

The Influence of Word Frequency of Occurrence and Visual Imagery on L2 Incidental Vocabulary Learning

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Received: February 21, 2022

Accepted: March 21, 2022

Online Published: March 24, 2022

doi:10.5430/wjel.v12n1p390

URL: <https://doi.org/10.5430/wjel.v12n1p390>

Abstract

The purpose of this study was to determine the influence of word frequency of occurrence and visual imagery on incidental vocabulary learning through viewing a documentary. The study attempts to answer these questions: (1) To what extent does L2 incidental vocabulary learning occur through viewing a documentary?; (2) What is the influence of word frequency of occurrence on incidental learning of L2 unfamiliar words?; (3) What is the influence of visual imagery on incidental learning of L2 unfamiliar words?. This study is significant because it exploits social media sites which are excellent resources for viewing videos by most young EFL learners. Participants were 63 EFL students who viewed a captioned documentary. Two groups of word families that included 12 target words were prepared. The first group, labeled the sensitive group, had six words from the third and fourth 1000-word list and occurred three times or more in the documentary with different levels of visual imagery support. The second group, labeled the challenging group, included six words from the sixth and seventh 1000-word list that had only one occurrence in the documentary with almost no visual imagery support. The study used a multiple-choice vocabulary test as a pretest and posttest to measure receptive knowledge of the meaning of the target vocabulary items. The findings suggested that viewing a documentary positively affected incidental vocabulary learning and that learning was positively affected by word frequency of occurrence as well as visual imagery.

Keywords: captions, incidental vocabulary learning, viewing television, frequency of occurrence, visual imagery

1. Introduction

Second language (L2) learners need to read and listen to a large amount of input to learn L2 vocabulary (Webb & Nation, 2017). However, there is not much time in most L2 classrooms, especially in EFL contexts where L2 learners are only exposed to a relatively limited amount of input and are left with only instructed input (i.e., EFL textbooks) as the primary resource for vocabulary learning (Alsaif & Milton, 2012; Jordan & Gray, 2019). This situation is detrimental to L2 learning, especially for learners who do not have access to much authentic L2 input outside the classroom. L2 research has long been advocated for extensive reading as the primary resource for L2 lexical development (e.g., Grabe & Stoller, 2013; Nation & Webb, 2011; Pigada & Schmitt, 2006; Wang, 2013). However, recent studies suggest that EFL learners, especially young people prefer viewing English audiovisual materials to reading in English (e.g., Lindgren & Muñoz, 2013; Peters, 2018; Peters et al., 2019). Recent studies have provided strong evidence that viewing television enhances incidental vocabulary learning when the attention is on the meaning of aural input and message (e.g., Montero Perez et al., 2018; Peters & Webb, 2018; Puimège & Peters, 2019; Webb, 2009).

The recent research on lexical learning has included a major portion of studies that have empirically examined all potential factors that could positively affect lexical learning after viewing L2 audiovisual materials. Nevertheless, there are shortcomings in previous studies. Nevertheless, there are shortcomings in current research which indicate that further studies are necessary to address those shortcomings and fill in the gaps. For instance, earlier studies did not exploit social media sites which are excellent resources for viewing videos by most young viewers at home. Second, earlier studies have used types of videos that provided too many encounters with the target words which exceeded the regular encounter rates in television programs (e.g., Vidal, 2003, 2011). Third, very few factors that have received attention in previous studies including the frequency of occurrence (e.g., Ahrabi Fakhr et al., 2021; Peters et al., 2016; Rodgers & Webb, 2020), number of occurrence in different texts (e.g., Rodgers & Webb, 2020;

Webb & Chang, 2015), and existing lexical knowledge (e.g., Montero Perez et al., 2014; Peters et al., 2016; Peters & Webb, 2018, Pujadas & Muñoz, 2019; Puimège & Peters, 2019). However, there are only two studies that experimentally examined visual imagery, which is an essential factor because it “distinguishes audiovisual input from listening and reading and theoretically accounts for its superiority as learning material over them” (Ahrabi Fakhr et al., 202, p. 171). Hence, the purpose of this study is to expand on the current research and fill in the gaps by using a documentary uploaded on YouTube. Thus, this research has been conducted in order to increase the current knowledge on incidental lexical acquisition and the effect of viewing TV on lexical growth. This research is needed because it deals with an essential aspect of learning any language because vocabulary is believed to affect all language skills.

2. Literature Review

2.1 Incidental Vocabulary Learning

Vocabulary learning can occur incidentally, and thereby, the term incidental vocabulary learning exists. Different from the direct, intentional learning of vocabulary, incidental vocabulary learning refers to vocabulary learning from context when the focus is on comprehension rather than deliberately learning new words (Gass, 1999; Hulstijn, 2001). Incidental learning vocabulary from context means learning occurs through reading or listening to a language input while the learner focuses on the text’s message (Schmitt, 2010). The readers might be short or long. Thus, context-based learning involves learning from extensive reading, participating in conversations, listening to the radio, and viewing television. As stated by Nation (2001), most of our first language vocabulary learning occurs through incidental learning during reading and listening times. Most of the first language vocabulary is acquired through incidental learning through the receptive skills, i.e. reading and listening (Nation, 2001). Although some researchers have suggested intentional learning and deliberate instruction of English vocabulary (Pellicer-Sánchez & Schmitt, 2010), significant vocabulary improvement and learning the less frequent vocabulary presents a challenge for L2 learners. The best vocabulary learning approach which should be used in English language learning programs is to learn vocabulary incidentally. However, L2 programs often use materials that contain simplified materials in which the text difficulty has been minimized so that they contain a small number of the less frequent word families (Rodgers & Webb, 2020). For learning the less frequent vocabulary, it is inevitable to be dependent on authentic materials (Schmitt & Schmitt, 2014) because they “provide exposure to low and mid-frequency vocabulary that may potentially be learned incidentally as they are encountered again and again” (Rodgers & Webb, 2020, pp. 192-193).

Most previous studies have operationalized incidental learning in respect of test announcement. Thus, incidental learning occurs in situations where no instructions are given to learners to pay attention to vocabulary items or when they are not informed of a vocabulary test (Feng & Webb, 2020; Hulstijn, 2003; Peters & Webb, 2018; Rodgers & Webb, 2020). Earlier studies of incidental vocabulary learning used episodes of television programs (e.g., Rodgers & Webb, 2020) or a single television program (e.g., Feng & Webb, 2020; Peters & Webb, 2018). Incidental vocabulary learning occurred in both types of studies. Regular viewing of TV increases exposure to the less and more frequent words and this contributes to L2 lexical growth (Rodgers & Webb, 2020; Webb, 2009). Findings from current research support the potentiality of viewing TV on vocabulary development. For instance, Peters and Webb (2018) reported that the experimental students incidentally learned around 14% more new words after viewing a one-hour documentary. Similarly, Rodgers and Webb (2020) claimed that watching a full TV series of 10 episodes yielded learning of 25% percent of the unfamiliar target words. In the same vein, Fievez et al. (2021) found that participants successfully recalled the form of 27% of target words and 36% of the words’ meanings. These studies suggest that L2 incidental vocabulary learning is possible through TV viewing and that extensive viewing of L2 television for enjoyment has a similar influence to extensive reading on L2 vocabulary development.

2.2 Factors Influencing Incidental Vocabulary Learning

Incidental vocabulary learning was found to be influenced by various variables. On one hand, there is prior vocabulary knowledge which is considered to be a learner-related factor. On the other hand, there are item-related variables (e.g., frequency of occurrence, visual imagery, cognateness, transparency, contextual clues, lexicalization, and word relevance). This study will investigate the most important and primarily under-researched factors (namely, frequency of occurrence and visual imagery).

The frequency of occurrence refers to the number of times a word appears in a text. The research on incidental vocabulary learning has given significant attention to this important factor. It is believed that the more a word is encountered in context, the more likely it will be learned (e.g., Pellicer-Sánchez & Schmitt, 2010; Waring & Takaki, 2003). In research into the L2 reading, it has been shown that acquiring strong word knowledge requires learners to encounter the word six to sixteen times before they can master it. However, it has not been possible to determine an

exact number of encounters in listening/viewing research (Rodgers & Webb, 2020). Furthermore, researchers have argued (e.g., Vidal, 2011) that frequency of occurrence is more critical when listening than reading because L2 listening causes specific problems to L2 learners such as decoding and segmenting the speed of speech. Nevertheless, several studies have found that one single encounter with the target word had a positive effect on the acquisition of that word (e.g., Peters & Webb, 2018). Typically, vocabulary learning increases with more encounters in the text. However, some studies found that some words were learned after the first encounter (e.g., Peters et al., 2016; Vidal, 2003). Nevertheless, learning a word from the first encounter certainly requires a very rich text that provides an informative context for the word (Rodgers & Webb, 2020).

The second important factor that recently has attracted researchers of L2 viewing is visual imagery. Visual imagery is the distinctive feature of audiovisual input which is not provided by spoken input or written input. This feature gives audiovisual input the superiority as a learning material over reading and listening (Mayer, 2001; Rodgers, 2018; Rodgers & Webb, 2020). Visual imagery is more critical when the context provides little help for guessing because the images and visual support of the audiovisual input should provide semantic support for learning unfamiliar words (Rodgers, 2018). Several studies suggest that on-screen imagery and visual aids of the audiovisual input yield learning gains through viewing (Peters et al., 2016; Peters & Webb, 2018; Rodgers & Webb, 2019). Rodgers (2018) demonstrated the support provided by visual imagery in audiovisual input is different across genres. For instance, imagery in documentaries co-occurs with words within a closer time compared to narratives. Thus, viewing documentaries should yield more vocabulary gains than viewing narratives. However, very few intervention studies have determined the influence of visual imagery on lexical acquisition in a systematic investigation.

There are few gaps in the previous studies, which this present study aims to fill in. First, the frequency of occurrence has been left loose, meanwhile it is well-established in reading research. A relatively large number of exposures are required to learn words from reading. Conversely, some viewing studies revealed that learners successfully learned words from the first encounter. Second, visual imagery is a very under-researched factor in the literature of L2 viewing, and little is known about its effect on incidental vocabulary learning. To that end, the present study attempts to answer the following research questions:

1. To what extent does L2 incidental vocabulary learning occur through viewing a documentary?
2. What is the influence of word frequency of occurrence on incidental learning of L2 unfamiliar words?
3. What is the influence of visual imagery on incidental learning of L2 unfamiliar words?

3. Methodology

3.1 Participants

The participants were 63 Saudi Arabic-speaking male EFL students ($M_{age} = 18.05$ years, $SD = .23$). They were enrolled in a mandatory English program that focused on basic skills in reading, writing, speaking, and listening in a Saudi public university. Their English was acquired in public schools with an average of seven years of learning. Very few had spent time abroad to learn English in English-speaking countries. According to the data obtained from the program, students had pre-intermediate to intermediate English proficiency levels, as assessed by an in-house English proficiency exam. The participants were administered the updated Vocabulary Levels Test (VLT; Webb et al., 2017) at the 1,000-, 2000-, 3000-, 4,000-, and 5,000-word levels to inform the study design and to appropriately choose target words. The total possible score for the test sections is 150 marks (30 marks for each section). Table 1 provides more details on the VLT results.

Webb et al. (2017) recommend a cutting point of 29/30 for mastery of 1000, 2000, and 3000 levels and 24/30 for the 4000 and 5000 levels. Participants only showed mastery of the first level (i.e., the first 1000 words). However, according to Schmitt et al.'s (2001) suggestion that a level is considered mastered when a score of 26 out of 30 is reached, they had a mastery of the 2000 level.

Table 1. Descriptive statistics of the VLT results

Word level	<i>M</i>	<i>SD</i>	Min.	Max.
1000	29.10	.84	25	30
2000	26.75	2.91	17	30
3000	20.01	5.08	10	30
4000	21.22	5.93	4	30
5000	18.23	6.63	4	30

3.2 Audiovisual Input

One, 46-min documentary episode titled “Washington, D.C.” from a television series called Aerial America served as

the audiovisual input for the experimental group. The documentary was made available on YouTube. The documentary discussed the history, purpose, and what happens inside the walls of Washington, D.C., hence hypothetically interesting for people of the same age as the participants of the study. Two English language teachers with more than ten years of teaching experience were consulted in the selection of the video. The following linguistic and paralinguistic criteria when selecting the video were used by the teachers: situational appropriateness, grammatical and lexical complexity, and inherent interest value to university-level students (Garza, 1991).

An analysis of the documentary's lexical profile using Cobb's Lextutor's VocabProfile and the BNC/COCA word lists revealed that a knowledge of the most frequent 5000-word families was needed to reach a 90% coverage of the documentary's vocabulary. This indicates that the documentary was at a level a little above their current L2 competence. With a high level of vocabulary difficulty, any incidental learning can be attributed with higher confidence to the effects of the study's variables, i.e., frequency of occurrence and visual imagery.

3.3 Target Words

The BNC/COCA word lists were used to determine the appropriate target words. No target words were selected from the most frequent 2000 word families because they were believed to be known to most participants. Two different groups of words were included. The first group, labeled the sensitive group, included words from the third and fourth 1000-word lists and occurred three times or more in the documentary with different levels of visual imagery support. The second group, labeled the challenging group, included words from the sixth and seventh 1000-word lists that occurred only once in the documentary with almost no visual imagery support. The transcript was run in Cobb's Lextutor's VocabProfile to determine occurrence frequency of the word items within the documentary, to classify the vocabulary items according to the BNC/COCA 24 word lists, and eliminate names of people and places and borrowed words. There were a total of 63 word families that met the inclusion criteria in the documentary. From the list, 12 word families were eventually selected and were distributed evenly across the four targeted word levels (three word families for each level). The test items for the word families were the word types that most commonly occurred in the documentary.

An analysis of the vocabulary items was carried out to determine occurrence frequency and visual imagery. The occurrence frequency refers to the number of times the target items occurred in the input. The degree of visual imagery was assessed by three experts who used a three-level scale devised by Ahrabi Fakhr et al. (2021) to find out the extent to which an image co-occurred with its spoken form. The scale has three degrees of visual imagery in which the meaning of the target word can be inferred or not: 1 = no visual imagery; 2 = partial visual imagery; 3 = full visual imagery. Scores given by the three raters were then averaged to be used in the analyses for the levels of visual imagery. The target items and their variables are provided in Table 2. For instance, we know from the table that the target word, *institution*, is included in the BNC/COCA third 1000-word family list (word list), occurs six times in the documentary (family frequency), and has the third degree of visual imagery (visual imagery).

Table 2. Vocabulary test items, their frequency, and visual imagery in the documentary

Word family	Word list	Family frequency	visual imagery
Sensitive group			
1. institution	3	6	3
2. campaign	3	3	2
3. constitution	3	3	2
4. fort	4	9	2
5. marble	4	4	3
6. rocked	4	3	3
Challenging group			
7. gallop	6	1	1
8. etched	6	1	1
9. scribbled	6	1	1
10. fervent	7	1	1
11. glimmering	7	1	1
12. infuriated	7	1	1

3.4 Data Collection

Incidental vocabulary learning was measured at the level of form-meaning connection by a multiple-choice test. The vocabulary test had 12 multiple-choice questions which included a stem (target word), the key (the correct answer), five distractors (incorrect answers), and an "I don't know this word." option. The target word was written in the participants' L2, but all the other options were provided in their L1 (Arabic). The distractors were selected so that they have similar characteristics in form or meaning with the key word in order to raise the difficulty level of the test.

In order to get some feedback on the translated words and the selected distractors, the test was piloted with students of the same characteristics. Table 3 shows the appearance of Item #1 on the test.

Table 3. The appearance of Item #1 on the test

1. Institution	
1.	اختتام
2.	تكريس
3.	خيال
4.	تشثيت
5.	مؤسسة
6.	جيش
7.	لا أعرف هذه الكلمة

For a proper presentation of the stems, both their written and spoken forms were provided. For participants who successfully learned the target words after viewing and listening to the documentary, the provision of spoken forms was intended to activate their prior knowledge of the target words so they could answer the item on the posttest. The spoken forms were downloaded from the online Cambridge Dictionary. Following Rodgers and Webb (2020), the administration of the pretest took place one week before the intervention (viewing the documentary) and took place immediately after the intervention for the posttest as recommended for “more pronounced vocabulary learning and a stronger relationship with frequency of occurrence might have been evident had posttests come immediately following the viewing” (Rodgers & Webb, 2020, p. 214). The multiple-choice test administered in the pretest and posttest was the same in every aspect with the exception of the order of the items which was different between the tests.

3.5 Scoring

Following Rodgers and Webb (2020), three different categories were given for scoring each word: *known*, *learned*, or *not learned*. *Known* is a score given when a student’s response was correct on both the pretest and posttest; *learned* score refers to the situation when a wrong answer or ‘*I don’t know this word.*’ was provided to the pretest but a correct answer was provided to the posttest; *not learned* score is given in a situation when an incorrect answer was provided or when ‘*I don’t know this word.*’ was selected on both tests. The *not learned* score is also given when a student provided a correct answer on the pretest but provided an incorrect answer on the posttest.

4. Results

4.1 The Influence of Viewing a Documentary on Incidental Vocabulary Learning

The mean number of words known was 4.8 out of 12. This figure indicates that the participants knew around 40% of the target words prior to viewing the documentary. However, there were differences regarding the items they learned and the number of known items. Therefore, there were various variations with regards to the amount of possible vocabulary learning among students. The average vocabulary gain was 1.06. Table 4 shows the statistics for the vocabulary gains.

Table 4. Vocabulary gains (K = 12)

Mean raw gain	SD	Median	Minimum	Maximum
1.06	1.30	1	0	5

In order to provide more explanations for vocabulary learning, relative word takings by the participants were calculated because students with larger vocabulary size had fewer learning opportunities than students with smaller vocabulary size. Hence, the absolute vocabulary takings might not explain the whole situation. Thus, we calculated the relative word takings to take into account all the different learning opportunities. The following famous formula for relative gain percentage (e.g., Shefelbine, 1990; Horst et al., 1998; Rodgers & Webb, 2020) was used:

$$\text{Relative Gain for Participants} = \frac{\text{Number of Target Words Learned}}{\text{Number of Items on Tests} - \text{Number of Target Words Known}} \times 100$$

The result for relative gain is shown in Table 5. The mean relative gain was 14.72%.

Table 5. Relative vocabulary gains

Mean relative gain	Median	Minimum	Maximum
14.72%	13.88%	0.00%	69.44%

Before computing inferential statistics on the data obtained by the vocabulary test, the collected data were tested for normality of the dependent variables with the Shapiro-Wilk test for normality ($p > .05$). The results obtained by the test indicate that the scores were normally distributed. Thus, we used the paired sample t -test because it is the appropriate test when the same measurement is used as the pretest and as the posttest in a single group quasi-experimental study. To determine the significance of the raw vocabulary gains, a t -test was carried out. The paired samples t -test showed that the total scores on the pretest were significantly different compared to those of the posttest. The pretest received a larger mean score of ($M = 5.75$, $SD = 2.8$) compared to the posttest ($M = 4.75$, $SD = 2.8$). The effect size as measured by d was 0.73, which is considered a small effect size, according to Plonsky and Oswald (2014). These findings suggest that the impact of viewing television on lexical learning is small, but significant.

4.2 The Influence of Frequency of Occurrence and Visual Imagery on Incidental Vocabulary Learning

To determine if there were more learning chances for words that had more frequent occurrences in the documentary with higher visual imagery support, the average word takings for items in the challenging and sensitive groups were examined. The mean word takings on the sensitive and challenging groups were .75 and .31 out of 6, respectively which show that the participants learned around 7.5% of the sensitive words and 3.1% of the challenging words. To find out if the raw word takings were significant, ANCOVA was carried out. The ANCOVA showed that the gains on the sensitive group are significantly different compared to those of the challenging group. ($F(1, 60) = 43.15$, $p < .001$, $R^2 = .53$, $\eta^2 = .53$) The mean gains on the sensitive group ($M = .75$, $SD = .91$) was larger than that of the challenging group ($M = .31$, $SD = .59$). The effect size as measured by d was 0.65, which is considered a small effect size, according to Plonsky and Oswald (2014). These findings suggest that the impact of frequency of occurrence and visual imagery on lexical learning is small, but significant.

5. Discussion

5.1 The Influence of Viewing a Documentary on Incidental Vocabulary Learning

The results of this study suggest that viewing a documentary in the L2 improves vocabulary learning. After viewing the documentary, participants had average word takings of 1.6, indicating that students learned more than one word through viewing a single television documentary. The lexical development was significant from the pretest to the posttest. The difference in terms of the average number of learned words might appear small; however, some students successfully learned up to five words. This gives an indication that large lexical improvement is possible through viewing television. These results are consistent with previous findings suggesting that incidental learning of L2 lexicon was achieved by watching short videos (Sydorenko, 2010; Winke et al., 2010), a TV documentary (Peters & Webb, 2018), and dramas and comedies on television (Rodgers & Webb, 2020). This research study might be considered as expansion to the previous studies in various ways: exploiting social media sites which are the resource for viewing videos by most young viewers at home, viewing a video that has a large number of less frequent word families, and targeting words that occurred only once. This study allows us to examine the effects of viewing behavior that more resembles the everyday viewing habits at home. The findings from this study and the earlier studies suggest that incidental learning of L2 lexicon was achieved through viewing television.

5.2 The Influence of Frequency of Occurrence on Incidental Vocabulary Learning

This study found that more target words were learned from the sensitive group, which included words that had three or more occurrences in the documentary compared to the challenging group of the target words, which had words that had only one occurrence in the entire documentary. This is consistent with the widely accepted belief concerning the impact of vocabulary repetition on vocabulary acquisition which suggests that each additional encounter with a word in a text should increase the learning chance by 20–25%. This is also consistent with previous viewing studies (e.g., Ahrabi Fakhri et al., 2021; Rodgers & Webb, 2020; Peters & Webb, 2018) that found a significant impact of frequency of occurrence on lexical acquisition. The study also found that some students learned up to two target words that had only one occurrence in the documentary. This is in line with previous research (e.g., Peters et al., 2016; Vidal, 2003). However, as a general rule, vocabulary learning chances are bigger with more word occurrences (Vidal, 2011).

5.3 The Influence of Visual Imagery on Incidental Vocabulary Learning

The results indicate that more target words were learned from the sensitive group, which had words that had higher visual imagery compared to the target words in the challenging group, which had words that had almost no visual imagery. This is supported by previous studies (e.g., Ahrabi Fakhri et al., 2021; Peters, 2019) that learning chances are increased three times with lexical items that have high levels of visual imagery. It is also in line with studies that suggested that the strong correlation between imagery and vocabulary learning may be partly due to using documentaries as audiovisual input, which has been found to have more imagery connected to words and with temporal proximity than narratives (Rodgers, 2018). However, the primary finding from this research and also from similar studies that studied visual imagery is that incidental vocabulary learning is achieved when words are semantically supported with co-occurring images provided in audiovisual input. Ahrabi Fakhri et al. (2021) concludes that the effects found for other factors such as prior vocabulary knowledge and lexicalization might be partly explained by reasons other than viewing a video, “visual imagery of words is solely identified by features of the audiovisual input used in this study, making its facilitative effect on retention relatively more reliable” (p. 182).

6. Limitations

Although this study has shown that incidental vocabulary learning was achieved through viewing television, several limitations have been identified. First, it was beyond the study design to investigate all possible vocabulary gains because there might be learned words but they were not tested. The study randomly chose six words for the sensitive group and another six words for the challenging group to be presented as the target words for investigation. Second, it is believed that when the proportion of word occurrences decreases, the learning chances also decrease. Nonetheless, some students successfully learned words that occurred once in the documentary. Unfortunately, the study could not find an explanation of the incidental learning of those words that occurred once with almost no visual imagery support except for that they “were explicitly explained” (Rodgers & Webb, 2020, p. 111) in the documentary. Third, as audiovisual input allows encountering partially known words in a rich context which can potentially yield a deeper knowledge of those words, the study was not designed to test all varying aspects of lexical knowledge such as collocations, spoken form, and multiple meanings of words.

7. Conclusion and Implications

The purpose of the study was to explore the influence of viewing television on learning L2 new words. The study investigated the potential influence of word occurrence frequency and visual imagery of TV on lexical takings. The study found a major influence of viewing a documentary on learning L2 new lexicon and that learning was positively affected by frequency of occurrence and visual imagery. The study provides further evidence for the benefits of L2 viewing on learning new vocabulary which suggest that extensive viewing should be encouraged in L2 teaching.

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