reading skills are called receptive skills due to the fact that we receive input from others. Productive skills imply the idea that we produce language forms using writing and speaking to convey a message to others (Nation, 2001). This distinction is not completely suitable because there are some productions in receptive skills and vice versa.

### 2.1.3. Vocabulary retention

Vocabulary retention has been long neglected in the field of language learning. Richards and Schmidt (2002) define vocabulary retention as “the ability to recall or remember things after an interval of time. In language teaching, retention of what has been taught may depend on the quality of teaching, the interest of the learners, or the meaningfulness of the materials” (p. 457).

Retention is the process of transferring new information into long-term memory. This means you’ve effectively taken in the information and are able to recall it in the future (Folse, 2006). Retention needs to engage more in the process of learning and acquiring words through different channels and applying them in different contexts (Hummel, 2010). Vocabulary learning is strengthened when learners use visual and linguistic methods in learning a word. It will be also helpful to associate them with similar words (Tinkham, 1997).

## 2.2. Empirical studies

In a study related to using flashcards, Komachali and Khodareza (2012) investigated the effect of using flashcards on vocabulary learning of Iranian pre-university students. The participants of the study were 50 female students. They were randomly divided into two groups. The control group received traditional treatment and the experimental group received flashcard treatment. The scores of the post-test revealed that there was a significant difference between the two groups. The results showed that compared to the control group the experimental group had a higher level of improvement in their vocabulary knowledge.

Furthermore, Mohammadnejad et al. (2012) tried to study the efficiency of word lists and picture flashcards and their effects on students’ English vocabulary learning. There were 36 students in an English institute. The researchers used the two mentioned techniques to teach new words to students. The results of the post-test indicated that using flashcard was more helpful than word list.

In another study in line with these studies, Sitompul (2013) investigated the effect of using flashcards and word lists on vocabulary learning. The students of two classes were participants in this study. The experimental group received flashcard treatment and the control group received word lists treatment. The findings of the study showed that the vocabulary knowledge of students improved after using flashcards. It was found that using flashcards could help students to memorize the words more easily.

In line with previous studies, Mojarradi (2014) compared the effect of using flashcards on ESL students’ ability to learn vocabulary. The participants of the study were 40 pre-university students in two separate classes. The participants were given a post-test to make sure their vocabulary level was at the same level. The control group was asked to develop their own flashcards for learning the new vocabulary and the experimental group was asked to use the already prepared flashcards. The results of the post-test showed that the group with already prepared flashcards was able to learn vocabulary better than students in the control group who made their own flashcards. The findings of this study showed the positive effect of flashcards on vocabulary learning.

Osman et al. (2015) investigated the position of flashcards vs. word lists for vocabulary building. There were ninety students from King Abdullah High school. There were three experimental groups: 1. the students in the first group studied vocabulary from bilingual word lists. 2. The students of the second group used bilingual flashcards, where the target word and its Arabic meaning were on one side. 3. The last experimental group studied words on bilingual flashcards, where the target word was on one side, and the Arabic meaning was presented on the other side. The study followed the T1-treatment-T2 format, where participants were pretested with the target words, given the new vocabulary, and post-tested on the target words for any retention or attrition effects. Finally, the researchers concluded that there were no significant differences between the three types of flashcards in King Abdallah High School.

Taghizadeh and Porkar (2018) compared the effect of tablets, Short Message Service (SMS), and flashcards on learner’s vocabulary knowledge and their attitude. The participants were 45 Iranian advanced learners. The participants were divided into three groups. The first group studied the vocabulary via SMS, next group studied vocabulary using tablet and the last group learned vocabulary items via flashcard. The results of the pre-test showed that vocabulary instructions using SMS, tablet, and flashcard was effective in improving learners’ vocabulary knowledge. Most of the learners in the flashcard group considered flashcards as an effective and flexible tool for learning words.

Based on the results of some studies, some researchers disagreed with the use of flashcards due to the fact they considered flashcards as tools focused on memorization. Basoglu and Akdemir (2010) compared the effect of flashcard and a mobile program on learners' vocabulary development. The participants of this study were 60 university students. The results of the study showed that the mobile phone program was a more effective tool than flashcard in developing students' vocabulary.

In another study, Azabdaftari and Mozaheb (2012) studied the effect of mobile learning and flashcard on vocabulary knowledge. The participants of the study were 80 university students studying English literature and translation at the BA level. The participants were divided into two groups of forty. Forty students were in the experimental group learning vocabulary using mobile phones. The students of the control group learned the new words using flashcard. A multiple-choice test was used to assess after experiment. The result revealed that compared to flashcard using mobile phones would be more beneficial.

In addition, Khodashenas et al. (2014) compared the effect of using flashcards and educational cartoons on the vocabulary learning of intermediate EFL learners. There were 44 students in this study as participants. They were selected based on a pre-test and divided into a control group and an experimental group. The experimental group was presented words using Magic English cartoons while the control group was taught words using flashcards. The result of post-test indicated a significant difference between the performances of students in two groups. The students in experimental group outperformed the students of the control group. It was concluded that using magic cartoons could be seen as effective technique to improve learners' knowledge.

### 3. Methodology

#### 3.1. Instrumentation

The instruments used in this study are presented in below. They include a placement test, pre-test, post-test, and a delayed post-test.

##### 3.1.1.Placement test

In order to homogenize participants according to their level of language proficiency, a standard language proficiency test, i.e. quick placement test of Oxford University Press and University of Cambridge Local Examinations Syndicate was used. This test includes 60 multiple choice questions of vocabulary, grammar, and comprehension passage. All participants were given the same placement test to check if the learners' proficiency level is suitable for the present study. According to the test scale, the participants who achieved 21-40 were considered as elementary learners and were appropriate for the purpose of this study.

##### 3.1.2.Pre-test

The pre-test was researcher-made and aimed to compare the results with the post-test to determine whether there was any significant progression in learners' receptive and productive vocabulary knowledge. The test had two parts. In the first part there were 15 matching questions. The students were asked to match each word on the left column to its definition in the right column. This part was designed to measure learners' receptive knowledge of words. Next part includes 15 fill in the blanks questions and in each part the first three letters of the words were given. The second part was designed to measure learners' productive knowledge. The pre-test was designed based on the content of the course which was from book entitled *Top Notch1 (Third edition)* by (Saslow & Ascher, 2011). In order to measure the reliability of the teacher-made pre-test, it was administrated to a class of 20 students who had similar characteristics and proficiency level with the learners in control group and experimental groups. The reliability of the pilot study calculated by Cronbach's alpha turned to be 0.82 which considered a reliable test.

##### 3.1.3.Post-test and delayed post-test

In this study, the pre-test, post-test, and delayed post-test were exactly the same. The purpose of conducting post-test was to measure the possible difference in receptive and productive knowledge of learners after receiving treatment. One of the major purposes of this study was measuring the effect of treatments on retention of receptive and productive vocabulary knowledge. For achieving this purpose, a delayed post-test was conducted after two weeks from the first post-test to measure the level of retention in learners

### 3.2. Materials

#### 3.2.1.Text book

Top Notch 1 was the book from which words were selected. This book consists of 10 units, from each lesson of this book, 15 words were selected that were more important based on the researcher's opinion and were in line with the main objectives of that lesson. The reason for choosing this book was the researcher's mastery over the topics of the book due to its teaching in the classrooms and also its compatibility with the level of students in this research. The units of the book include the following topics:

- Unit1: Getting Acquainted
- Unit2: Going out
- Unit 3: The extended family
- Unit 4: Food and Restaurants
- Unit 5: Technology and You
- Unit 6: Staying in Shape
- Unit7: On Vacation
- Unit8: Shopping for Clothes
- Unit9: Taking Transportation
- Unit10: Spending Money

### 3.2.2. Quizlet flashcards

In order to make and use online flashcards, the Quizlet website (<https://www.quizlet.com>) was used. The website is designed to enable learners to find suitable courses based on their needs or they can create their own courses. The website has different modes for learning and studying new words. The modes include:

- Flashcards: In this mode, users are shown a card for each term, which they can flip the cards. The face of the card can be an image, a word, or both.
- Learn: In this mode, learners answer multiple-choice and written questions repeatedly.
- Write: In this mode, Learners are given a definition or term and should write a definition or term that goes with what is shown.
- Spell: This mode enables the learners to work on spelling of the words. The term is read out loud and learners must type what they hear with correct spelling.

Using Quizlet website helps learners to work on different aspects of a word. They can easily receive the pronunciation, spelling, and meaning of the words and practice all these aspects in different modes of the website.

### 3.3. Data collection procedure

For conducting this study, three groups of learners were needed: The first group which considered as control group taking traditional method (explicit teaching of vocabulary, the second group which is the first experimental group were responsible to work on teacher-made flashcards, and the third group which was the second experimental group were asked to create their own online flashcards. The first step was conducting a placement test to measure students' proficiency level and select the students with appropriate knowledge for this study (Elementary learners).

At the first step the students should be familiar with this website and application and its features. After the participants' familiarization with both site and application, the pre-test will be administered to three groups. The pre-test and post- test for this study will be the same. In the first part of the test students should match 15 words to their definition and this part is designed to measure the students' receptive vocabulary knowledge. In the second part the students should fill in the blanks with some



words which will be given to them in the box. The second part of the test will consist of 15 sentences and this part will be for measuring students' productive vocabulary knowledge. For teaching the vocabulary, Top Notch1 (third edition) which has suitable level will be used. After the pre-test is done, the participants are supposed to elicit the meaning of the words of each unit from the context and will receive feedback from the teacher. The course will be conducted in 5 weeks and 2 sessions on every week. Each session 1 unit of the book will be covered. The first group of students which are experimental group1 are supposed to work on the flashcards which will be uploaded by the teacher on the Quizlet. The experimental group2 will develop their own flashcards on the Quizlet based on what they will be taught in the class and the third group which is our control group will work on the definitions and examples they will be provided in the class.

After 10 weeks the students of the three groups will have an immediate post-test. For measuring the retention of productive and receptive vocabulary knowledge, the posttest will be readministered 2 weeks after conducting the first post-test.

### 3.4. Data analysis procedure

The main focus of this study was to investigate the effect of online Quizlet flashcards and student-created Quizlet flashcards on learning and retention of receptive and productive vocabulary knowledge of Iranian EFL learners.

Concerning the first research hypothesis, the participants' scores in pre-test and post-test receptive vocabulary knowledge were drawn. Firstly, a One-way ANOVA was done on the scores of the pre-test receptive vocabulary knowledge to ensure that there was no significant difference in the scores of the participants prior to the intervention. In order to determine the effect of online Quizlet flashcards and student-created Quizlet flashcards on learning of receptive vocabulary knowledge, a One-way ANOVA was done on the post-test receptive vocabulary knowledge scores in the three groups. Afterwards, to determine which group had the most improvement in learning of the receptive vocabulary knowledge, LSD post-hoc test was conducted on the results of post-test receptive vocabulary knowledge.

For the second research hypothesis, similar to the first question, a One-way ANOVA was done on the results of the pre-test productive vocabulary knowledge to ensure homogeneity before the treatment. Afterward, a One-way ANOVA was conducted on the post-test productive vocabulary knowledge scores in three groups of learners. In order to show which group had the most improvement in productive vocabulary knowledge, LAD post-hoc test was used.

For the third research hypothesis, a One-way ANOVA was conducted on the delayed post-test receptive vocabulary knowledge scores in three groups of learners. In order to show which group had the most ability in retention of receptive vocabulary knowledge, LSD post-hoc test was employed.

For the fourth research hypothesis, similar to the third research hypothesis, a One-way ANOVA was conducted on the delayed post-test productive vocabulary knowledge scores in three groups of learners. In order to show which group had the most ability in retention of productive vocabulary knowledge, LSD post-hoc test was employed.

## 4. Results and discussion

### 4.1. Results

The main objective of this study was to investigate the effect of Quizlet flashcards on learning and retention of receptive and productive vocabulary knowledge of students. This section examines the hypotheses raised in this study to examine their acceptance or rejection.

#### 4.1.1. Research hypothesis 1

H01. There is no significant difference between traditional method, online Quizlet flashcards, and student-created Quizlet flashcards on learning of receptive vocabulary knowledge.

To evaluate the effectiveness of the treatment on the learning of receptive knowledge and to test the first hypothesis, another One-way ANOVA was run on participants' post-test receptive knowledge scores. The descriptive statistics of the post-test scores are shown in Table 1.

**Table 1.** Descriptive statistics of the post-test receptive vocabulary knowledge scores

Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Control	20	10.2500	2.65320	.59327	9.0083	11.4917	6.00	15.00
Experimental 1	20	12.6000	1.66702	.37276	11.8198	13.3802	9.00	15.00
Experimental 2	20	10.6500	2.15883	.48273	9.6396	11.6604	8.00	15.00
Total	60	11.1667	2.39467	.30915	10.5481	11.7853	6.00	15.00

As it can be seen in Table 1, the mean of all three groups has increased in the post-test in terms of receptive knowledge. In order to investigate whether the increase in the receptive knowledge was significant or not, the researcher conducted a One-way ANOVA on the post-test scores of the receptive vocabulary knowledge. The results of the one-way ANOVA on the post-test receptive vocabulary knowledge scores are shown in Table 2.

**Table 2.** One-way ANOVA: comparison between scores on post-test receptive vocabulary knowledge scores

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	63.233	2	31.617	6.551	.003
Within Groups	275.100	57	4.826		
Total	338.333	59			

As the results of Table 2 show, an F ratio of  $F(2, 59) = 6.551$ ,  $p = .003 < .05$  indicated a statistically significant difference among the three groups; therefore, the first null hypothesis of the study was rejected. To find the location of the difference a post-hoc LSD was carried out. The results are presented in Table 3.

**Table 3.** LSD post-hoc test: comparison between post-test receptive vocabulary knowledge scores

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.
Control	Experimental 1	-2.35000*	.69472	.001
	Experimental 2	-.40000	.69472	.567
Experimental 1	Control	2.35000*	.69472	.001
	Experimental 2	1.95000*	.69472	.007
Experimental 2	Control	.40000	.69472	.567
	Experimental 1	-1.95000*	.69472	.007

\*. The mean difference is significant at the .05 level.

The mean difference reported in Table 3. indicates a statistically significant difference between the online Quizlet flashcards (Experimental group 1) and control groups. There is also a significant difference between online Quizlet flashcards and student-created Quizlet flashcards (Experimental group 2) groups as presented in Table 4. the mean difference of  $M = 1.95$ ,  $p = .007 < .05$ . The most difference lies between the experimental group 1 and the control group with a mean difference of  $M = 2.35$ ,  $p = .001 < .05$ . Based on the mean differences, the three groups can be ordered in this way with regard to receptive knowledge scores: (1) online Quizlet flashcards (2) student-created Quizlet flashcards (3) control. Moreover, there is not a significant difference between the student-created Quizlet flashcards (Experimental group 2) and control group' scores on post-test receptive vocabulary knowledge as presented in Table 4. the mean difference of  $M = .40$ ,  $p = .567 > .05$ .

#### 4.1.2. Research hypothesis 2

To evaluate the effectiveness of the treatment on learning of productive vocabulary knowledge and to test the second hypothesis, another One-way ANOVA was run on participants' post-test scores on productive vocabulary knowledge. The descriptive statistics of the post-test scores are shown in Table 4.

**Table 4.** Descriptive statistics for the post-test productive vocabulary knowledge scores

Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Control	20	7.7000	1.92217	.42981	6.8004	8.5996	5.00	13.00
Experimental 1	20	5.8500	2.96071	.66203	4.4643	7.2357	2.00	13.00
Experimental 2	20	6.3000	2.40832	.53852	5.1729	7.4271	3.00	13.00
Total	60	6.6167	2.55178	.32943	5.9575	7.2759	2.00	13.00

As it can be seen in Table 4., the mean of all three groups has increased in the post-test in terms of productive vocabulary knowledge. In order to investigate whether the increase in the productive vocabulary knowledge was significant or not, the researcher conducted a One-way ANOVA on the post-test scores of the productive vocabulary knowledge. The results of the one-way ANOVA on the post-test productive vocabulary knowledge scores are shown in Table 5.

**Table 5.** One-way ANOVA: comparison between scores on post-test productive vocabulary knowledge scores

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	37.233	2	18.617	3.059	.042
Within Groups	346.950	57	6.087		
Total	384.183	59			

As the results of Table 5. show, an F ratio of  $F(2, 59) = 3.059$ ,  $p = .042 < .05$  indicated a statistically significant difference among the three groups; therefore, the second null hypothesis of the study was rejected. To find the location of the difference a post-hoc LSD was carried out. The results are presented in Table 6.

**Table 6.** LSD post-hoc test: comparison between post-test productive vocabulary knowledge scores

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.
Control	Experimental 1	1.85000*	.78018	.021
	Experimental 2	1.40000	.78018	.078
Experimental 1	Control	-1.85000*	.78018	.021
	Experimental 2	-.45000	.78018	.566
Experimental 2	Control	-1.40000	.78018	.078
	Experimental 1	.45000	.78018	.566

\*. The mean difference is significant at the .05 level.

The mean difference reported in Table 6. Indicates a statistically significant difference between the Control group and online Quizlet flashcards group, as presented in Table 4.6 the mean difference of  $M = 1.85$ ,  $P = .021 < .05$ . There is not a significant difference between control group and student-created Quizlet flashcards group as Experimental group 2, as presented in Table 6. the mean difference of  $M = 1.40$ ,  $P = .078 > .05$ . Also, there is not a significant difference between online Quizlet flashcards (Experimental group 1) and student-created Quizlet flashcards (Experimental group 2), as presented in Table 6, the mean difference of  $M = .45$ ,  $P = .566 > .05$ . Based on the mean differences, the three groups can be ordered in this way with regard to productive knowledge scores: (1) Control group (2) student-created Quizlet flashcards (3) online Quizlet flashcards.

#### 4.1.3. Research hypothesis 3

H03. There is no significant difference between traditional method, Online Quizlet flashcards, and Student-Created Quizlet flashcards on retention of receptive vocabulary knowledge.

To evaluate the effectiveness of the treatment on retention of receptive vocabulary knowledge and to test the third hypothesis, One-way ANOVA was run on participants' delayed post-test scores on receptive vocabulary knowledge. The descriptive statistics of the post-test scores are shown in Table 7.



**Table 7.** Descriptive statistics for the delayed post-test receptive vocabulary knowledge scores

Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Control	20	7.9500	2.66508	.59593	6.7027	9.1973	5.00	15.00
Experimental 1	20	11.3000	1.75019	.39135	10.4809	12.1191	9.00	15.00
Experimental 2	20	9.3000	3.14726	.70375	7.8270	10.7730	5.00	15.00
Total	60	9.5167	2.89647	.37393	8.7684	10.2649	5.00	15.00

As indicated in Table 7., three groups vary in standard deviation and standard error of mean. The mean of the three groups is different on the delayed post-test receptive vocabulary knowledge. To test whether this difference in retention of receptive vocabulary knowledge of three groups is significant or not the researcher conducted a One-way ANOVA on the delayed post-test of the receptive vocabulary knowledge. The results of the one-way ANOVA on the delayed post-test receptive vocabulary knowledge scores are shown in Table 8.

**Table 8.** One-way ANOVA: comparison between scores on post-test productive vocabulary knowledge scores

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	113.633	2	56.817	8.492	.001
Within Groups	381.350	57	6.690		
Total	494.983	59			

As the results of Table 8 show, an F ratio of  $F(2, 59) = 8.492$ ,  $p = .001 < .05$  indicated a statistically significant difference among the three groups; therefore, the third null hypothesis of the study was rejected. To find the location of the difference, a post-hoc LSD was carried out. The results are presented in Table 9.

The mean difference reported in Table 9. indicates a statistically significant difference between the online Quizlet flashcards (Experimental group 1) and control groups. There is also a significant difference between online Quizlet flashcards and student-created Quizlet flashcards (Experimental group 2) groups as presented in Table 9., the mean difference of  $M = 2.00$ ,  $p = .018 < .05$ . The most difference lies between the experimental group 1 and the control group with a mean difference of  $M = 3.35$ ,  $p = .000 < .05$ . Based on the mean differences, the three groups can be ordered in this way with regard to receptive knowledge scores on the delayed post-test: (1) online Quizlet flashcards (2) student-created Quizlet flashcards (3) control. Moreover, there is not a significant difference between the student-created Quizlet flashcards (Experimental group 2) and control group' scores on delayed post-test receptive vocabulary knowledge as presented in Table 9. the mean difference of  $M = 1.35$ ,  $p = .104 > .05$ .

**Table 9.** LSD post-hoc test: comparison between delayed post-test receptive vocabulary knowledge scores

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.
Control	Experimental 1	-3.35000*	.81795	.000
	Experimental 2	-1.35000	.81795	.104
Experimental 1	Control	3.35000*	.81795	.000
	Experimental 2	2.00000*	.81795	.018
Experimental 2	Control	1.35000	.81795	.104
	Experimental 1	-2.00000*	.81795	.018

#### 4.1.4. Research hypothesis 4

H04. There is no significant difference between traditional method, Online Quizlet flashcards, and Student-Created online Quizlet flashcards on retention of productive vocabulary knowledge.

To evaluate the effectiveness of the treatment on retention of productive vocabulary knowledge and to test the fourth hypothesis, One-way ANOVA was run on participants' delayed post-test scores on productive vocabulary knowledge. The descriptive statistics of the post-test scores are shown in Table 10.

**Table 10.** Descriptive statistics for the delayed post-test productive vocabulary knowledge scores

Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Control	20	4.9500	2.21181	.49458	3.9148	5.9852	2.00	12.00
Experimental 1	20	4.9000	3.19374	.71414	3.4053	6.3947	1.00	13.00
Experimental 2	20	5.3000	2.40832	.53852	4.1729	6.4271	2.00	12.00
Total	60	5.0500	2.60003	.33566	4.3783	5.7217	1.00	13.00

As indicated in Table 10., three groups vary in standard deviation and standard error of mean. The mean of the three groups is different on the delayed post-test productive vocabulary knowledge. To test whether this difference in retention of productive vocabulary knowledge of three groups is significant or not the researcher conducted a One-way ANOVA on the delayed post-test of the receptive vocabulary knowledge. The results of the one-way ANOVA on the delayed post-test productive vocabulary knowledge scores are shown in Table 11.

**Table 11.** One-way ANOVA: comparison between scores on delayed post-test productive vocabulary knowledge scores

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.900	2	.950	.136	.873
Within Groups	396.950	57	6.964		
Total	398.850	59			

As Table 11. shows, an F ratio of  $F(2, 59) = .136$ ,  $p = .873 > .05$  indicated no statistically significant difference among the three groups; therefore, the fourth null hypothesis of the study was accepted.

## 4.2. Findings

In this section, findings of the study are presented with reference to the research questions followed by their discussions.

### 4.2.1. Research question 1

Q1. Is there any significant difference between traditional method, online Quizlet flashcards, and student-created Quizlet flashcards in learning of receptive vocabulary knowledge?

The analysis of data collection for the study revealed that in terms of learning receptive vocabulary knowledge, the three groups of the study were significantly different. The difference in mean scores is proof to claim that the students who received the online Quizlet flashcards outperformed other groups. Based on these data and the analysis of SPSS, the first null hypothesis is rejected. In other words, there is a significant difference between online Quizlet flashcards and student-created online flashcards and control groups for Iranian EFL learners in learning receptive vocabulary.

The difference between the findings of the current study and previous studies was the difference in the scores of students in online Quizlet flashcards and student-created Quizlet flashcards groups. The students of online Quizlet flashcards significantly outperformed student-created Quizlet flashcards group. In a study conducted by Mojarradi (2014), there was not any significant difference between prepared flashcards and student-created flashcards in terms of vocabulary learning. In a study conducted by Hung (2015), there was not any significant difference between student-created flashcards and prepared flashcards in terms of vocabulary learning.

The first explanation for the difference in the results of the experimental groups and control group is the repetition. Vidal (2011) found that repetition is a major factor affecting learning words compared to the other factors like type of elaboration, type of words, and word form. Brown et al. (2008) found that words that repeated more often had a greater chance of being learned. The data revealed that many repetition of the words (20 to 50 times) will be needed for substantial leaning of words. The students of the control group just were taught the words in the classroom and they didn't have any chance for practicing and repetition. Quizlet website provides enough chance for students to repeat each word more than 5 times. Moreover, it enables students to review the words of a course again. One of the main reasons for the superiority of the two experimental groups over the control group is more repetition during the period. The students in the control group received the

words of each session in 30 minutes, while the students in the experimental groups learned the words gradually over a week with a lot of practice and repetition.

#### 4.2.2. Research question 2

RQ2: Is there any significant difference between traditional method, online Quizlet flashcards, and student-created Quizlet flashcards in learning of productive vocabulary knowledge?

The analysis of data collection for the study revealed that in terms of learning productive vocabulary knowledge, the students of the control group significantly outperformed the students in online Quizlet flashcards.

These findings and results contrast with some of the previous findings in regard to employing online flashcards to learn productive vocabulary knowledge. In a study conducted by Taghizadeh and Porkar (2018) use of online flashcards had significant effect on improving productive vocabulary knowledge of students. The reason of the contrasting might be related to the COVID-19 widespread in Iran. This caused a situation that the teacher was not able to check the experimental groups who were supposed to work on the flashcards. Some students might not devote enough time to practice the flashcards. The students of the control group participated in face-to-face class.

One of the important factors in learning a word is word consciousness. Word consciousness involves the awareness of word parts, word order, and word choice in different uses of the language, how words extend their meanings, underlying core meanings, and how words are learned. The learners should be encouraged to expand their knowledge about members of a lexical set. Using flashcards as an example of explicit learning cannot give enough information about productive usage of the words (Nation, 2001). Scott and Nagy (1997) argue for developing word consciousness with L1 learners and Graves (2006) also strongly confirms their opinion in this regard.

As mentioned above, one of the most important information that a learner should be taught about the words is how to use them in different contexts and sentences. Students in control group received some examples for each word and also informed about parts of speech related to each word. On the other hand, students in both experimental group due to the impossibility of adding examples in flashcards could not receive some examples related to each word. This factor can be a good reason for the lack of superiority of experimental groups in the productive parts of the tests. The findings of this study is in contrast with the study conducted by (Webb, 2007) that showed there is no significant difference between learning a decontextualized word and its translation and learning a word and its translation with a sentence context. Flashcards are not able to provide detailed information about different forms and usages of a words. Flashcards limit the chance of practicing different forms of the words. Vocabulary exercises should focus on internalizing the words not just practicing surface form-meaning level. Students need to deal with collocations and multiple-word units not just single words (Faraj, 2015).

#### 4.2.3. Research question 3

RQ3: Is there any significant difference between traditional method, online Quizlet flashcards, and student-created Quizlet flashcards on retention of receptive vocabulary knowledge?

The analysis of the data showed students of online Quizlet flashcards group significantly outperformed students of the student-created Quizlet flashcards and control groups. Based on this claim the third null hypothesis were rejected. This means the rate of forgetfulness was higher in control and student-created Quizlet flashcards groups.

Unfortunately, there were not any previous studies related to the effect of online flashcards on retention of the receptive vocabulary knowledge, so the researcher was not able to compare the results and findings of the current study with the studies conducted before.

Students in both experimental groups had many opportunities to review and repeat vocabulary. The strength of the connection between meaning and form will determine how students retrieve the meaning of the word when they see it or hear it or how to use it when they want to express a meaning. It is also important for students to have enough repetition in addition to the knowledge of form and meaning (Nation, 2001). There are some evidence that the knowledge of form-meaning from using flashcards can be remained for a long time (Bahrick et al., 1987; Beaton et al., 1995).

As mentioned in previous parts using flashcards can increase self-testing effect. Many studies proved that you will recall 50% more of learned information by testing the items you learned rather than spending the same amount of time for studying (Zung et al., 2022).

#### 4.2.4. Research question 4

RQ4: Is there any significant difference between traditional method, online Quizlet flashcards, and student-created flashcards in retention of productive vocabulary knowledge?

The results and findings of the study revealed that there was no significant difference between three groups of the study.

The results of this study are in contrast with some of the previous study. For instance, Alghamdi and Elyas (2020) claimed that the use of online flashcards had significant effect on vocabulary retention of students in Saudi Arabia. In another study conducted by Nemati (2009), the results of the study showed that use of flashcards significantly improve retention of productive vocabulary knowledge.

Testing and generating effects are two important factors in recalling words. Testing effect is more concerned with the initial test of words in the process of recalling words. Initial tests mostly include multiple choice and matching questions which are closely related to receptive knowledge of the words. Testing effect works in more limited situations. Generating effect is more concerned with free final testing of the words. As it can be understood the knowledge you need to recall in generating effect is more concerned with productive vocabulary knowledge (Karpicke & Zaromb, 2010). According to the lexical activation hypothesis, learner must search his or her semantic memory during the process of generation (Payne et al., 1986).

## 5. Conclusion

This study aimed at investigating the effect of online Quizlet flashcards and student-created online flashcards on learning and retention of receptive and productive vocabulary knowledge by Iranian EFL learners. The findings proved that both experimental groups outperformed the control group on the post-test and delayed post-test. Based on the reviewed literature and this small-scale experimental research, it can be concluded that teaching vocabulary needs to be updated based on the needs of the learners and tools that instructors have at their disposal. Too much emphasis on traditional methods can reduce the motivation and performance of learners. The new generation are digital native and the teacher should adapt their methods of teaching with the interests of their learners. Although learning through online flashcards has not been introduced recently, its use among Iranian teachers and language learners needs more attention.

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