INNOVATION IN LANGUAGE LEARNING International Conference

Effects of Equal and Expanding Spacing Techniques on EFL Learners' Immediate and Delayed Vocabulary Retrieval

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Abstract

The spacing effect, which refers to the distribution of learning across time, is assumed to lead to better vocabulary retrieval as compared to immediate repetition of words. This study investigated the impact of using digital flashcards and wordlist memorization for vocabulary learning through equal and expanding spacing conditions. The participants consisted of 60 homogeneous A2 level EFL learners randomly assigned to two control and two experimental groups. The target words of the study consisted of 20 unknown B1 level words. The control groups studied and practiced the new words using a wordlist containing all the target words, their definitions, and example sentences, while the two experimental groups studied the same words using the Cram.com website, whereby 20 digital flashcards were prepared with each word on one side and the related picture and definition on the other side. The words were presented five times in each class. In the equal spacing control and experimental groups, the words were recycled once a week, while in the expanding spacing groups they were recycled over intervals of 2, 5, 7, and 13 days. At the end of the treatment, all the participants took two immediate multiple choice and gap-filling posttests. After a two-month interval, five members of each group were randomly selected and given three delayed multiple choice, gap filling, and sentence making tests testing their knowledge of the same words. The results indicated no statistically significant differences between the four groups' mean scores on the immediate and delayed vocabulary posttests. Moreover, there was no statistically significant difference between each group's mean scores on the immediate and delayed vocabulary posttests, suggesting that their uptake had turned into the acquistion of target words, giving credence to the efficiency of repetition in the process of vocabulary learning irrespective of the type of spacing condition and the use of more modern or traditional techniques.

Keywords: *Vocabulary learning; teaching techniques;*

1.Introduction

Vocabulary learning plays a crucial role in both L1 and L2 language acquisition, and any defect in this area would lead to communication breakdown [1], as the knowledge of grammar cannot guarantee accomplishments in the conveyance of the message [2]. Clearly, successful communication is the primary concern of all L2 learners, highlighting the role of vocabulary knowledge not only in comprehension but also in production. Thus, it is necessary for teachers to employ the most efficient strategies to enhance vocabulary learning and to train more autonomous individuals.

A critical factor regarding vocabulary learning is how frequently the words are repeated, and how efficiently they can be retrieved, implying that exposure frequency plays a key role in vocabulary retention both in L1 and L2 acquisition [3]. Research findings indicate that the more frequently the learners are exposed to a word, the more probable it is for them to learn it [4 and 5].

2.The Role of Memory in Vocabulary Acquisition

Recent studies on vocabulary learning underscore the significance of inter-word connections and repetition for better retrieval and, thus, learning of a word [6]. Undoubtedly, the role of working memory as the main component for maintenance and retrieval of all incoming information cannot be ignored here. It refers to a complex storage system which is "responsible for temporary maintenance of task-relevant information while performing cognitive tasks" [7]. Based on the most commonly cited model of working memory proposed by Baddeley in 1974, learning occurs in working memory, and repetition

and rehearsal can facilitate learning as they can transfer the learned knowledge from working memory to long-term memory [6].
The information that moves into long term memory is not recalled easily, which might be due to the form which information takes within this space. Some researchers believe that information is stored in a visual form; some focus on the verbal form; some insist that it is stored depending on its meaning, and some claim that richness of meaning is also critical in this process [8].

3.Spaced Repetition

Repetition is a useful technique for word acquisition; however, there is no consensus regarding the number of exposures to new words and the interval among exposures. For instance, Waring and Takaki [9] report that for a 50% chance of word retrieval, at least eight encounters are required. They add that more frequent exposure, even up to 20 times, make a slight difference in the results. Webb [10] also states that 10 encounters could guarantee a reasonably large learning gain.
Spacing is defined as presenting some material to the learners, waiting for a time interval, and presenting it again, be it a few repetitions or many [11]. In a study comparing equal (3-3-3-3) and expanded spacing (0-1-3-8) conditions, Landauer and Bjork [12] concluded that expanded spacing led to higher retrieval. Schuetze [13] acknowledged that in L2 acquisition, it is necessary to keep words in long-term memory for a more extended period and retrieve them later, thus the point is to determine the best interval for the optimal retrieval of words [3].

4. Method

4.1. Research Question

Are there any differences between the effects of equal and expanding spacing techniques on EFL learners' immediate and delayed vocabulary retrieval?

4.2. Instruments

- An immediate vocabulary MC posttest
- An immediate vocabulary gap filling posttest
- A delayed vocabulary MC posttest
- A delayed vocabulary gap filling posttest
- A delayed sentence making posttest

4.3. Participants

The participants were 60 male and female Iranian A2 level EFL learners between 18 to 40 years old in two control and two experimental groups at a language school in Tehran.

5. Procedure

All the participants had taken the same achievement and interview tests before entering the pre-intermediate level. Initially, given the students' proficiency level (A2), a test of 50 B1 level words (in the form of wordlist) was given to them to choose 20 words which were completely unknown to all the participants. The new words were presented to both control groups using a wordlist containing all the target words. The two experimental groups studied the words using the Cram.com website, whereby 20 digital flashcards were prepared with each word written on one side and the related picture and definition on the other side. The target words were recycled five times in each class. In the equal spacing control and experimental groups, the words were repeated once a week, while in the expanding spacing groups they were recycled over intervals of 2, 5, 7, and 13 days.The participants of four groups took two immediate MC and gap-filling posttests at the end of the treatment. After a two-month interval, five members of each group were randomly selected and given three delayed multiple choice, gap filling, and sentence making tests to determine the degree of their retrieval of the target 20 words.

6. Results

The immediate MC and gap filling post-tests were given three days after the last session of the instruction to measure the participants' recll of the target words. The ANOVA results revealed no significant differences between the mean scores of the word list memorization and digital flash-card groups, both in equal and expanding spacing conditions (Table 1). However, both groups had

significantly improved their word knowledge. It is noted that the expanding spacing wordlist group obtained the highest mean score on both MC (M=18.53) and gap filling tests (M=18.13).

Table1. ANOVA for Immediate Post-Test

		Sum of Squares	df	Mean Square	F	Sig.
MC	Between Groups	10.933	3	3.644	.453	.716
	Within Groups	450.800	56	8.050		
Fills in the Gaps	Between Groups	29.200	3	9.733	.635	.595
	Within Groups	857.733	56	15.317		

To check the effects of using wordlist memorization and digital flashcards on long-term retention of words, three delayed tests were admintered after 45 days (the MC and gap filling tests, as well as a sentence making test). With F=1.1, *P* = 0.37 for delayed MC tests and F = 0.54, *P* = 0.657 for delayed gap filling tests, it was concluded that there was no statistically significant difference between the mean scores of the four groups on both receptive tests. Furthermore, with F = 1.3, *P* = 0.30, no significant difference was observed between their mean scores on the productive test (Table 2). However, the students who learned the words by digital flashcards under the expanding condition achieved the highest mean on all the three delayed posttests.

Table2. ANOVA for Delayed Post-Test

		Sum of Squares	df	Mean Square	F	Sig.
MC	Between Groups	59.600	3	19.867	1.102	.377
	Within Groups	288.400	16	18.025		
Fills in the Gaps	Between Groups	24.200	3	8.067	.548	.657
	Within Groups	235.600	16	14.725		
Sentence Making	Between Groups	70.150	3	23.383	1.319	.303
	Within Groups	283.600	16	17.725		

The results of another ANOVA revealed that there was no statistically significant difference between the mean scores of the four groups' on the immediate and delayed MC, gap filling, and sentence making tests.

7. Conclusions and Discussion

The obtained results indicated the presence of no statistically significant differences between the mean scores of the participants under the equal and expanding spacing conditions. Moreover, there was no statistically significant difference between their mean scores on the immediate and delayed vocabulary posttests, suggesting that the participants' uptake of the 20 words in all four groups had immediately turned into the acquistion of the words. In other words, despite the types and times of recycling the target words in each groups, the participants had the same amount of retrival, which once more highlighted the significance of repeated exposure to data in vocabulary learning.

Similarly, Nakata [14] found no significant differences between the effects of using equal and expanding conditions in his study of 128 Japanese college students who studied 20 English-Japanese word pairs. In another study, Dizon and Tang [15] compared the efficacy of digital flashcards versus paper flashcards to improve receptive and productive L2 vocabulary learning. They concluded that, although both groups had made significant improvement in this regard, the difference between their gains was not significant. However, the findings of a 10-item survey with closed and Likert-scale questions showed that the participants prefered digital flashcards to paper ones. Finally, Jo [16] found out that the long term retention of concrete and abstract words was not influenced by the choice of flashcards or wordlists.

The findings of this study highlight the primary significance and efficiency of repetition in the process of vocabulary acquisition irrespective of the type of spacing condition and the use of more modern or traditional techniques. Given the results of this study and many others, it seems that, even in croweded classrooms lacking modern facilities, students can learn new words effectively only by employing some simple techniques like wordlist memorization provided that they have enough exposure to input.

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