# A comparative study between the effectiveness of reading-only condition and reading-while-listening condition in incidental vocabulary acquisition

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**Abstract**

Vocabulary knowledge is very crucial for learners who want to be competent in a language. Vocabulary knowledge means having the knowledge of or command over words of a language and their usages in real-life contexts. Vocabulary knowledge can be gained incidentally and intentionally. The paper compares the effectiveness of the reading-only condition and reading-while-listening condition in incidental vocabulary acquisition. It seeks to find out whether students acquire more vocabulary knowledge by reading a text only or reading the text while listening to it. It also disseminates the effect of word exposure frequency. By applying four vocabulary tests, it proves that learners can gain vocabulary knowledge in both the conditions; but the reading-while-listening condition can result in more gain of vocabulary knowledge. The paper also shows that the more the number of encounters with words in context, the more the vocabulary gains. Studies with students from different levels of education and gender based studies can be conducted. This is a pioneering study on this topic in Bangladesh, so the paper will pave a way for the researchers who want to work on the same topic.

*Keywords:* incidental vocabulary acquisition; incidental vocabulary learning; reading-only condition; reading-while-listening; vocabulary knowledge; frequency of word occurrence

## 1. Introduction

Students who learn English as a Second Language (ESL) can gain vocabulary knowledge in two ways: intentionally and/or incidentally. Intentional vocabulary knowledge means to acquire knowledge consciously. On the other hand, incidental vocabulary acquisition signifies the earning of vocabulary knowledge without putting the direct focus on word learning activity. It signifies the subconscious learning of vocabulary. Some studies, (such as Laufer, 2003; Richards & Schmidt, 2002; Huckin & Coady, 1999; Brown et al., 2008) refer to incidental vocabulary acquisition as a "by-product" (Huckin & Coady, 1999, p. 182) of learning other things or acquiring novel features of Second Language without any direct focus of doing so (Van Zealand & Schmitt, 2013). Shintani and Ellis (2011) were of the view that incidental acquisition of vocabulary knowledge happens when a

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learner gains the knowledge of one feature of the target language whereas his/her attention is on a different aspect of that language.

Some studies profess that through reading, it is possible to gain vocabulary knowledge incidentally (Dupuy & Krashen, 1993; Pitts et al., 1989; Grabe & Stoller, 2002; Pigada & Schmitt, 2006; Song & Sardegna, 2014). An opposite view challenges that reading for incidentally acquired word knowledge might not be as efficient as it is shown by some previous writers. (Laufer, 2003; Paribakht & Wesche, 1997; Pellicer-Sánchez & Schmitt, 2010; Teng, 2014a; Waring & Takaki, 2003). However, many researchers who work with vocabulary learning opine that learners acquire most of the words incidentally through real life conversations, watching television, and reading texts (Akhtar, 2004; Elley, 1989; Henderson et al., 2015; Houston-Price et al., 2014). There are very few studies that assessed the effects that reading-while-listening condition offered to the students learning English as a foreign language (EFL). The list includes but is not limited to Brown et al., (2008), Webb, Newton, and Chang (2013); and Pellicer-Sánchez et al., (2018).

## 1.1. Significance of the Study

For several reasons, this particular study is necessary. Firstly, learning vocabulary is thought by many to be very essential for learning a language. Secondly, finding out an effective method of learning vocabulary would help the Bangladeshi EFL/ESL students strengthen their linguistic ability. Most importantly, to add to the literature on vocabulary teaching, this study might give teachers a chance to improve their teaching of vocabulary.

## 1.2. Rationale for the Study

In this modern globalized world, it is very necessary for students to have a stronghold over the English language, be it for jobs or higher study and this command includes vocabulary strength. On the other hand, it is important on the part of the teachers to find out the vocabulary strength of students so that the teachers can help the students if they have a poor vocabulary. Besides, students learn most of the words incidentally, it is imperative to find out the rate at which they can pick up vocabulary incidentally. In addition, in Bangladesh, research in this area is yet to be done. To be specific about the subject matter of this present research, this is the first study on this topic in the country. No comprehensive study like this one has been done before. Most of the studies on vocabulary learning conducted in Bangladesh are concerned with the techniques and strategies that are followed by students or learners (Nousin, 2015; Alam & Ashrafuzzaman, 2018); the benefits that the students can get from learning vocabulary (Ashraf, 2015); and the steps in teaching vocabulary in a way that indirectly facilitates learning (Sayma, 2013). This study, therefore, will open a new horizon of research in Bangladesh.

## 1.3. Literature Review

Several research studies have endeavored to find out how much effective the skill of reading can be in the incidental acquisition of vocabulary knowledge. Some studies think that through extensive reading, learners can develop the knowledge of the words that were previously unknown to them (Day & Bamford, 1998; Grabe & Stoller, 2002; Renandya, 2007). The study that Waring and Takaki (2003) conducted include three tests: word-form recognition, prompted meaning recognition and unprompted meaning recognition at diverse times: an immediate test after reading, a test one week after the immediate test, and a test after three months of the immediate test, on 15 Japanese female students to explore learning from graded readers. For their study, they selected 25 words from the graded reader, *A Little Princess*. Their choice of words depended on the appearance of the words that occurred in

different levels of frequencies. The three different periods showed a substantial decrease in mean score over time. Immediately after the three tests, the mean scores were: word-form recognition test-15.3 (61.2%), multiple-choice recognition test- 10.6 (42.4%), and meaning (translation) test- 4.6 (18.4 %). After three months, the mean scores for the three tests were: word-form recognition test-8.4 (33.6%), multiple-choice recognition test- 6.1 (24.4%), and meaning (translation) test- 0.9 (3.6 %).   It was found that after three months, learners forgot the meanings of 24 words out of 25 and retained only one. Their study concluded that more than 20 encounters are necessary for gaining a complete understanding of a new word item and retaining it.

Pigada and Schmitt (2006) conducted a one participant study in which they found out how much knowledge of word meaning, spelling and grammatical characteristics that particular participant could acquire. For their study, they selected 133 target words from graded readers. The study showed that knowledge of 97 words, which is 65.4%, was enhanced in one or more dimensions. The pickup rate was about 1 of every 1.5 words that had been tested. The knowledge of spelling was highly enhanced, even from a few encounters. There were improvements also in meaning and grammatical knowledge. However, these two aspects were not improved to the same extent as that of spelling. This study goes hand in hand with Waring and Takaki's study (2003) which also found that only a few exposures are enough for a learner to acquire the knowledge of spelling. Pigada and Schmitt (2006), like that of Waring and Takaki (2003), recommended 20 or more encounters for a learner to have the command over all three knowledge dimensions.

An experiment exploring the acquisition of word form recognition (spelling), word-class recall, and meaning recognition and recall was done by Pellicer-Sánchez and Schmitt (2010) that used 34 target words. The study used the reading of an authentic novel and pointed out that knowledge of 9.4 (28%) was enhanced somehow. They concluded that 10 or more encounters with a word results in a substantial increase in learning for all the knowledge types used in their study. However, although their study propounds that the acquisition of the knowledge of spelling entails fewer occurrences than that of the other types of vocabulary knowledge, it clearly goes against Waring and Takaki's (2003) finding which shows the exact opposite.

Song and Sardegna (2014) aspired to find out whether the knowledge of English prepositions could be incidentally acquired or not. They ran the investigation to see if enhanced extensive reading could contribute to vocabulary development. They took a sample of 24 secondary school EFL students as participants. The participants were divided into two groups: the experimental group (with enhanced instruction for reading), and the control group (without any instruction of enhanced reading). By using pre-tests and post-tests, the study measured the development of target words. From their study, it was found that the experimental group had a sharp improvement from a mean score of 53.67 to 67.59; on the other hand, the control group only improved from 52.83 to 53.67. From the interviews of the students, it was found that it is possible for a learner to learn and retain vocabulary if the learner is frequently presented with a word in a meaningful context. One of the suggestions was that word exposure frequency is one of the major aspects of incidental vocabulary learning. Webb and Chang (2012) opined that there should be more studies on this issue. Webb (2007a) proposed that a participant could gain vocabulary knowledge with the increasing number of repetitions. In the study, he replaced authentic words with pseudowords with 1, 3, 7, and 10 encounters.

Chen and Truscott (2010) also steered a study to discover the effectiveness of reading in incidental vocabulary learning, but in a different way. Instead of using pseudowords, they used English words in their regular forms. The data analysis of the study proved that if the number of encounters is increased, the score could increase as well. This study concluded that between productive knowledge and receptive knowledge, repetition tends to increase the acquisition of the former one more than that of the latter one.

Teng's (2014a) study used 30 substituted pseudowords and divided them into 5 groups of frequency levels. Through the study, he found out the incidental learning of these pseudowords. For his study he used a story titled *Love or Money*, and administered three different tests on three different features of vocabulary knowledge: recognizing the form, recalling the meaning, and using a word. The study brought forth the following outcome: Any word having more than 14 occurrences in the same text could help the learner acquire all three aspects of vocabulary knowledge in 68.3% instances. The learners scored 8.3% in the form recognition test, 5% in meaning recognition test, and 3.3% in usage for the words that they encountered once only. His study showed that for meaning recognition, a learner requires more exposures than form recognition. This is similar to Pellicer-Sánchez and Schmitt's (2010) study that found the same result, but it contradicts with the results of Waring and Takaki's (2003) study which claimed that form recognition should involve more exposures than meaning recognition.

After that, Teng (2016a) conducted another research containing 15 target words. He distributed the words into 3 frequency groups. This experiment used four test measures: recall of form, recognition of form, recall of meaning, and recognition of meaning. His goal in this study was to see how far the students are able to build the form-meaning link. He wanted to see if there is any development in vocabulary knowledge; thus he administered an immediate post-test. The results revealed that reading could work as a positive factor in acquiring incidental vocabulary knowledge. His study put forth the decision that recognition of form was the most easily acquired vocabulary knowledge and recall of form is the most difficult one in the list.

According to the outcomes of these studies, vocabulary knowledge can be gained through reading. Some of them showed that over time the vocabulary knowledge could decrease. There are also some studies that show that the more encounters a learner have with an unknown word, the more vocabulary knowledge of the word s/he gains. In some studies, meaning recognition entails fewer encounters than form recognition. In some studies, this is the opposite. Schmitt (2010) claimed that acquiring the knowledge of incidental vocabulary is complex and it increases with the number of more and more encounters with words used in context. So, the present paper suggests that further research should be conducted on the incremental quality of word exposure frequency in learning vocabulary.

There are some studies concerning incidental vocabulary acquisition through reading-while-listening. Brown et al. (2008) showed the comparison between the results of reading- while-listening with the gains achieved through reading and listening conditions. The tests were conducted over a period of three months. The first one was after one week after the experiment. The second one was done after three months after the experiment. The study, in brief, used three different conditions (reading condition, listening condition, and reading-while-listening condition) and 28 target words within four frequency groups. The study mainly produced two findings. Firstly, it was found after one week of the experiment that the participants scored highest in the reading-while-listening condition with 13.32 (47.5%) for the multiple-choice recognition test and 4.38 (15.6%) for the meaning-by translation test. In the other two conditions, the scores were lower. After three months of the experiment, the participants were asked to attend another multiple-choice test. It was found that the participants could retain the meaning of only one target word which is only 3.57%. This study showed that the reading-while-listening condition yields higher gains than the other two. On top of that, the reading-while-listening condition proved to be the most productive for participants to retain the vocabulary knowledge which was obviously more than what they gained or retained from reading only condition or listening only condition. They suggested that for listening, reading and reading-while-listening to yield substantial improvement, 15–20 repetitions, 10–13 repetitions and 7–9 repetitions are necessary respectively for the three conditions. Webb et al. (2013) presented reading-while-listening to

be producing a positive outcome. They also posed importance on the encounters that learners have with a target word which means that the more the encounters, the better the result.

Zealand and Schmitt (2013) conducted a study "to provide a more complete picture of vocabulary knowledge gains from listening through the use of multiple tests, both immediately and two weeks after listening." All the 30 participants that they considered for their study were at the postgraduate level studying at a university in Britain. They ran a listening task to find out the score of three vocabulary knowledge dimensions: form recognition, grammar recognition, and meaning recall in order to investigate how much vocabulary knowledge could the participants gain by listening. They divided the participants into two groups. In one group, they put 20 participants and provided them with the listening input. After receiving the instructions, participants sat for an immediate post-test. In the other one, there were 10 participants who received the input but they had a two-week delayed post-test.

In another study, Teng (2016 b) showed differences between the effects of two conditions: reading-while-listening condition and reading-only condition. This study applied four different types of vocabulary knowledge tests namely Form Recognition, Grammar Recognition, Meaning Recall and Collocation Recognition. For his study, he selected 24 words and divided them into four frequency groups. There were 60 participants in his study. The results from the study are presented in the table below.

**Table 1.** Vocabulary Gains in Reading-only Condition and in Reading-while-listening Condition

| Test | Vocabulary Gains in Reading-only Condition (%) | Vocabulary Gains in Reading-while-listening Condition (%) |
|------|------------------------------------------------|-----------------------------------------------------------|
| Form Recognition | 52.9% | 65.4% |
| Grammar Recognition | 34.1% | 43.3% |
| Meaning Recall | 4.1% | 7.3% |
| Collocation Recognition | 3.1% | 4.8% |

From the results presented here, it can be decided that the reading-while-listening condition could produce better results. At the same time, it is to mention that the knowledge of collocation is the most difficult one. One thing that he found to be important in incidental vocabulary gains for acquiring the knowledge of word form and grammar was "word exposure frequency" which means a participant will have a better idea about a word if s/he has more exposure with a word in context.

Valentini et al. (2018) explored children's learning of three types of information: phonological, orthographic, and semantic, from the words encountered in the context of a story. They conducted the study on 71 children (8-9 years old) who were experimented through to a story that contained novel words in the following three conditions: (a) listening, (b) reading, and (c) simultaneous listening and reading. The total mean scores of the story comprehension task in three different conditions were as follows: Listening group-6.25, Reading group-5.35, and Combined group-6.83. The recommendation was that if the children listen to and/or read stories; they can identify information about the phonological forms, orthographic forms, and meanings of new words. They opined that both listening and reading conditions are useful in learning new phonological forms. At the same time, if the teachers write down some words, it facilitates the learning of orthographic forms. The study concluded that if the participants are presented or familiarized with new words with both their oral and written forms, they can have more vocabulary gains than if they are provided with only one form. Pellicer-Sánchez et

al. (2018) also showed that the reading-while-listening condition offers the development of a number of skills related to listening fluency.

The previous studies represent that participants tend to show better performance when they are presented with a text along with the audio of the text (reading-while-listening condition) which might be a result of the probability that "aural-written verification is more likely to facilitate learners developing auditory discrimination skills, refine word recognition, and gain awareness of a form-meaning link." (Teng, 2016b, p. 3)

### 1.4. Context of the Problem

It is not that vocabulary related studies are not being conducted in the context of Bangladesh, but most of them concentrate on demonstrating the challenges faced by EFL teachers while teaching vocabulary. Some studies are of the opinion that EFL classrooms are the only place from where the students learn vocabulary (Jahan & Jahan, 2011; Siddiqua, 2016). Some others analyzed strategies of vocabulary learning (Ashraf, 2015; Bristi, 2015), and the prevalent practices of vocabulary teaching (Hasan, 2014), which Arju (2011) found as the responsible reasons which are making vocabulary-related tasks unproductive. However, the studies mentioned above have not focused on incidental vocabulary acquisition and its different components, particularly the comparison between the two conditions in the context of Bangladeshi university students discussed in the present paper. Hence, the current study filled the research gap and attempted to investigate the comparisons between the results of the Reading-only condition and the Reading-while-Listening condition in incidental vocabulary acquisition. It will be done by employing an analysis of four tests of vocabulary knowledge: Form Recognition, Grammar Recognition, Meaning Recall and Collocation Recognition.

### 1.5. Benefits of the Study

The present study on incidental vocabulary acquisition would come up with several benefits. To begin with, it will reveal a wider horizon of research in Bangladesh because this is the first study on this topic. Secondly, it will, through its results, disseminate whether only reading a text or simultaneous reading and listening produces a better result. Finally, the teachers can empirically use the technique (subconscious learning of vocabulary through other things) in helping the students build a good command of vocabulary knowledge of a target language because this is how the teachers could present the contents of a text to the students in a more interesting way.

### 1.6. Hypothesis of the Study

The null hypothesis for this study is:

HO: There is no significant difference between the two conditions (Reading-only condition and Reading-while-listening condition).

It is tested against the alternative hypothesis:

HA: There is a significant difference between the two conditions (Reading-only condition and Reading-while-listening condition).

### 1.7. Research Questions

The research questions below were addressed by the present paper:

Research Question 1: How much vocabulary knowledge is gained in each of the four input conditions (Form Recognition, Grammar Recognition, Meaning Recall and Collocation Recognition)?

Research Question 2: How far does the frequency of word occurrence affect the acquisition of these four dimensions of word knowledge?

Research Question 3: Out of the reading-while-listening and reading-only condition, which condition proves to be more effective for the participants in acquiring vocabulary knowledge?

## 2. Method

### 2.1. Sample / Participants

A total of 70 first trimester students from the Department of Computer Science and Engineering of a university in Dhaka were included in the study. The plan was to include the first trimester students whose native language is Bangla and who studied English as an academic subject for 12 years. The participants were chosen on the basis that they all fall between minimum levels of proficiency in vocabulary. For the pre-test, Nation and Beglar's (2007) 14000 version Vocabulary Size Test (VST) was adopted to find out the vocabulary proficiency level of the participants. In this test, there are 140 multiple-choice questions. There are 10 items for each 1000 word level. Whatever a learner scores, it is multiplied by 100 to find out his/her receptive vocabulary size. As Teng (2016b) pointed out, "this test measures knowledge of written word form, the form-meaning connection, and to smaller degree concept knowledge." (p. 4) However, Beglar (2010) established the test as a reliable one. To find out the proficiency level of the participants, the present research tested their vocabulary knowledge up to the 5000-word level with the first 50 MCQ items. The average score of the participants was 36.3. This score signifies that the participants have a vocabulary size of 3630 words (Nation & Beglar, 2007). In each condition, 35 participants were randomly assigned (n=35). The average scores of the two groups of participants were: reading-only condition 35.77 out of 50 and reading-while-listening condition 36.83 out of 50. This shows that the participants were able to read and understand a story that contains most 2000 frequent words.

### 2.2. Reading Materials for Participants

It has been indicated by some previous studies (Hsueh-chao & Nation, 2000; Laufer, 1992; Liu & Nation, 1985) that participants should be familiar with at least 95% of the words included in a text for a well-balanced comprehension. Therefore, choosing an appropriate text was very important. At the same time, it has to be authentic and standard. For this study, the story titled *The Love of a King* (Dainty, 2007) was used. The book was established to be a valid one by Teng (2016b). He conducted a thorough evaluation of the text through the computer program RANGE (Heatley et al., 2002). However, the book was typed into the Compleat Lexical Tutor website (Cobb, 2004) to have a Vocabulary Profile of the text. From the analysis, it was found that the book contains 6169 tokens of 858 word types and 529 families. 89.11% words of the text are from the 1000-word level, 3.70% are from 2000 words level, 0.13% are from the Academic Word List, and the other 7.07% words are categorized as off-list words. Many of these off-list words are comprehensible to the learners considering their education level. As it was indicated by some previous studies, knowing 95% of running words is adequate to comprehend a text (Van Zealand & Schmitt, 2012, 2013). Therefore, the participants should not face any lexical difficulty in reading and comprehending the story.

### 2.3. Target Items for the Experiment

As revealed by the Vocabulary Profile, a program accessible on the Compleat Lexical Tutor Website (Cobb, 2004), most of the words were within the 2000 word list level. It can be considered that the participants had the knowledge of the 2000 word level because these words are included in

their syllabi from class 1 to class 12 which is Higher Secondary level. Therefore, it can easily be understood that the participants have an understanding of a lexical coverage of 95% (Only 46 words of the text fell above the 2000 word list level). Moreover, the average score of the pre-test (36.3) signifies that participants have the vocabulary size of 3630 words.

To make the target words unfamiliar to the participants, 24 target words were replaced by pseudowords. Some of the pseudowords have been adapted from the Appendix A and Appendix B of Teng (2016b). Some others were collected from the ARC Nonword Database (Rastle et al., 2002). Waring and Takaki (2003) also opine that replacing the target words with pseudowords is very useful in incidental vocabulary tests. The target words could be replaced with synonyms, but it was not done keeping in mind that the participants might already have the knowledge of synonyms very well because they have to study synonyms as part of the university admission test.

Next, in order to find out the answer to the second research question, four different frequency groups were chosen (occurring 1–2 times, 4–5 times, 9–10 times, and 14–16 times) as Teng (2016b) did in his study. As there were 24 words in total, six-word items were given to each frequency group (two nouns, two verbs, and two adjectives). The reason behind choosing only three parts of speech is that a natural text would generally contain these parts of speech (Webb, 2005) and the experiment only considered the grammatical component (Teng, 2016b). If other parts of speech were chosen, this solidarity would have been lost.

## 2.4. Measurement Instruments

Four tests were conducted to measure the word knowledge of the target items. The first one was *Form Recognition Test*. It was a multiple-choice recognition test to measure the knowledge of word form. It is appropriate because it enabled the students to recognize the form of a word from 4 options. So, it checked whether the participants could distinguish the correct form from the other wrong word forms given. So, there were three distractors besides the correct answer. Some previous studies on the same subject used distractors (Chen & Truscott, 2010; Webb, 2007b; Teng, 2016b). The second test was called *Grammar Recognition Test* where the participants were to find out the correct target word from three sentences in which one contained the target word. Besides these three sentences, there was the fourth option "I don't know". This test provided the participants with a few possibilities because it was a closed test. This would also enable participants to understand the part of speech of the word from contextual examples. The third test, *Meaning Recall Test*, was applied to measure the participants' knowledge of meaning. The participants were asked to write anything that makes the meaning clear, and there was an "I don't know" option if they were unable to write anything. The fourth and last test was *Collocation Recognition Test*. Through a multiple-choice format question, this test measured the knowledge of collocation. In the test, the learners were provided with five options where there was a correct collocation and three puzzling options. There was also an 'I don't know' option for students who do not know the answer. It is very important to find out if the participants understand a word in context with the other words that it comes with. The format of this test was adopted from Teng (2016b) who adopted it from a former study (Pellicer-Sánchez, 2015).

Appendix B provides an example of each of the four tests. However, Webb's (2007a) study established the validity of the tests. The tests followed this chronology: form recognition test, grammar recognition test, meaning recall test, and collocation recognition test. The tests were sequenced in a way in which the effect of the previous tests on the answers to the later tests could be reduced. There was 'I don't know' or 'I don't remember any of these' options if any participant had no knowledge of the correct answer. Each test except the Meaning Recall test was on one page. In the Meaning Recall Test, the participants required writing the meanings of the given words, so more space was required.

First, they read the full story, and then the scripts were collected from them. After that, they attempted the tests. So, during the test, they did not have the chance to look at the story because they did not have the text at their disposal.

## 2.5. Data Collection Procedures

In the Form Recognition Test, Grammar Recognition Test, and Collocation Recognition Test, a participant would get 1 (one) point if s/he can write the correct answer and 0 (zero) point if s/he cannot. In the meaning recall test, a participant would get 1 point for writing a correct answer and if the answer was considered somehow acceptable, it was given 0.5 (half) point. There were two raters who fixed the scoring consensus and rated the tests independently. If there was any confusion, at first, they would talk to each other to come to a decision. A third rater was there to look after any dissimilarity in the scoring of the two raters. They would take a logical decision to solve any confusion in the answers, especially in the meaning recall test.

In the reading-only condition, the students had read the book and then attempted five tests. Something different was done for the participants in the reading-while-listening condition. A recording of the text was played which was read by an experienced English teacher who has a clear voice and mostly correct pronunciation. The reading speed was approximately 93 WPM (words per minute). Participants in each condition were given about 65 minutes to read the text. The participants were informed that there are some unknown words called pseudowords in the story and that they have to try to understand from the context. After reading the text, they had to take part in an immediate comprehension test. The immediate test was taken to see if they comprehended the text or not. For answering the immediate MCQ test containing 10 general questions, the participants were given 10 minutes. The mean score of this immediate reading comprehension test was 7.41 out of 10 (standard deviation- 1.611). The score showed that they had comprehended the text. After that, they had to sit for 4 vocabulary knowledge tests which took 40 minutes. Thus, the whole experiment took 114 minutes. The experiment could be considered as an incidental one (Hulstijn, 2013) as the participants were not informed about it. So, the whole experiment took about 115 minutes (reading-65 minutes+ immediate comprehension test 10 minutes+ four vocabulary knowledge tests 40 minutes). Before determining the time for each test, a pilot study was conducted with a different group of students who have a similar level of vocabulary knowledge.

## 2.6. Data Analysis

The data were tested with the Shapiro-Wilk normality test and it displayed that the distribution of the data were not normal. Friedman tests and Wilcoxon signed-rank tests were used to answer the proposed research questions. The first research question was based on finding out the extent of vocabulary knowledge that the learners gained in each of the four input conditions. The gained vocabulary knowledge is given in the table and the figure (column chart) below.

**Table 2.** Mean Scores of the four tests in two conditions

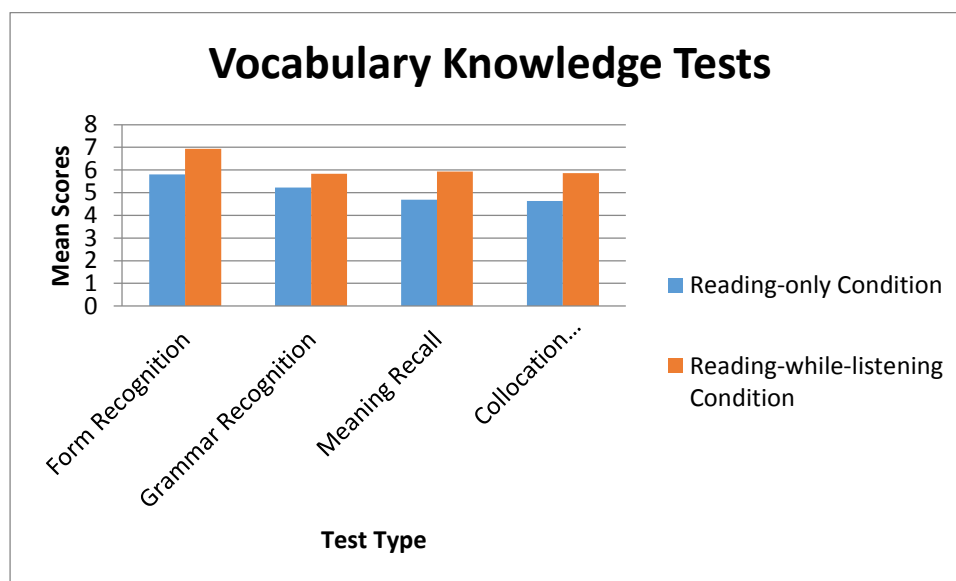| Condition | Form | Grammar | Meaning | Collocation |
|---|---|---|---|---|
| Reading-only | Mean score-<br>5.80 (2.25) 58% | 5.23 (12.55)<br>52.29% | 4.69 (11.26)<br>47% | 4.63 (11.11)<br>46% |
| Reading-while-listening | 6.94 (16.66)<br>69.42% | 5.83 (13.99)<br>58.29% | 5.94 (14.26)<br>59.41% | 5.86 (14)<br>58.33% |

**Figure 1.** Comparison of mean scores in two conditions

In the form recognition of the reading-only condition, the participants could answer only 58% of the questions which mean only 13.92 words were learned out of 24. In contrast, in the reading-while-listening condition, it was 69.42% which signifies that 16.66 words were learned. The results showed better learning than that of Teng's (2016b) and Brown et al.'s (2008) studies. Teng's (2016b) study reported 52.9% gains in the form recognition test in the reading-only condition with the learning of 12.7 words out of 24 and 65.4% in the form recognition test in the reading-while-listening condition with the learning of 15.7 words out of 24. The latter one reported 45% and 48% gains in the reading-only and reading-while-listening condition.

The grammar recognition test results demonstrated that in the reading-only condition, 12.55 (52.29%) words are learned and in the reading-while-listening condition 13.99 (58.29%) words are learned. Compared to Teng's (2016b) 8.2 (34.1%) and 10.4 (43.3%) in the reading-only and reading-while-listening condition respectively, the present study resulted in better gains in terms of the number of correct answers. The gains in the meaning recall test are 47% and 59.41% respectively in the reading-only and reading-while-listening condition which is better than Teng's (2016b) 17% and 30.4 %. From the collocation recognition test, the mean scores were found to be 4.60 in the reading-only condition and 5.86 in the reading-while-listening condition.

By applying the Bonferroni correction ($p < .005$), post-hoc analyses with Wilcoxon signed-rank tests were conducted to see the chronology in which the learners learn the word knowledge. Table 3 shows that the scores (posttest) for form recognition in the reading-only condition is not significantly higher than grammar recognition test ($Z = −1.128$, $p > .05$), but it is higher than the knowledge of meaning ($Z = -2.147$, $p < .05$), and collocation ($Z = -2.817$, $p < .05$). The scores obtained from grammar recognition is not significantly higher than that of meaning ($Z=-1.271$, $p>.05$) or collocation recognition ($Z=-1.458$, $p>.05$). Similarly, the scores obtained from the meaning recall test is not higher than that of collocation ($Z=-0.328$, $p>.05$). According to the result, the tests will look like this in terms of learning: form=grammar, but form>meaning>collocation, and grammar=meaning=collocation. ('>' means a more substantial learning according to Teng (2016b).

As shown in Table 4, in the reading-while-listening condition, the posttest scores for the form recognition test were significantly higher than the grammar recognition test ($Z= -2.948$, $p<.05$),

meaning (Z= -2.781, *p*<.05), and collocation (Z= -2.963, *p*<.05). But the grammar recognition test was not higher than meaning test (Z= -.470, *p*>.05), and collocation (Z=0.000, *p*>.05). Similarly, the meaning test was not significantly higher than that of collocation (Z= -.292, *p*> .05).

The results can be shown like this: form> grammar=meaning=collocation

**Table 3.** Test Statistics of Wilcoxon Signed Ranks Test to find out the relative performance of the four test types [a] in Reading- only condition

|  | Grammar Recognition - Form Recognition | Meaning Recall - Form Recognition | Collocation Recognition - Form Recognition | Meaning Recall - Grammar Recognition | Collocation Recognition - Grammar Recognition | Collocation Recognition - Meaning Recall |
|---|---|---|---|---|---|---|
| Z | -1.128[b] | -2.147[b] | -2.817[b] | -1.271[b] | -1.458[b] | -.328[b] |
| Asymp. Sig. (2-tailed) | .259 | .032 | .005 | .204 | .145 | .743 |

 a. Wilcoxon Signed Ranks Test

 b. Based on positive ranks

**Table 4.** Test Statistics of Wilcoxon Signed Ranks Test to find out the relative performance of the four test types [a] in Reading-while-listening Condition

|  | Grammar Recognition - Form Recognition | Meaning Recall - Form Recognition | Collocation Recognition - Form Recognition | Meaning Recall - Grammar Recognition | Collocation Recognition - Grammar Recognition | Collocation Recognition - Meaning Recall |
|---|---|---|---|---|---|---|
| Z | -2.948[b] | -2.781[b] | -2.963[b] | -.470[c] | .000[d] | -.292[b] |
| Asymp. Sig. (2-tailed) | .003 | .005 | .003 | ..638 | 1.000 | .770 |

 a. Wilcoxon Signed Ranks Test

 b. Based on positive ranks

The second research question tries to find out the role of frequency of word occurrence in the two conditions. The researchers hypothesize that the more the number of encounters, the higher the scores are. It means that a higher frequency of encounters results in more gains than a lower frequency of encounters with a word given in the context. To do that, the mean scores of the correct answers were taken into account. The data for the Reading-only condition is presented in Table 5 and Figure 2 below.

*Reading-only Condition*

**Table 5.** The number and percentage of correct items in each frequency group

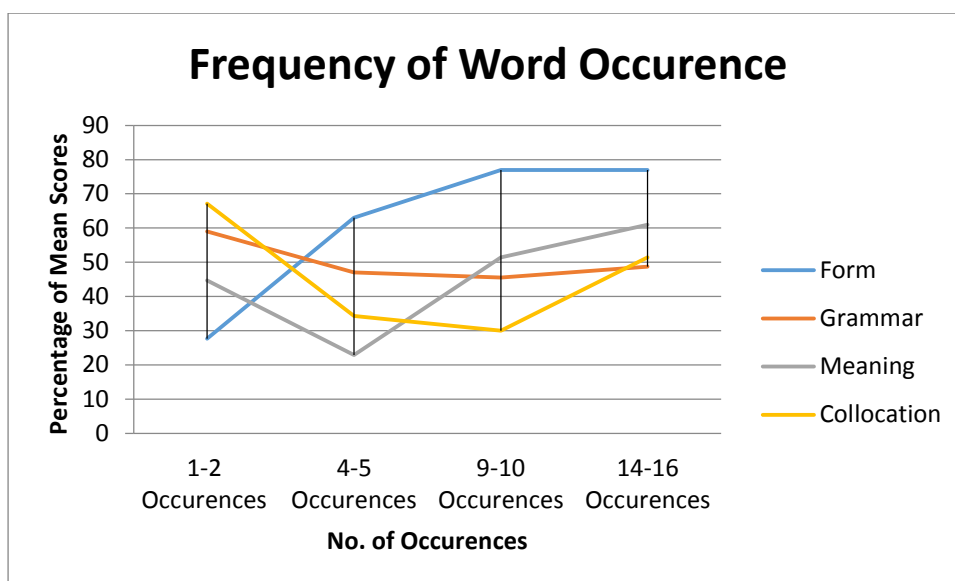| Frequency | Form | Grammar | Meaning | Collocation |
|---|---|---|---|---|
| 1-2 Occurrence (max.=6) | 1.66 (27.67%) | 3.54 (59%) | 2.68 (44.67%) | 4.02 (67.14%) |
| 4-5 Occurrence (max.=6) | 3.78 (63%) | 2.82 (47%) | 1.38 (22.86%) | 2.07 (34.29%) |
| 9-10 Occurrence (max.=6) | 4.62 (77%) | 2.73 (45.5%) | 3.09 (51.43%) | 1.80 (30%) |
| 14-16 Occurrence (max.=6) | 4.62 (77%) | 2.92 (48.67%) | 3.66 (60.95%) | 3.09 (51.43%) |

**Figure 2.** Percentage of Mean Scores in each frequency group (Reading-only Condition)

*Reading- while- listening Condition*

**Table 6.** The number and percentage of correct items in each frequency group

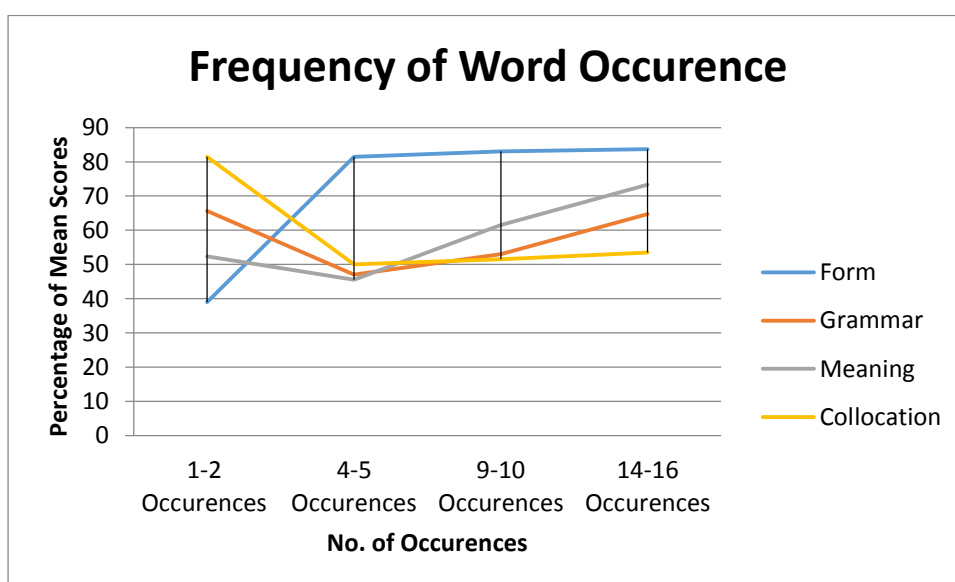| Frequency | Form | Grammar | Meaning | Collocation |
|---|---|---|---|---|
| 1-2 Occurrence (max.=6) | 2.34 (39%) | 3.94 (65.67%) | 3.14 (52.33%) | 4.89 (81.5%) |
| 4-5 Occurrence (max.=6) | 4.89 (81.5%) | 2.82 (47%) | 2.73 (45.5%) | 3.00 (50%) |
| 9-10 Occurrence (max.=6) | 4.98 (83%) | 3.18 (53%) | 3.69 (61.5%) | 3.09 (51.5%) |
| 14-16 Occurrence (max.=6) | 5.02 (83.67%) | 3.88 (64.67%) | 4.40 (73.33%) | 3.21 (53.5%) |



**Figure 3.** Percentage of Mean Scores in each frequency group (Reading-while-only Condition)

Table 5 and figure 2 show that in the form recognition test in the reading-only condition the mean scores increased with the number of encounters. It is the same in the Reading-while-listening condition as shown in Table 6 and Figure 3. But in the grammar recognition test in the reading-only condition, the mean score for 4-5 encounters is less compared to the mean score for 1-2 encounters. In the same way, the mean score for 9-10 encounters is less than that of 4-5 encounters. But it increased slightly with 14-16 encounters. In the Reading-while-listening condition, the mean score of 1-2 encounters went downward in 4-5 encounters but then kept on rising with the increased number of encounters.

In the Meaning Recall test, the reading-only condition shows a fall in the mean score from 2.68 (1-2 encounters) to 1.38 (4-5 encounters), but it went up sharply with 9-10 encounters to 3.09 and further increased to 3.66 in 14-16 encounters. Similarly, in the reading-while-listening condition, the mean score of 1-2 encounters which was 3.14 fell to 2.73 in 4-5 encounters but increased in the next two steps with the increased number of encounters. In the collocation recognition test, both the conditions had a decrease in the mean score from 1-2 encounters to 4-5 encounters. In the reading only condition, the mean score of 4-5 encounters was 2.07 but went down to 1.80 in 9-10 encounters. With the 14-16 encounters, it shows a rise. In the reading-while-listening condition, the mean scores for 9-10 and 14-16 encounters are not potentially different although it climbed from the former to the latter. In most of the frequency groups of the four test types, the participants of the reading-while-listening condition scored higher than the participants of the reading-only condition. The only exception was of the mean scores for 4-5 occurrences of the Grammar Recognition test which were similar in both the conditions (2.82).

Running the Friedman test for the four test types in both the conditions, it was seen that there was a significant effect of frequency in all the frequency groups ($p<.001$). Wilcoxon Signed Ranks Tests were performed to find out the comparison between two frequency variables. In the test of Form Recognition shown in Table 7, the scores of the participants showed a significant difference in all the frequency groups ($p<.05$) except for one where the score crossed the limit of $p$ value. This one is in the reading-while-listening condition. In the Form Recognition test in the Reading-while-listening condition, the participants showed no significant difference in scores for the items which they faced 4–5 times and 9–10 times ($p > .05$). In the Grammar Recognition Test shown in Table 8, no significant differences were observed for the items occurring 1-2 times to 4-5 times, 1-2 times to 9-10 times, 4-5 times to 14-16 times, and 9-10 times to 14-16 times ($p<.05$). On the other hand, there were significant differences for the words that occurred: 1-2 times to 14-16 times and 4-5 times to 9-10 times ($p>.05$). In the Meaning Recall Test which is shown in Table 9, a significant difference was observed for almost all the frequency variables in both the conditions except for the words that occurred 1-2 times to 9-10 times in the reading-only condition where the $p$ value is .063 ($p> .05$). For both the conditions in the Collocation Recognition Test as shown in Table 10, no significant difference was observed for the words that occurred for 4-5 times to 9-10 times ($p>.05$). The $p$ values in this frequency variable are 0.521 and 0.841 respectively for the reading-only condition and the reading-while-listening condition. In all the other frequency groups, there were significant differences ($p<.05$). From the tests, it can be concluded that when the number of encounters with a word increases, it plays a substantial role in learning the word most of the time.

**Table 7.** Wilcoxon Signed Ranks Test: Form Recognition

| Condition | Z Score and Significance Level (2-tailed) | 4-5 vs. 1-2 | 9-10 vs. 1-2 | 14-16 vs. 1-2 | 9-10 vs. 4-5 | 14-16 vs. 4-5 | 14-16 vs. 9-10 |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |

| Reading-only | Z Score Significance | -2.402 .016 | -4.044 .000 | -5.135 .000 | -2.236 .025 | -4.527 .000 | -4.193 .000 |
| Reading-while-listening | Z Score Significance | -2.004 .045 | -2.466 .014 | -4.732 .000 | -.243 .808 | -4.252 .000 | -4.667 .000 |

**Table 8.** Wilcoxon Signed Ranks Test: Grammar Recognition

| Condition | Z Score and Significance Level (2-tailed) | 4-5 vs. 1-2 | 9-10 vs. 1-2 | 14-16 vs. 1-2 | 9-10 vs. 4-5 | 14-16 vs. 4-5 | 14-16 vs. 9-10 |
|---|---|---|---|---|---|---|---|
| Reading-only | Z Score<br><br>Significance | -3.716 .000 | -4.210 .000 | -1.616 .106 | -.055 .956 | -2.995 .003 | -2.909 .004 |
| Reading-while-listening | Z Score Significance | -4.580 .000 | -4.520 .000 | -.160 .873 | -1.000 .317 | -3.962 .000 | -4.112 .000 |

**Table 9.** Wilcoxon Signed Ranks Test: Meaning Recall

| Condition | Z Score and Significance Level (2-tailed) | 4-5 vs. 1-2 | 9-10 vs. 1-2 | 14-16 vs. 1-2 | 9-10 vs. 4-5 | 14-16 vs. 4-5 | 14-16 vs. 9-10 |
|---|---|---|---|---|---|---|---|
| Reading-only | Z Score Significance | -4.058 .000 | -1.862 .063 | -2.307 .021 | -3.329 .001 | -4.711 .000 | -4.093 .000 |
| Reading-while-listening | Z Score Significance | -3.248 .001 | -2.396 .017 | -3.196 .001 | -1.985 .047 | -4.688 .000 | -4.280 .000 |

**Table 10.** Wilcoxon Signed Ranks Test: Collocation Recognition

| Condition | Z Score and Significance Level (2-tailed) | 4-5 vs. 1-2 | 9-10 vs. 1-2 | 14-16 vs. 1-2 | 9-10 vs. 4-5 | 14-16 vs. 4-5 | 14-16 vs. 9-10 |
|---|---|---|---|---|---|---|---|
| Reading-only | Z Score Significance | -3.295 .001 | -4.064 .000 | -3.122 .002 | -.642 .521 | -4.443 .000 | -4.791 .000 |
| Reading-while-listening | Z Score Significance | -3.378 .001 | -3.356 .001 | -2.746 .006 | -.200 .841 | -4.127 .000 | -3.925 .000 |

The third research question tried to find out the condition in which participants gained more vocabulary. To find that out, first, the data were put into SPSS to find out the results of Friedman test

in order to find out whether there is any significant difference between the significance level (*p*<.05) of the two tests. The tests showed that between the two conditions a significant difference was found. But the level of difference is not the same in the two conditions. For example, in the reading only condition, the level of significance is .05 which is at par with the alpha level .05, so here *p* =.05. Conversely, in the Reading-while-listening condition, the significance level is .009 which signifies less than the alpha level (*p*<.05). From here, we can conclude that there is a strong possibility of gaining more vocabulary in the Reading-while-listening condition than the Reading-only condition. Wilcoxon signed Rank Tests were then performed in order for comparing the scores gained in the two conditions. From the tests, it was found out that there was a significant difference between the reading-only condition and the Reading-while-listening condition for Form recognition test, Meaning Recall Test, and Collocation recognition Test, but there was no significant difference between the two conditions for Grammar Recognition Test. Besides, from the mean scores presented in Table 2 and Figure 1, it is clear that in all the four test types, score of participants in the Reading-while-listening condition was higher than the score of the participants in the reading-only condition. The effect sizes for all the tests done are small according to Cohen's (1988) criteria although in the Form Recognition Test, Meaning Recall Test, and Collocation Recognition Test, the effect sizes are very close to medium which are shown below.

**Table 11.** Effect Sizes according to Cohen's Criteria

| Test Type | Form | Grammar | Meaning | Collocation |
|---|---|---|---|---|
| Significance Level | .018 (*p*<.05) | .166 (*p*>.05) | .019 (*p*<.05) | .007 (*p*<.05) |
| Cohen's D | 0.45 | 0.23 | 0.43 | 0.49 |

## 3. Discussion

From the data analysis, it can be seen that participants could gain vocabulary knowledge from both the conditions (Reading-only Condition and Reading-while-listening Condition). Both conditions have some advantages and disadvantages. In the reading-only condition the participants could read the passage according to their own pace, but as they have limited time and there might be some slow readers, some of them might not be able to finish the story in time. As a result, there is a possibility of making wrong assumptions about some words. The participants gained more vocabulary knowledge in the reading-while-listening condition. It might be because they have several benefits over the participants of the reading-only condition. First of all, they could get the actual pauses. On the other hand, the reading-only participants read according to their own reading style and some of them might not use their knowledge of fixations properly and they might have to return sweep. Secondly, they received the proper use of intonation from where they could guess the intensity, importance and the situation which allowed them to make "better deductions of the meaning of unknown words" (Teng, 2016b). So, the present study is in line with Amer (1997), Brown et al. (2008), Teng (2016b), Valentini et al. (2018), and Webb and Chang (2014) which conclude that reading combined with listening or simultaneous listening and reading can produce a better result than the reading-only condition or listening-only condition.

In line with the findings of Chen and Truscott (2010); Pellicer-Sánchez and Schmitt (2010); Teng (2016b); Van Zealand and Schmitt (2013); Waring and Takaki (2003); Webb (2007b) and many others, the present study finds out that students develop the knowledge of form (spelling) primarily. Then they gain the knowledge of grammar and meaning. Teng (2016b) exhibited that the toughest kind of vocabulary knowledge is the knowledge of collocation. The present study concords with Webb

et al. (2013) and Teng (2016b) partially. In the reading-only condition, the participants scored lowest in the collocation which signifies that it is similar to Teng's (2016b) findings, but in the reading-while-listening condition, this is not the case. There, the grammar test produced the lowest mean score (5.83) although it is very close to the mean score of knowledge of collocation (5.86). This result concords with González Fernández and Schmitt (2015). It can be predicted that the reading-while-listening condition could give students a better sense of understanding collocation than the reading-only condition.

Frequency of word occurrence is also a very important consideration for gaining vocabulary knowledge. The study shows that although frequency can have a significant effect, sometimes 1 or 2 occurrences can also give the students the understanding of a word. In the form recognition tests, a constant progression is noticed with the number of frequency in each of the conditions. Each time-frequency increased, the mean score increased. In the grammar tests, the results are not a one-way trip. There are fluctuations. Words occurring 1-2 times produced higher mean score than the words occurring 4-5 times, 9-10 times, or 14-16 times. On the other hand, the mean score for the words that occurred 4-5 times is more than that of the words that occurred 9-10 times in the reading-only condition. But the score of 14-16 occurrences is more than the scores for 4-5 occurrences and 9-10 occurrences. Different researchers suggested a varied number of encounters for a proper form-meaning connection. Rott (2007) opined that a sufficient number of encounters with a word is needed to have substantial knowledge about that word. Rott's (1999) study found that 6 encounters are enough. In the study done by Horst et al. (1998), it is 8 encounters. Webb (2007a) and Teng (2014a) suggested a minimum of 10 and Waring and Takaki (2003) suggested 20 encounters to be sufficient.

## 4. Conclusion

The paper puts forward a number of implications. First of all, when a teacher reads a text aloud or plays recorded audio of a text, it results in more understanding of a text. It will benefit the students who might be lacking sufficient knowledge of pronunciation, intonation, and chunks in reading. Exposure to reading aloud could make them better readers. It has also been backed up by the data derived from the tests. So, the teachers who are teaching vocabulary to students should use this method.

In understanding any unknown word, inferencing is very important. Schmitt (2010) and Teng (2014b) opined that inference is a very crucial approach that can promote the acquisition of lexical knowledge or learning of unfamiliar words. The teachers should teach the students how they can infer about a word from the given context if they do not have any knowledge of that word. The knowledge of grammar and cohesion is also important in this regard. For example, if a student has a good knowledge of parts of speech and tense, they could easily infer a word into its context compared to someone who does not have the knowledge. Reading newspapers and scholarly articles is also helpful in this regard because they contain up to date vocabulary. Teng (2016a) proposes that a lot of reading can substantially enrich a participant's knowledge of the words that they know partially and this habit can also inflect new words in their lexicons.

Using vocabulary in real-life situations is also an important factor. Using a word (that the student has learned from a source) in context can result in vocabulary gains. When any student learns a new word, they should use it repeatedly to have a longer memory effect. Repetition (Sayma, 2013) or word frequency is very important in retaining vocabulary knowledge. Webb and Chang (2014) also pointed out incidental vocabulary learning as an incremental process and opined that it requires repetitive encounters in context. And the study also proves that a higher frequency of word occurrence could result in higher vocabulary gain. The teachers should try to create awareness among students who

want to learn English so that they try to use the words when they talk to others in real life or when they write in the exam hall.

## 5. Limitations and Recommendations for Further Research

The first limitation was that only students from Computer Science and Engineering department were involved in the study. There could be more cross-departmental studies on the same topic, involving students from different departments. So, the result of the study can be inclusive and indicative but not conclusive. Next, on the day of the experiment, some students came late mainly due to heavy traffic. Due to their delay, the experiment started 10 minutes late. So, starting the test on time was an issue that future researchers should look into. The fluctuations among the scores of some frequency levels are another issue to be noticed. In some tests, the words occurring 1-2 times resulted in a higher mean score than the words occurring 4-5 times; this disproves that an increase in the number of encounters with a word brings a higher score. The use of pseudowords in the story, which they were not familiar with before attending the experiment, might have been hard for them to understand.

As this is the first study in Bangladesh on this topic, there is always a scope for the researchers to come up with more studies and more insights on the same topic with learners from different levels of education, i.e. primary, secondary and tertiary. If future researchers could conduct their research activities on this issue avoiding the limitations mentioned earlier, their studies could demonstrate more empirical and applicable results. The present study suggests a gender based study on the same topic with four groups of people: two groups of participants for both the male and female learners. It might produce striking result about their understanding of vocabulary by revealing whether the male participants or the female participants have higher vocabulary gains from these two conditions. It can also show in which condition the male participants score higher and vice versa. One thing for sure, the government, the universities and the other responsible authorities who are looking after the education and research sector should come up with more focus in helping the research activities on this topic.

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**Appendix A: The list of target words of 24 items (Adopted and adapted from Teng, 2016b)**

| Items and Occurrences | Original word | Word class | Substituted words |
|---|---|---|---|
| 6 items (1-2 occurrences) | Weak | Adjective | Breat |
| | Warm | Adjective | Wenchy |
| | To walk | Verb | To trepe |
| | To wear | Verb | To pook |
| | Truth | Noun | Grike |
| | Teacher | Noun | Blondor |
| 6 items (4-5 occurrences) | Black | Adjective | Pamful |
| | Young | Adjective | Wour |
| | To forget | Verb | To frait |
| | To remember | Verb | To recate |
| | Newspaper | Noun | Nunce |
| | World | Noun | Wight |
| 6 items (9-10 occurrences) | Alone | Adjective | Ponely |
| | Small | Adjective | Spitful |
| | To say | Verb | To vook |
| | To leave | Verb | To glabe |
| | Father | Noun | Fruiser |

|                              | Life    | Noun      | Troice   |
|------------------------------|---------|-----------|----------|
| 6 items (14-16 occurrences)  | Happy   | Adjective | Sobby    |
|                              | Your    | Adjective | Wote     |
|                              | To live | Verb      | To wod   |
|                              | To like | Verb      | To deese |
|                              | Night   | Noun      | Grath    |
|                              | Love    | Noun      | Zine     |

### Appendix B: One item from each of the test questions (Adopted and adapted from Teng, 2016b)

Test 1 *Form Recognition*: From the following word forms, please find and tick the option that you think is correct. One of them is correct, three are wrong and if you think you do not know the answer, tick option 'E'.

A. breat B. breet C. bleet D. bret E. I don't remember any of these

Test 2 *Grammar Recognition*: Please select the sentence where the words given have been used correctly. You can select one of them. If you think you do not know the answer, tick option 'D'.

*breat* A. You're very breat. B. He is a breat. C. He breated. D. I don't know

Test 3 *Meaning Recall*: Please write the meaning for the italic words in the blank space. If you think you do not know the answer, tick the option 'I don't know'.

You are very *breat*. _____ I don't know

Test 4 *Collocation Recognition*: From the five options given, please tick the one that was a frequent collocate of the target word. If you think you do not know the answer, tick option 'E'.

*breat* A. love B. child C. point D. friend E. I don't know