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How Does Mode of Input Affect Incidental Vocabulary Learning

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Abstract

This study investigated the extent to which different modes of L2 input contributed to vocabulary learning. One hundred and seventy-three EFL university students in China were randomly assigned to six groups, each of which was presented with the same full-length documentary in different modes: reading the transcript, listening, viewing with captions (VC), viewing without captions (VNC); silent viewing with captions (SVC), and a non-treatment control mode. A checklist-test and a multiple-choice test were designed to measure knowledge of the target words. Participants also completed the Vocabulary Levels Test (Webb, Sasao, & Ballance, 2017). The results showed that L2 incidental vocabulary learning occurred in all of the experimental modes, but no significant differences were found between them. Positive correlations were detected between vocabulary levels and vocabulary gains in the VC and SVC groups. Only in the VC group was frequency of occurrence of target vocabulary found to affect learning.

Keywords

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Chapter 1

1   Thesis Introduction

This chapter provides a brief introduction of the background, the purpose, the rationale, and the theoretical framework of the present study. The overall structure of this thesis is also stated in this chapter.

1.1   Background

Vocabulary is one of the most important elements of language acquisition. The more extensive the vocabulary, the more likely comprehension will be achieved. Research has shown that English as a second language speakers need to know at least 3,000 word families to understand spoken text (Webb & Rodgers, 2009a, 2009b) and 8,000 word families to understand written text (Nation, 2006). These two figures only cover 95% of the words for spoken text and 98% of the words for written text. To reach 100% coverage, speakers need to know more than 14,000 word families (Nation, 2006). An educated adult native English speaker has an even larger vocabulary size that can reach up to 20,000 word families (Zechmeister, Chronis, Cull, D'Anna, & Healy, 1995). Therefore, learning vocabulary can be a heavy burden for language learners.

Of all the sources of vocabulary learning, incidental learning is the most important (Nation, 2013). Before native speakers go to school to intentionally learn the language, most of their vocabulary knowledge is gained during incidental learning in daily activities. 'Incidental learning' means that learning occurs subconsciously (Krashen, 1989) or that one thing is learned with the initial intention of learning something else (Schmidt, 1994). For second language learners, Krashen (1985,1989) believes that 'comprehensible input' will allow them to acquire vocabulary knowledge incidentally and more efficiently. Other research also reveals the potential for incidental vocabulary learning through written language input (e.g., Brown, Waring, & Donkaewbua, 2008; Nagy, Herman, & Anderson, 1985; Swanborn & Glopper, 1999) and spoken language input (e.g., Elley, 1989; van Zeeland & Schmitt, 2013; Vidal, 2011), establishing the importance of incidental learning in L2 vocabulary acquisition.

1.2   Purpose and Rationale

The present study investigated how different modes of input affect L2 incidental vocabulary learning. The participants were shown the same full-length TV documentary in different modes: reading the transcript only, listening to the audio only, viewing the video with captions, viewing the silent video with captions, viewing the videos without captions, and a non-treatment control condition. The main purpose is to investigate whether L2 incidental vocabulary learning could occur through these modes of input, and it could, how does the vocabulary gain compare across the different modes? A secondary aim is to investigate the relationship between incidental vocabulary learning and two factors: frequency of occurrence and prior vocabulary knowledge.

There are three reasons for comparing the incidental vocabulary learning through different modes of input and investigating the learning effect of the two factors. First, research has shown that L2 vocabulary can be incidentally learned through reading (e.g., Horst, Cobb, & Meara, 1998; Swanborn & Glopper, 1999; Waring & Takaki, 2003), listening (e.g., Toya, 1993; van Zeeland & Schmitt, 2013; Vidal, 2003, 2011), viewing (e.g. Neuman & Koskinen, 1992; Rodgers & Webb, 2011; Yuksel & Tanriverdi, 2009), and viewing with captions (e.g., Hsu, 2014; Sydorenko, 2010; Peters & Webb, in press). Of all these modes of input, reading is the most researched one because it was believed to be the main source of L1 vocabulary growth during learners' school years (Nagy, Anderson, & Herman, 1987; Webb & Chang, 2012). Viewing is also a popular source of incidental vocabulary learning because English television programs and movies are widely available and motivating to ESL and EFL learners (Rodgers & Webb. 2011; Webb, 2010). However, there was only one study that has investigated the difference between incidental vocabulary learning through reading and viewing. Neuman and Koskinen (1992) found that viewing captioned television resulted in significantly higher vocabulary gain than reading the transcript, addressing the potential of viewing being an equivalent or even better input source for L2 vocabulary learning compared to reading. Nevertheless, there were two drawbacks of Neuman and Koskinen's study. First, they did not report the statistical comparison between viewing without captions and reading the transcript, leaving it unclear how captions affect incidental vocabulary learning through

viewing. Second, they used short segments of television programs as the research materials, making their findings lack ecological validity. Taken together, it is necessary to examine the differences between the vocabulary learning in different modes of input using a full-length television program. This will help provide ecologically valid evidence to support viewing as a valuable input source of L2 incidental vocabulary learning.

Second, research has indicated that repeated encounters of unknown words are necessary for incidental vocabulary learning to occur through any kinds of input (e.g., see Horst et al., 2008 for reading; see van Zeeland & Schmitt, 2013 for listening; see Peters, Heynen, & Puimège, 2016 for viewing). However, different thresholds of frequency of occurrence for incidental vocabulary learning to happen have been suggested by these studies. This suggests that the extent to which frequency of occurrence affect vocabulary learning in different modes of input may vary. Therefore, it is useful to investigate this issue and it may provide helpful implications for L2 learners to choose the suitable amount of input they need to fuel their vocabulary learning.

Third, prior vocabulary knowledge is a learner-related factor that has been found to have a positive impact on incidental vocabulary learning (e.g., Horst et al., 1998; Zahar, Cobb, & Spada, 2001). Research has indicated that a larger vocabulary size could lead to greater comprehension and greater vocabulary learning (Hu & Nation, 2000; Liu & Nation, 1985; Webb & Chang, 2015a). Because the vocabulary size needed to comprehend different types of input varies (Hirsh & Nation, 1992; Nation, 2006; Webb & Rodger, 2009), it is reasonable to hypothesize that the extent to which prior vocabulary knowledge is related to incidental vocabulary learning through different modes of input could vary. However, there are no studies investigating this issue. The current study aims to answer this question and provide a better understanding of how to use different modes of L2 input more efficiently based on learners' vocabulary level.

1.3   Theoretical Framework

1.3.1   Incidental Vocabulary Learning Hypothesis

The present study was conducted through the lens of the incidental vocabulary learning (IVL) hypothesis, which was first confirmed empirically by Nagy et al. (1985). The IVL

hypothesis was first made to state that L1 words can be learned incidentally through reading, and that incidental learning from written context is the primary reason for L1 vocabulary growth. Nagy et al. (1985) was the first study using a pre-test and a post-test that were sensitive to partial word knowledge. A checklist vocabulary test was used as the pre-test; a story memory task, a meaning recall interview, and a multiple-choice test comprised the post-test. Two junior high level texts were used as the reading material to ensure the authenticity because all the participants were junior high school students. The results successfully detected measurable vocabulary knowledge growth through incidental learning.

Nagy et al. (1985)'s study has set the tone for later studies that measured incidental vocabulary acquisition in both L1 and L2 learning, establishing a standard methodology for future studies measuring small gains in incidental vocabulary learning. Results showed that learning from context incidentally not only occurred, but was also the most likely way for children to gain their L1 vocabulary knowledge. The incidental vocabulary hypothesis has been applied to L2 learning, and has guided a substantial number of studies in this domain.

1.3.2   Dual Coding Theory

Dual Coding Theory (DCT) indicates that human cognition consists of two coding systems, a verbal system that processes objects encoded in verbal modality, and an imagery system that processes objects encoded in nonverbal modality (Sadoski & Paivio, 2001). Presenting information in both modes can improve recall. It also implies that exposing learners to contexts containing language items in different modes can increase vocabulary acquisition because it enriches the volume of verbal and nonverbal connections (Sadoski, 2005).

Incidental learning from context is in line with DCT because encountering words in various contexts can enhance the connections between verbal and nonverbal objects (Sadoski & Paivio, 2001; Sadoski, 2005). Results showed that exposure to various modes would increase vocabulary acquisition, though the research did not explicitly address the application of DCT. Reading while listening has been shown to be an effective approach

to learn words incidentally from context (Brown et al., 2008; Webb & Chang, 2012, 2015a, 2015b; Webb, Newton, & Chang, 2013). Watching videos with captions is another well-established method of improving comprehension and learning vocabulary (Chai & Erlam, 2008; Danan, 2004; Garza, 1991; Shamsaddini, Ghanbari, & Nematizadeh, 2014). Captioned video presents language information in three encoding modes: nonverbal visual mode (video), verbal visual mode (caption), and audio mode. therefore, it may enhance the learning effect by activating learners' dual coding system.

1.3.3   Multimedia Learning Theory

Multimedia learning is another cognitive theory related to vocabulary learning. It is based on the idea that there are separate channels in the working memory to process words and pictures (Mayer, 2009). Research on incidental vocabulary learning rooted in multimedia learning theory overlaps with DCT in terms of the similar methodology both research lines have used.

Little research has been done to examine the role of every single mode in the multimodal setting. Sydorenko (2010) studied captioned video, non-captioned video, and captioned silent video modes. Results indicated that viewing television with captions aided vocabulary learning more than video with audio or video alone. Hsu (2014) also looked at four modes of input on students' productive vocabulary knowledge. The four modes were video with captions, video without captions, silent video with captions, and soundtrack only. Results revealed that non-captioned videos with audio resulted in greater vocabulary learning than captioned videos with audio, silent captioned videos, and audio alone. These inconsistent results on modes of input suggest that there are other factors that affect incidental vocabulary learning through multimedia input. Those factors, such as frequency of word occurrence and prior vocabulary knowledge, are discussed in the next chapter.

1.4   Human Ethics Requirements

The present study was conducted after obtaining the approval of Western University Non-Medical Research Ethics Board. The approval notice is provided in Appendix A.

1.5 Thesis Organization

This thesis consists of three parts. Chapter one provides an overview of the present study's background, purpose, rational, theoretical framework, and ethics approval. Chapter two presents the quasi-experimental study that investigated how different modes of input affect L2 incidental vocabulary learning. Chapter three summarizes the findings and implications of the present study and provides suggestions for future research.

Chapter 2

2 Article

2.1 Introduction

The value of reading for L2 vocabulary acquisition is well established (e.g., Brown et al., 2008; Horst et al., 1998; Pellicer- Sánchez & Schmitt, 2010; Waring & Takaki, 2003; Webb & Chang, 2015a, 2015b). In recent years, there has also been an increasing number of studies indicating that other modes of input could make meaningful contributions to gaining L2 vocabulary knowledge such as listening (van Zeeland & Schmitt, 2013; Vidal, 2003), viewing (Chai & Erlam, 2008; Neuman & Koskinen, 1992; Rodgers & Webb, 2011; Webb, 2011; Webb & Rodgers, 2009; Yuksel & Tanriverdi, 2009), and viewing with captions (Hsu, 2014; Montero Perez, Peters, & Desmet, 2015; Peters et al., 2016). Because viewing television and movies are highly popular and motivating for L2 learners (Gieve & Clark, 2005), it is useful to determine whether audiovisual modes of L2 input can contribute to a similar degree of vocabulary learning to reading. However, this remains to be determined.

Research has shown that L2 incidental vocabulary learning can occur through viewing short videos or excerpts of TV programs (d'Ydewalle, 2002; d'Ydewalle & Pavakanun, 1995, 1997; Neuman & Koskinen, 1992; d'Ydewalle & Poel, 1999). The two main cognitive schemes supporting vocabulary learning through viewing are the Multimedia Learning Theory (Mayer, 2009) and Dual Coding Theory (Sadoski & Paivio, 2001; Sadoski, 2005). Both theories suggest that presenting information in verbal and pictorial forms together can improve learning. However, the redundancy principle states that people may learn more deeply from graphics and narration than from graphics, narration, and on-screen text because the two verbal streams of information may overload the learner's cognitive capacity (Mayer, 2014; Mayer & Fiorella, 2014). Research on how captions affect vocabulary learning through viewing has indicated that captioned videos can result in non-significantly higher vocabulary gain (Yuksel & Tanriverdi, 2009), less vocabulary gain (Hsu, 2014), or even no vocabulary gain (Bisson, van Heuven, Conklin,

& Tunney, 2014) compared to non-captioned videos. The inconsistency of the findings suggested a need for research to investigate how the captions, the audio, and the video in viewing modes each affect incidental vocabulary learning.

The primary aim of the present study is to investigate the effects of five modes of input: reading, listening, captioned video, non-captioned video, and silent video with captions on L2 incidental vocabulary acquisition. A full-length TV documentary presented in the five modes was used as the research materials. There is almost no research that has examined incidental vocabulary learning through viewing full-length TV programs (see however, Peters and Webb, in press; Rodgers, 2013). Investigating vocabulary learning through viewing a full-length TV program is important because this is the audiovisual material that L1 and L2 learners most typically watch. Moreover, comparing vocabulary learning through different audiovisual modes of input and the individual modes of listening and reading with ecologically valid materials may provide a more accurate assessment of the vocabulary learning efficacy of each mode. A secondary aim of the study was to examine how frequency of word occurrence and prior vocabulary knowledge influence vocabulary learning in these different modes of input.

2.2   Literature Review

2.2.1   Incidental Vocabulary Learning through Reading

Many researchers have argued that reading is one of the most important sources of L1 vocabulary acquisition (e.g., Jenkins, Stein, & Wysocki, 1984; Nagy et al., 1987; Nagy et al., 1985). Although the vocabulary gains shown in L1 reading studies have been rather small, L1 learners experience a rapid and substantial vocabulary growth during their school years because they receive a large amount of reading input (Elley, 1989; Nagy et al., 1987). Research has also revealed the usefulness of reading for L2 incidental vocabulary learning (e.g, Horst et al., 1998; Hulstijn, 1992; Pellicer-Sánchez & Schmitt, 2010; Waring & Takaki, 2003). However, L2 learners may not always receive a large amount of written input. One solution to increase the amount of reading input is extensive reading.

Extensive reading is a language learning approach that involves learners reading a large quantity of materials for pleasure. Research has shown that extensive reading is an effective approach for L2 learners to increase their vocabulary knowledge (Horst, 2005; Pigada & Schmitt, 2006; Webb & Chang, 2015b). An obvious advantage of extensive reading is the repeated occurrence of words throughout the text. Nation and Wang (1999) examined the vocabulary load of 42 graded readers, which are commonly used as extensive reading materials for L2 learners, and found that the books at each level had almost 40% of the vocabulary at that level occurring ten times or more. This indicated the potential value of reading graded reading material to contribute to vocabulary learning. Empirical studies have confirmed that repeated encounters with unfamiliar words are needed for L2 incidental vocabulary learning to occur through reading (Hu, 2013; Pigada & Schmitt, 2006; Waring & Takaki, 2003).

Research on L2 incidental vocabulary learning through reading other types of texts has also indicated that more encounters with unfamiliar words is likely to result in greater vocabulary gains (Chen & Truscott, 2010; Horst et al., 1998; Rott, 1999; Webb, 2007). Various frequency of occurrence thresholds have been suggested for incidental learning to occur. For example, Webb (2007) used sets of short sentences as reading materials to control the frequency of occurrence of target words. His results showed positive correlations between vocabulary knowledge and the frequency of occurrence of target words. He suggested a minimum of 10 encounters to ensure a relatively large increase in vocabulary knowledge to occur through reading. Chen and Truscott (2010) used self-composed short stories as reading materials. They found that words that occurred seven times had significantly higher learning rates than the words that only occurred once. Taken together, the research suggests that there is not a threshold of frequency of word occurrence that can ensure vocabulary learning because some words are learned after few encounters while others are not learned after many encounters (Saragi, Nation, & Meister, 1978). However, the more words are encountered in reading, the more likely they are to be learned.

2.2.2   Incidental Vocabulary Learning through Listening

Werner and Kaplan (1950) reported that listening is children's sole source of learning L1 words before they acquire the ability to read. Research has also indicated that listening input can contribute to L2 incidental vocabulary learning (Brown et al., 2008; van Zeeland & Schmitt, 2013; Vidal, 2003, 2011). However, the comparison between L2 vocabulary learning gains through reading and listening has revealed an unfavorable position for listening. Brown et al. (2008) compared the vocabulary gains occurring through reading, listening, and reading-while-listening to graded readers. They found that both written and combined written and aural input modes contributed to significantly larger gains in vocabulary knowledge than aural input. Vidal (2011) compared incidental vocabulary learning through reading and listening to academic texts. The results indicated that incidental vocabulary learning occurred through both input modes but the reading mode resulted in significantly higher scores than the listening mode in the study. Taken together, these studies indicate that the mode of aural input may be inferior to the mode of written input for incidental vocabulary learning. One reason why written input might contribute to larger gains in vocabulary knowledge than aural input is that listening requires faster processing and it may therefore be difficult for learners to notice the known and the unknown words from the context (Goh, 2000; Renandya & Farrell, 2011; van Zeeland & Schmitt, 2013).

Research on L2 incidental vocabulary learning also indicates that a higher number of encounters with words is required for learning to take place through listening compared to reading. Brown et al. (2008) found that words that were met 15 to 20 times in aural input only had a 3% chance to be learned, while words that were met 10 to 13 times had a 20% chance to be learned through reading and a 21% chance to be learned through reading-while-listening. Brown et al. found that words should be encountered more than 20 times in aural input for incidental learning to occur. They also suggested that 50 or even 100 encounters may not always be enough for incidental vocabulary learning to take place through listening. Van Zeeland and Schmitt (2013) found support for this claim. Their results indicated that even when target words were met 15 times, there was relatively little learning that occurred through listening to aural input. This suggests that

L2 learners may need to receive a considerable amount of aural input for listening to be a useful source of incidental vocabulary learning. However, although L2 learners, especially foreign language learners, may lack access to large amounts of aural input, they may encounter large quantities of audiovisual input. Therefore, it is necessary to explore the potential for audiovisual modes of input to fuel L2 incidental vocabulary learning.

2.2.3 Incidental Vocabulary Learning through Viewing

L1 research has revealed that children can incidentally acquire vocabulary knowledge through viewing (Oetting, Rice, & Swank, 1995; Rice & Woodsmall, 1988) and that it may have a positive effect on children's vocabulary growth (Rice, Huston, Truglio, & Wright, 1990). Moreover a series of L2 studies have revealed that viewing may also contribute to L2 incidental vocabulary learning (d'Ydewalle, 2002; d'Ydewalle & Pavakanun, 1995, 1997; Neuman & Koskinen, 1992; Rodgers, 2013; d'Ydewalle & Poel, 1999). In fact, viewing television may offer the same potential for L2 vocabulary acquisition as reading because television programs provide repeated encounters with unknown words and English language programs are popular among L2 learners, making them ideal to serve as a rich source of input that may fuel incidental vocabulary learning (Rodgers & Webb, 2011; Webb, 2010, 2015; Webb & Rodgers, 2009).

Neuman and Koskinen (1992) conducted the only study that compared incidental vocabulary learning through viewing with reading. Children viewed short television segments with and without captions or read the corresponding transcripts. The results indicated that the two audiovisual modes of input both led to greater vocabulary learning than reading. The difference between captioned television and reading was statistically significant, but the statistical comparison between non-captioned television and reading was not reported. Neuman and Koskinen' study provided empirical evidence indicating that audiovisual modes of input may be useful sources of incidental vocabulary learning for L2 learners. Moreover, it addressed another widely-discussed topic related to viewing: how captions affect L2 incidental vocabulary acquisition.

Research has revealed inconsistent results on whether viewing with captions leads to greater vocabulary gain than viewing without captions. There are two cognitive theories supporting the use of viewing with captions. Dual coding theory suggests that human cognition consists of two coding systems, a verbal system that processes objects encoded in written and oral verbal modality, and an imagery system that processes objects encoded in nonverbal modality (Sadoski & Paivio, 2001; Sadoski, 2005). Second, Multimedia learning theory (Mayer, 2009) suggests that there are separate channels in working memory to process words and pictures (Mayer, 2009). Plass and Jones (2005) described multimedia learning environment as a combination of print, audio, and imagery (as cited in Sydorenko, 2010, p. 50). Both theories suggest that presenting information in written, audio, and pictorial modes together can improve learning, indicating that providing captions along with video and audio may boost vocabulary learning. Several studies have provided evidence that viewing with captions may lead to greater vocabulary learning than viewing without captions (Baltova, 1999; Neuman & Koskinen, 1992; Peters et al., 2016; Sydorenko, 2010).

One reason captions may be useful for L2 vocabulary learning is because reading captions may be an automatic behavior, and so learners spend the same amount of time reading the captions whether or not the video is accompanied with audio, (d'Ydewalle & Pavakanun, 1997; d'Ydewalle, Praet, Verfaillie, & Van Rensbergen, 1991). Perhaps captions also make unfamiliar words more salient by drawing attention to unknown forms presented on screen. For instance, Sydorenko (2010) compared the vocabulary gain between viewing captioned videos, non-captioned videos, and silent captioned videos. The results indicated that both types of captioned video led to greater gain than the non-captioned videos. Moreover, the difference between the overall vocabulary learning in the captioned video group and the silent captioned video group was not statistically significant. She suggested that learners paid attention to vocabulary in captions the most, followed by video and then audio. Research on vocabulary learning through reading provides support for this. Godfroid et al. (2017) found that the amount of attention focused on unknown words during reading impacts vocabulary learning.

There have also been studies indicating that viewing videos with captions can result in similar vocabulary gain (Yuksel & Tanriverdi, 2009), no vocabulary learning (Bisson et al., 2014), or even less vocabulary learning (Hsu, 2014) compared to viewing videos without captions. One reason why viewing video with captions may not be effective is that viewers' attention may be divided among the different types of input. The Multimedia Redundancy Principle suggests that people may learn more deeply from graphics and narration than from graphics and narration with on-screen text because the on-screen text and spoken text may interfere with each other during the processing of language input (Mayer, 2014; Mayer & Fiorella, 2014). d'Ydewalle and Pavakanun (1997) also suggested that a considerable amount of attention to language input is lost when learners switch their visual attention between the video and the captions, reducing the potential to learn from each type of input.

For viewing to be a valuable mode of L2 incidental vocabulary learning input, words need to be encountered multiple times and this likely requires viewing large quantities of input. While research has suggested that in reading and listening input, the more that words were encountered, the more likely they could be learned (Brown et al., 2008; Horst et al., 1998; van Zeeland & Schmitt, 2013; Waring & Takaki, 2003; Webb, 2007), there are few studies investigating the relationship between frequency of word occurrence and vocabulary learning through audiovisual input. Peters et al. (2016) and Peters and Webb (in press) both reported positive correlations between frequency of occurrence and language learning through viewing. This suggests that a similar frequency effect may apply to L2 incidental vocabulary acquisition through viewing. The extent to which frequency of occurrence affects vocabulary learning in different modes of L2 input has yet to be investigated. One of the aims of this study is to help clarify this issue.

There are two reasons why it is useful to investigate the extent to which frequency of occurrence affects vocabulary learning in different modes of input. First, examining the relationship between frequency of occurrence and vocabulary learning allows us to better understand the extent to which materials may contribute to vocabulary learning. This in turn may help materials creators to design materials that promote vocabulary learning. Second, this line of research should help to reveal the different amounts of input that are

necessary to promote vocabulary learning in different modes. Corpus driven studies have looked at the extent to which vocabulary learning may occur through encountering different amounts of input. However, the frequency of occurrence that may indicate that learning may occur in these studies tends to vary from study to study (e.g., Cobb, 2007; Nation, 2015; Webb, 2010).

2.2.4 Prior Vocabulary Knowledge and Incidental Vocabulary Learning

Prior vocabulary knowledge has been found to have a positive impact on L2 incidental vocabulary learning through reading (Horst et al., 1998; Tekmen & Daloğlu, 2006; Webb & Chang, 2015a; Zahar et al., 2001). The reason why learners with larger vocabulary sizes may learn more words than those with smaller vocabulary sizes could be because greater vocabulary knowledge is likely to yield greater comprehension (Hu & Nation, 2000; Schmitt, Jiang, & Grabe, 2011), making the context more accessible and help learners to successfully infer the meanings of unknown words (Liu & Nation, 1985).

Surprisingly there is no research that has investigated the relationship between vocabulary knowledge and vocabulary learning through listening. However, three studies have examined the relationship between prior vocabulary knowledge and vocabulary learning through viewing. Rodgers (2013) investigated vocabulary learning through viewing 10 episodes of a TV program with and without captions. He found significant correlations ($r = .307$ and $r = .270$ for the two vocabulary knowledge tests used in the study) between prior vocabulary knowledge and vocabulary learning for those who viewed TV with captions but not for those who viewed the program without captions. Montero Perez, Peters, Clarebout, and Desmet (2014) also found significant positive relationships ($b = .12$, $b = .16$, $b = .01$, and $b = .02$ for the four vocabulary knowledge tests used in the study) between vocabulary size and L2 incidental vocabulary gain when the scores of participants who viewed video clips with captions and participants who viewed video clips without captions were examined together. Peters and Webb (in press) found a significant positive correlation ($b = .028$) between vocabulary size and vocabulary learning for learners who viewed a full-length documentary TV program without captions.

Taken together, the research indicates that the larger learners' vocabulary size, the more likely they could learn new words through reading and viewing. However, the extent to which prior vocabulary knowledge is related to the amount of vocabulary learning in different modes of L2 input is yet to be examined. The current study aims to fill this gap in the research literature. There are two reasons why it is useful to investigate this question. First, answering this question sheds light on how individual differences in vocabulary size may affect vocabulary learning in the most common forms of L2 input (reading, listening, viewing, and viewing with captions). This in turn may help teachers to better understand the degree to which their students may learn words through input, as well as which students are likely need greater support for their learning. Second, answering this question can help guide L2 learners selecting the appropriate learning materials based on their vocabulary levels. This may further increase learners' motivation and self-efficacy for vocabulary learning.

2.3   The Present Study

This study aims to investigate the effect that input mode has on L2 incidental vocabulary learning. In particular, it aims to explore how reading and listening input contribute to incidental vocabulary learning in comparison to viewing modes using a full-length documentary. The following research questions were examined:

1. To what extent does incidental vocabulary learning occur across different modes of input?
2. How does vocabulary gain compare across different modes of input?
3. How does prior vocabulary knowledge affect incidental vocabulary learning in different modes of input?
4. How does frequency of word occurrence affect incidental vocabulary learning in different modes of input?

2.4   Method

2.4.1   Participants

The research was a quasi-experimental study in an EFL context with 137 participants ranging from 19 to 21 in age. The participants were students majoring in English Translation at a university in China. The participants were in six classes that were randomly assigned by the university, with 82 second-year students divided into three classes and 55 third-year students divided into the other three. Data collection took place during their class time and their pre-assigned classes were randomly assigned to the experimental and control groups. Twenty-one participants were assigned to a reading group, thirty-one participants were in a video with captions group (VC), thirty participants were assigned to a silent video with captions group (SVC), fifteen participants were in an audio group, twenty-one participants were in a video without captions group (VNC), and 19 were assigned to a control group.

The Vocabulary Levels Test (VLT; Webb et al., 2017) was administered in a paper and pencil format to the participants to measure their prior vocabulary knowledge. The test results indicated that all of the participants had mastered the most frequent 1000 words; one hundred and twenty-five (91.2%) of them had mastered the most frequent 2000 words or more; seventy-eight (56.9%) of them had mastered the most frequent 3000 words or more. There were four participants whose scores showed that they had mastered the 1k and 3k word levels but not the 2k level. This suggested that either they had specialist vocabulary knowledge with limited practical experience (Meara, 1992) or successful guessing accounted for a big part of their performance at the 3k level. Therefore, the vocabulary level of these four participants was marked as being at the 1000 word level.

2.4.2   Materials

The documentary, *Why the Towers Fell* (Kennedy & Klein, 2002), originally broadcast by the Public Broadcasting Service (PBS) was used as the research materials. The program is about how and why the World Trade Center fell in the 9/11 attacks. The video was 54 minutes and 14 seconds long and the script contained 6240 running words. The

script was obtained from the PBS website (available at http://www.pbs.org/wgbh/nova/transcripts/2907_wtc.html). The script and the vocabulary in the video were examined to ensure that there were no differences between the audio and written language. The script was analyzed using AntWordProfiler (Anthony, 2014) and the BNC/COCA lists (Nation, 2012) to determine its lexical profile (the proportion of words that are found in different word frequency lists). Results of the analysis showed that the most frequent 3000 words plus proper nouns covered 95.21%.

Researchers have proposed different lexical coverage targets for comprehension, ranging from 90% to 98%, depending on the type of discourse (Hu & Nation, 2000; Nation, 2006; Webb & Rodgers, 2009a; van Zeeland & Schmitt, 2012) or the benchmark on which the comprehension level was based (Hu & Nation, 2000; Stæhr, 2008). Van Zeeland and Schmitt's (2013) study of incidental vocabulary learning from listening indicated that most of participants in the present study would likely be able to comprehend the materials because 91.2% of them had mastered the most frequent 2000 words or more before they completed the treatment. In a study examining how lexical coverage affected comprehension of television programs, Rodgers (2013) also found that there were EFL students who had not mastered the 2000-word level who had better comprehension test of television than students with mastery of 2000-word level. In Rodgers' study the 2000-word level covered around 94% of the show. This suggested that comprehension may not only depend on a certain amount of lexical coverage, but also on the discourse and the language learner. Rodgers also suggested that incidental vocabulary acquisition could occur at a relatively low lexical coverage. Based on these findings, we believed that the participants in this study would be able to understand the materials.

2.4.3   Target Words

Forty-three words were selected as target words based on two criteria, their vocabulary frequency levels, and their frequency of occurrence within the script. Most of the target words (39/43) were words that were less frequent than the most frequent 2000 words in Nation's (2012) BNC/COCA lists. The frequency of the target words in the script ranged from 3 to 33 occurrences. The list of target words is shown in Table 1.

Table 1 *Target Words and Their Frequency of Occurrence in Why the Towers Fell*

Target word (Word Family)	Word list	Number of occurrences
Strike	1000	6
Steel	2000	31
Flame	2000	4
Trap	2000	4
Collapse	3000	33
Column	3000	22
Core	3000	21
Structure	3000	16
Fuel	3000	9
Aircraft	3000	7
Crew	3000	7
Elevate	3000	6
Emergency	3000	6
Jet	3000	6
Occupy	3000	5
Reveal	3000	5
Concrete	3000	4
Component	3000	3
Crucial	3000	3
Destruction	3000	3
Essential	3000	3
Fragment	3000	3
Initial	3000	3

Severe	3000	3
Terror	3000	3
Trigger	3000	3
Evacuate	4000	10
Ladder	4000	10
Bolt	4000	5
Vertical	4000	5
Intact	4000	3
Exterior	5000	7
Ignite	5000	3
Lateral	5000	3
Lurch	6000	3
Truss	9000	17
Stairwell	9000	4
Stalwart	9000	3
Squeegee	16000	4
Skyscraper	Transparent compound word list	6
Sheetrock	Transparent compound word list	3
Drywall	Not in the lists	10
Fireproofing	Not in the lists	7

2.4.4   Instruments

2.4.4.1   The Vocabulary Levels Test

The VLT (Webb et al., 2017) measures vocabulary knowledge at five word frequency levels: 1000, 2000, 3000, 4000, and 5000 from Nation's (2012) BNC/COCA word lists. Schmitt, Schmitt, and Clapham's (2001) suggestion of 26/30 words or higher was used as the cutting point for mastery of a level. The number of vocabulary levels participants had reached the cutting point was used as the indicator of their vocabulary knowledge in this study. Because the lexical profile of the script suggested that participants with mastery of the 2000-word level or higher were more likely to comprehend the materials and learn the unknown words, the participants were divided into two categories: one with mastery of only the 1000-word level and one with mastery of at least the 2000-word level. A chi-square test on the vocabulary level category between the groups indicated that the vocabulary level of the participants was equivalent between the groups, χ^2 (5, N = 137) = 4.126, $p = 0.531$.

2.4.4.2   Checklist Test

This paper and pencil test required participants to respond *yes* or *no* to indicate whether they knew the provided words. Adapted from the yes/no EFL vocabulary test designed by Meara (1992), this test consisted of 60 test items, including 43 target words, 10 words that were expected to be known, and seven nonwords (See Appendix B). Including 10 words that were likely to be known should have helped to encourage the participants to complete the test. Analysis of these words was excluded from the results. The seven nonwords were selected from the ARC Nonword Database (Rastle, Harrington, & Coltheart, 2002). All the nonwords in the database are made up based on the phonotactic and orthographic constraints of Australian English and Standard Southern British English monosyllables, therefore they looked and sounded like real English words. Nonwords were included to reduce the limitation caused by test takers overestimating their vocabulary knowledge or not taking the test seriously by ticking the words as they pleased. A "yes" response to a nonword was marked as a "false alarm"; a "yes" to a target word was marked as a "hit". The proportion of words truly known, p(k), was

calculated using the formula from Anderson and Freebody (1982) and Shu, Anderson, and Zhang (1995):

$$p(k) = \frac{p(hit) - p(false\ alarm)}{1 - p(false\ alarm)}$$

A maximum score of 100% could be achieved on the checklist test.

The items were randomized across the pretest, the immediate posttest, and the delayed posttest. The spoken form of the test items was provided along with the written form to ensure that the testing mode matched the treatment modes because participants in the VC group, the VNC group, and Audio group encountered spoken input in their learning conditions. This should have helped to maintain the reliability of the data (Brown et al., 2008). Giving all groups both aural and written forms of test items provided internal consistency of the tests and may have helped to increase the sensitivity of the test to reveal potential learning. The audio version of the test was recorded by a North American English native speaker prior to the study. Each word was read twice with a five-second pause between items.

2.4.4.3 Multiple-choice Test

This test was a prompted recognition four-choice test with the key and three distractors in the participants' L1 (Mandarin, see Appendix C). An "I don't know this word" option was presented as a fifth option to reduce the effect of guessing. The test items were randomly ordered across the pretest, immediate, and delayed posttests. The same 10 words and 7 nonwords from the checklist test were also included to reduce the potential that participants tried to intentionally learn items between the test intervals.

2.4.5 Procedure

All participants were told that the purpose of this study was to investigate the effect that mode of input could have on comprehension. This was to encourage the participants to focus on the content of the materials rather than paying deliberate attention to the unknown words during the treatment. Informed consent was obtained from all the participants in this study.

In the first week, all of the participants completed the VLT followed by the checklist test and then the multiple-choice test. This session lasted approximately 50 minutes. After seven days, the participants completed the treatment in their assigned groups in separate classrooms. Each classroom was equipped with a multimedia system that included a computer, a projector, and speakers. Participants in the Reading group were each given individual copies of the script to read. The VC group watched the documentary with audio and captions. The VNC group watched the documentary with audio input but no captions. The SVC group watched the documentary with captions but no audio input. The Audio group listened to the documentary without the support of the video or script. A posttest consisting of the checklist test and the multiple-choice test was completed by the participants immediately after the treatment. The control group took the posttest but did not complete a treatment. The week 2 session lasted approximately 80 minutes, which was sufficient to complete all treatments and tests.

After another seven days, all participants took the checklist test and the multiple-choice test again as a delayed posttest. The participants were given sufficient time for everyone to finish the tests. This was followed by a ten-minute debriefing session, which was to clarify the real purpose of this study.

2.4.6   Analysis

IBM SPSS (Version 22) was used to conduct all the statistical analyses in this study. To answer the first research question, Repeated Measures ANOVA was conducted with checklist test scores and multiple-choice scores being dependent variables, test timing being the within-participants variable, and treatment being the between-participants factor. A follow-up simple effects test was carried out to examined the difference between the scores at the three test time points within each of the treatment groups.

To answer the second research question, analysis of covariance (ANCOVA) was conducted instead of relative gain scores or absolute gain scores because in quasi-experimental research ANCOVA tends to afford more statistical power than analysis of gain scores (Lindstromberg, 2016). I used posttest score as the dependent variable, treatment as the between-participants factor, and the pretest score as the covariate to

adjust the preexisting difference between groups on their prior knowledge of the target words in this study. ANCOVA was conducted on the checklist test score and the multiple-choice score separately.

To answer the third research question, the relationship between the participants' vocabulary level and their test scores was analyzed using Spearman's rho correlation test instead of Pearson's correlation because the participants' vocabulary level was not normally distributed. This analysis was conducted for each group individually and all groups together.

To examine the relationship between the frequency of word occurrence and vocabulary learning, a different method of scoring was used. A word was considered to be learned if it was incorrect on the pretest and correct on the posttest. Because the size of every treatment group was different, the proportion instead of the raw number of participants who had learned each target word was calculated [(the number of participants who have learned the word) / (the number of participants who did not know the word in the pretest)]. This data was calculated for the five experimental groups on the checklist test and the multiple-choice test. Because the frequency of word occurrence was not normally distributed, the number of encounters of the target words was categorized into three bands: less than 5 encounters, 5 to 9 encounters, and more than 9 encounters. One-way ANOVA was carried out to compare the proportions of participants who learned the words between the three repetition bands in each experimental group to examine the relationship between the repetition time of words and the learning of those words.

2.5   Results

2.5.1   Preliminary Analyses

Descriptive statistics of the checklist tests and the multiple-choice tests at three test time points are presented in Tables 2 and 3. From pretest to posttest, all the experimental groups showed increased mean scores on the checklist test and the multiple-choice test, while the control group showed a decreased mean score on the checklist test and increased mean score on the multiple-choice test. From pretest to delayed posttest, all six groups showed increased mean scores on both the checklist test and the multiple-test.

Inferential analyses were then carried out to examine if the observed differences were
statistically significant.

Table 2 *Descriptive Statistics of Checklist Test Score*

Group	N	Pretest		Posttest		Delayed posttest	
		M	*SD*	*M*	*SD*	*M*	*SD*
Reading	21	0.745	0.106	0.749	0.127	0.781	0.111
Audio	15	0.678	0.087	0.772	0.080	0.816	0.098
VC	31	0.722	0.138	0.759	0.103	0.766	0.113
SVC	30	0.764	0.111	0.769	0.097	0.802	0.101
VNC	21	0.592	0.150	0.743	0.096	0.743	0.147
Control	19	0.684	0.155	0.672	0.167	0.755	0.152
Total	137	0.705	0.138	0.747	0.116	0.777	0.121

Note. Maximum score is 1 (100%).

Table 3 *Descriptive Statistics of Multiple-choice Test Score*

Group	N	Pretest		Posttest		Delayed posttest	
		M	*SD*	*M*	*SD*	*M*	*SD*
Reading	21	25.48	6.32	30.10	7.26	29.86	6.16
Audio	15	28.50	3.43	32.25	4.11	31.63	4.24
VC	31	25.61	5.93	30.35	5.64	30.65	5.93
SVC	30	26.90	3.93	30.53	3.70	30.27	4.97
VNC	21	26.05	4.94	30.29	5.16	28.76	6.17
Control	19	26.74	6.01	27.32	7.70	28.37	8.00
Total	137	26.38	5.21	30.11	5.73	29.99	5.96

Note. Maximum score is 43.

2.5.2   Vocabulary Learning across Modes of Input and How It was Retained

To answer the first research question Repeated Measures ANOVA was conducted followed by a simple effects test. The results of Repeated Measures ANOVA revealed a significant main effect for the checklist test, F (1.682, 220.354) = 35.421, $p < .001$, $\eta_p^2 =$ .213, and for the multiple-choice test, F (1.899, 248.782) = 89.560, $p <.001$, $\eta_p^2 = .406$. A significant Time x Treatment interaction was also detected for the checklist test ($F =$ 4.548, $df = 8.410$, $p < .001$, $\eta_p^2 = .148$) and for the multiple-choice test ($F = 2.681$, $df =$ 9.495, $p = .005$, $\eta_p^2 = .093$).

The results of the simple effect test revealed the pairs of scores that were significantly different from each other within each treatment group on the same test at different test time points. Checklist test data showed that for both the Audio group ($p < .005$) and the VNC group ($p < .001$), the posttest score was significantly higher than the pretest score. The analyses for the checklist test also showed that the delayed posttest scores were significantly higher than the pretest scores for both the Audio and VNC groups ($p <$ .001). No significant differences were detected between the pretest score and the posttest scores for the Reading ($p = .880$), VC ($p = .068$), SVC ($p =.828$), and Control groups ($p =$ .651). The VNC group also scored significantly higher on the delayed posttest than the pretest ($p < .001$), indicating that the vocabulary gain in the video without captions mode was retained a week after the treatment. The delayed posttest scores of the Audio group were significantly higher than the scores on the posttest ($p < .05$), therefore the retention of vocabulary gain could not be attributed to the treatment. The delayed posttest scores of the Control group were significantly higher than the scores on the posttest ($p < .05$), also indicating that the learning happened after the immediate posttest.

Multiple-choice test data showed that for all five experimental groups, the posttest scores were significantly higher than the pretest scores ($p < .001$). There was no significant difference between the posttest score and pretest score for the Control group ($p = .463$), indicating that the gains for the experimental groups could be attributed to the learning

conditions. Simple effects analysis also revealed significantly higher scores on the delayed posttest than the pretest in the Reading, Audio, VC, and SVC groups ($p < .001$), indicating that the acquired vocabulary knowledge in these four groups was retained a week after the treatment. The delayed posttest scores of the VNC group were significantly higher than the scores on the posttest ($p < .05$), therefore the retention of vocabulary gain could not be attributed to the treatment. No significant difference from the pretest to the delayed posttest was detected for the Control group ($p = .065$).

2.5.3 How does Vocabulary Learning Compare across Different Modes of Input

The results of the ANCOVA showed that there was a significant difference between the treatment groups on the posttest score after controlling for the pretest score both for the checklist test, $F (5, 130) = 3.568$, $p < .01$, $\eta_p^2 = .121$, and the multiple-choice test, $F (5,130) = 3.997$, $p < .005$, $\eta_p^2 = .133$. The covariate pretest score was significantly related to the posttest score for the checklist test, $F (1,130) = 58.355$, $p < .001$, and for the multiple-choice test, $F (1, 130) = 20.432$, $p < .001$. There was no significant difference between the treatment groups on the delayed posttest score on the checklist test ($p = .32$) and the multiple-choice test ($p = .06$), indicating that the retention rate of the gained vocabulary knowledge after a week was not significantly different between the groups.

A Bonferroni post hoc test of the immediate posttest revealed that the Audio group and the VNC group both had significantly higher scores on the checklist posttest than the Control group, $p < .05$ and $p < .005$, respectively. The posttest scores of other groups on the checklist test were not significantly different from each other. For the multiple-choice test, the Bonferroni post hoc test showed that the Reading, VC, SVC, and VNC groups all scored significantly higher than the Control group on the posttest, $p < .05$, $p < .005$, $p < .05$, and $p < .01$, respectively. The difference between the Audio group and the Control group was approaching statistical significance, $p = .054$. No significant differences were detected between the experimental groups, indicating that the learning effect on incidental vocabulary acquisition between different modes of input was not significantly different. The complete results of the Bonferroni post hoc test are displayed in Table 4.

Table 4 *The p Values in Pairwise Comparisons using the Bonferroni Post Hoc Test*

Group	Control		SVC		VNC		VC		Audio	
	CL	MC	CL	MC	CL	MC	CL	MC	CL	MC
Reading	1.000	.006**	1.000	1.000	.367	1.000	1.000	1.000	1.000	1.000
Audio	.031*	.054	1.000	1.000	1.000	1.000	1.000	1.000		
VC	.217	.001**	1.000	1.000	1.000	1.000				
VNC	.003**	.016*	.628	1.000						
SVC	.686	.035*								

Note. *p < .05. **p < .01.CL = Checklist test. MC = Multiple-choice test.

2.5.4 The Relationship between Vocabulary Level and Vocabulary Learning

Spearman's rho correlation test was carried out to examine the relationship between the participants' vocabulary level and their test scores. The results showed that vocabulary level as an indicator of vocabulary knowledge was significantly correlated with the posttest scores when all the experimental groups were tested together ($N = 118$). Small positive correlations were found between vocabulary level and scores on the checklist posttest ($r_S = .224$, $p < .05$) and the multiple-choice posttest ($r_S = .294$, $p < .01$). No significant correlation was found between vocabulary level and the scores on the checklist delayed posttest. Small positive correlations were found between vocabulary level and the multiple-choice delayed posttest scores ($r_S = .265$, $p < .01$). These findings indicated that the higher the learners' vocabulary level, the more target words they learned. When Spearman's rho correlation tests were carried out for each treatment group individually, small to moderate positive correlations were found between vocabulary level and the posttest scores only in the VC and the SVC groups. The results are presented in Table 5.

Table 5 *Spearman's Correlation rho on Vocabulary Level and the Test Scores*

Group	Checklist test		Multiple-choice test	
	Posttest	Delayed posttest	Posttest	Delayed posttest
Reading ($n = 21$)	.038	.059	.192	.179
Audio ($n = 15$)	.270	-.176	.165	-.060
VC ($n = 31$)	.445*	.428*	.400*	.319
SVC ($n = 30$)	.171	.204	.382*	.387*
VNC ($n = 21$)	.316	.306	.240	.315
Total ($N = 118$)	.224*	.166	.294**	.265**

Note. *$p < .05$. ** $p < .01$.

2.5.5 The Relationship between Frequency of Occurrence and Vocabulary Learning

One-way ANOVA was carried out to compare the proportions of participants who learned the words between the three frequency bands in each experimental group. There were 20 target words in the first band (encountered less than 5 times), fifteen in the second band (encountered 5 to 9 times), and eight in the third band (encountered more than 9 times). On the checklist test, the only significant between-groups difference was detected in the VC group, $F (2, 35) = 3.562$, $p < .05$. Tukey's Post Hoc test revealed that words from the second frequency band had a significantly higher learning rate than the words from the first band, $p < .05$, 95% CI [0.009, 0,495], indicating that when learners watch videos with captions, they have a significantly higher chance to learn a word it is encountered 5 to 9 times than if it is encountered less than 5 times. On the multiple-choice test, no significant differences were found between the frequency bands in any of the experimental groups. Descriptive statistics are presented in Table 6 and Table 7. The results of the ANOVAs are displayed in Table 8 and Table 9.

Table 6 *Checklist Test Descriptive Statistics for the Proportion of Participants Who Learned the Word*

Group	Frequency band 1			Frequency band 2			Frequency band 3			Total		
	M	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*N*
Reading	0.559	0.317	20	0.742	0.343	13	0.658	0.299	6	0.635	0.325	39
Audio	0.447	0.401	20	0.609	0.404	14	0.442	0.467	8	0.500	0.412	42
VC	0.401	0.225	19	0.654	0.298	12	0.590	0.329	7	0.516	0.287	38
SVC	0.443	0.384	19	0.728	0.280	13	0.495	0.352	6	0.549	0.363	38
VNC	0.591	0.375	19	0.653	0.250	13	0.660	0.293	8	0.625	0.317	40
Total	0.503	0.255	20	0.704	0.250	15	0.648	0.273	8	0.600	0.267	43

Note. The numbers of target words varied because there were words that were known by all the participants in the pretest in each group. These words were marked as missing when analysis was carried out in SPSS.

Table 7 *Multiple-choice Test Descriptive Statistics for the Proportion of Participants Who Learned the Word*

Group	Frequency band 1			Frequency band 2			Frequency band 3			Total		
	M	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*N*
Reading	0.395	0.233	19	0.416	0.373	15	0.544	0.236	8	0.431	0.290	42
Audio	0.523	0.357	19	0.547	0.372	13	0.571	0.446	8	0.540	0.371	40
VC	0.576	0.517	20	0.463	0.287	15	0.557	0.361	8	0.533	0.416	43
SVC	0.423	0.279	20	0.567	0.320	15	0.926	1.027	8	0.567	0.529	43
VNC	0.383	0.301	19	0.537	0.334	15	0.310	0.341	8	0.424	0.325	42
Total	0.438	0.218	20	0.523	0.243	15	0.568	0.166	8	0.492	0.220	43

Note. The numbers of target words varied because there were words that were known by all the participants in the pretest in each group. These words were marked as missing when analysis was carried out in SPSS.

Table 8 *ANOVA Summaries for Checklist Test*

Group	Source	df	SS	MS	F	p
Reading	Between groups	2	.265	.132	1.266	.294
	Within groups	36	3.766	.105		
	Total	38	4.031			
Audio	Between groups	2	.251	.126	.730	.488
	Within groups	39	6.702	.172		
	Total	41	6.953			
VC	Between groups	2	.516	.258	3.562*	.039
	Within groups	35	2.537	.072		
	Total	37	3.054			
SVC	Between groups	2	.650	.325	2.698	.081
	Within groups	35	4.216	.120		
	Total	37	4.866			
VNC	Between groups	2	.041	.021	.197	.822
	Within groups	37	3.879	.105		
	Total	39	3.921			
All experimental groups	Between groups	2	.369	.185	2.798	.073
	Within groups	40	2.638	.066		
	Total	42	3.007			

Table 9 *ANOVA Summaries for Multiple-choice Test*

Group	Source	df	SS	MS	F	p
Reading	Welch's ANOVA	2			1.119	.347
		18.962				
Audio	Between groups	2	.014	.007	.048	.953
	Within groups	37	5.346	.144		
	Total	39	5.360			
VC	Between groups	2	.116	.058	.325	.724
	Within groups	40	7.147	.179		
	Total	42	7.263			
SVC	Welch's ANOVA	2			1.647	.225
		15.267				
VNC	Between groups	2	.328	.164	1.593	.216
	Within groups	39	4.012	.103		
	Total	41	4.339			
All	Between groups	2	.118	.059	1.234	.302
experimental	Within groups	40	1.919	.048		
groups	Total	42	2.038			

Note. Welch's ANOVA was carried out for the Reading and the SVC groups because their data violated the assumption of homogeneity, shown by the Levene's Test of Homogeneity of Variances, for the Reading group, $F(2, 39) = 3.499$, $p < .05$, and for the SVC group, $F(2, 40) = 4.218$, $p < .05$.

2.6   Discussion

2.6.1   Incidental Vocabulary Learning through Different Modes of Input

This study is the first to investigate the effects of individual and combined input modalities on incidental vocabulary learning through viewing a full-length television program. Earlier studies have investigated incidental vocabulary learning in the individual modes of written input (e.g, Nagy et al., 1985; Waring & Takaki, 2003), aural input (e.g., Elley, 1989; van Zeeland & Schmitt, 2013; Vidal, 2003) and audiovisual input (e.g., Harji, Woods, & Alavi, 2010; Markham, 1999; Montero Perez et al., 2015; Peters & Webb, in press). Several studies have compared modes of input but not included multimedia modes of input (e.g., Brown et al., 2008; Vidal, 2011; Webb & Chang, 2012), or have compared multimedia modes of input but with materials that lacked ecological validity (e.g., Hsu, 2014; Neuman & Koskinen, 1992; Sydorenko, 2010). The present study expands on the earlier research and should provide a more accurate assessment of the extent to which different modes of L2 input contribute to incidental vocabulary learning.

The results of the multiple-choice test were consistent with the findings of earlier research showing that vocabulary knowledge can be incidentally acquired through reading (Brown et al., 2008; Shu et al., 1995; Waring & Takaki, 2003; Webb, 2007), listening (Brown et al., 2008; van Zeeland & Schmitt, 2013; Vidal, 2003, 2011), viewing videos with or without captions (Montero Perez et al., 2014, 2015; Neuman & Koskinen, 1992), and viewing silent videos with captions (Hsu, 2014; Sydorenko, 2010). Apart from supporting the beneficial effects of the traditional modes of input (i.e., reading and listening) for incidental vocabulary learning, the results also provided more evidence in support of learning vocabulary through viewing L2 television, a mode of input that learners appear to be highly motivated to learn with (Gieve & Clark, 2005; Rodgers, 2013). This is particularly useful because many earlier studies have investigated incidental vocabulary learning through viewing specialized materials such as academic speeches (e.g., Vidal, 2003, 2011), and short segments of videos (e.g., Montero Perez et al., 2014; Sydorenko, 2010)

Another purpose of this study was to compare the effects of individual input modes on incidental vocabulary learning and investigate the extent to which they each contribute to learning. One of the hypotheses that was based on the findings of earlier research was that incidental learning through multiple modes of input might be greater than through a single mode (Brown et al., 2008; Neuman & Koskinen, 1992; Sydorenko, 2010). However, the learning effect between modalities was not significantly different in both the multiple-choice and checklist tests. There are several possible explanations for the contrast in findings between the present research and earlier studies. First, in this study incidental vocabulary learning was assessed using a test measuring receptive knowledge of form-meaning connection. Similarly, Sydorenko (2010) found no significant differences between different modes of audiovisual input on receptive test scores. In her study, she only found statistically significant difference on translation test which measured productive knowledge of the form-meaning connection. A second reason why there were no statistically significant differences between the learning gains made through different modes of L2 input is that the only aspect of knowledge measured was form-meaning connection. Research indicates that different modes of L2 input may also contribute to incidental gains in other aspects of knowledge. For instance, Hsu (2014) found that audiovisual input contributed to improvement in the use of target words in a writing task. Whereas, Webb et al. (2013) and Pellicer-Sanchez (2017) found that participants gained knowledge of collocation incidentally through reading with audio support, and reading, respectively. The results of these studies suggest that the vocabulary gains from different modes of input may also be revealed through tests measuring different aspects of vocabulary knowledge. Thus using tests measuring multiple aspects of vocabulary knowledge in future research comparing modes of input should be considered.

The lack of significant differences between the learning conditions does not support the multimedia learning theory and dual-coding theory, which both suggest that the multimedia conditions would contribute to superior vocabulary gains. The Redundancy Principle in multimedia learning provides a possible explanation for the lack of significant differences. The Redundancy Principle suggests that learners may experience cognitive overload in the visual channel when exposed to visual presentation and on-

screen text at the same time (Clark & Mayer, 2011). Boers, Warren, He, and Deconinck (2017) also found that pictorial support alongside with textual information may reduce the attention learners give to unknown words, leading to poorer learning performance. Taken together, the multiple formats of visual and verbal information provided in the VC and SVC groups could distract the participants from focusing on the novel words, therefore the learning effect was counteracted, resulting in no superior learning in any of these viewing groups.

The contrast between the results of the current study and the earlier studies on incidental learning through different modes of input could also indicate that the learners' preference for the learning material and learning style may be a crucial factor that has been overlooked. Research has indicated that the characteristics of reading or listening materials, such as being funny, interesting, thought-provoking, incongruity, and the like, could increase attention levels intellectually and emotionally (Brown et al., 2008; Elley, 1989). Brown et al. (2008) also found that learners had greater vocabulary gains if the material was presented in their preferred mode. Similarly, Wang (2012) suggested that the interest level and the familiarity of the content is an important factor in L2 vocabulary learning through TV drama. Taken together, the documentary used in the current study may not be interesting to some of the participants and the assigned mode of input may not match their learning preference, thus leading to less attention to the unknown words and less vocabulary gain. Accordingly, a lack of familiarity of the content of the material encountered in the present study may have resulted in less interest in the content and less vocabulary gain. Future research should expand on this perspective and investigate the extent to which learner's preference for the learning material and learning style affects incidental vocabulary learning.

2.6.2 Relationship between Prior Vocabulary Knowledge and Incidental Learning

In answer to the third research question, prior vocabulary knowledge was only related to vocabulary acquisition in captioned video mode and the silent captioned video mode but not in any of the other modes of input. The small correlations found in the captioned video mode and the silent captioned video mode suggest that the inclusion of captions

may have helped to activate the participants' prior vocabulary knowledge and more effectively learn unknown words. The fact that there was no correlation between prior vocabulary knowledge and learning in the more typical mode of viewing without captions suggests that the captions may have made the input more salient to the participants. This may be because learners in the EFL context may receive more input through written text rather than spoken text. However, the lack of a significant correlation in the reading mode contrasts the findings of earlier studies that have found that vocabulary knowledge had small to large positive correlations with scores on posttests measuring vocabulary gain through reading (Webb & Chang, 2015a; Horst et al., 1998). A possible explanation for the lack of a significant correlation in the reading mode in this study is that the reading material was a transcript of a documentary instead of more typical written text. Unfamiliarity with the way that language is presented in the transcript may have reduced the impact that prior vocabulary knowledge had on learning. The non-significant correlations between vocabulary knowledge and vocabulary gain in the other modes may indicate that there were other aspects of learners' knowledge that affected incidental vocabulary learning. For example, Vidal (2003) suggested that students with higher levels of English proficiency tended to acquire more vocabulary knowledge through listening. In terms of the current study, participants with higher vocabulary levels may not necessarily have higher English proficiency levels because the latter is a superordinate concept of which vocabulary knowledge is just one aspect. It would be useful to investigate to which different aspects of language skills other than vocabulary knowledge affect incidental vocabulary learning in a follow-up study.

One interesting finding that was revealed when analyzing the data was that there were large positive significant correlations between the number of participants who knew each target word and the number of participants who learned that word, both for the checklist test ($r = .765$, $p < .001$) and for the multiple-choice test ($r = .671$, $p < .001$). In other words, the more participants who knew a target word on the pretest, the more likely that other participants were to learn that word. This finding may provide some indication of partial knowledge of a word. For example, if many people know a word, there is probably a greater chance that those who do not know the word have some knowledge of that word. However, their knowledge of the word is simply not sufficient to correctly answer

a pretest question. However, through the completion of a learning condition, knowledge of that word may be more likely to increase to a point where the word is known than for other words for which learners have no partial knowledge. In contrast, words that are unknown by a large number of people are less likely to have been encountered and the amount of partial knowledge of these words is likely to be smaller. Thus on average there may be more knowledge that needs to be gained for unknown words that few people know on a pretest in order to successfully answer a posttest question. It would be useful for future research to investigate this to determine whether prior knowledge of each target word for a group of participants could be a predictor of the learning of those words.

2.6.3   The Relationship between Frequency of Occurrence and Incidental Learning

In answer to the fourth research question, the results provided little evidence that frequency of occurrence affected vocabulary learning in the different modes of input. In only one of the five experimental conditions (captioned video mode) was there an effect found for frequency of occurrence. The results indicated that learning was more likely to happen in viewing with captions when words occurred for more than 5 times. No effect of repetition was found in other modes of input. This was in line with the findings of Webb and Chang (2015b), who found that no significant correlation was detected in a reading with audio support mode. However, the finding contrasts several other studies that have found that frequency of word occurrence was related to incidental vocabulary learning through reading (Brown et al., 2008; Waring & Takaki, 2003; Webb, 2007), listening (Brown et al., 2008), reading while listening (Brown et al., 2008), and viewing (Peters & Webb, in press; Rodgers, 2013) modes.

There are several reasons for the inconsistency in findings. First, the material was originally designed to present information with both audio and visual support, making it less ecologically appropriate to serve as reading material alone. The lack of visual support in the reading and audio modes, and audio support in the reading and silent video with captions modes could lead to the material becoming less informative and interesting. This may have caused the participants to become less engaged and pay less attention to the unknown words. Therefore the actual number of time a word was attended to when it

was encountered may be smaller than its frequency of occurrence in the transcript, reducing the impact of frequency of occurrence on learning.

Also perhaps other factors such as salience and relevance were more important than the frequency of word occurrence in the non-reading modes, given how densely the information is provided in a documentary. Ellis (2006) suggests that words may need more salient cues in the contexts around them to arouse the learning attention.

2.7   Implications

2.7.1   Methodological Implications

The results of the checklist and multiple-choice tests revealed inconsistencies in all of the statistical analysis in this study. This led to further examination of the data. Because Mochida and Harrington (2006) suggested that it might be possible to obtain an accurate measure of receptive vocabulary knowledge regardless of the responses to nonwords in yes/no tests, the analyses for the checklist test was conducted again using the number of checked target words as the checklist test score. Adapted from the approach used by Schmitt et al. (2011) and Zimmerman (1997), participants who answered yes to more than two nonwords were excluded to control for the effect of guessing. The results of Repeated Measures ANOVA showed significantly higher scores from pretest to posttest for the Audio ($p < .005$), VNC ($p < .01$), and the VC groups ($p < .001$). These groups did not show significant vocabulary gain in the analysis of their proportional scores on the checklist test. Between-groups comparison using the raw scores on the checklist test did not yield any difference between the experimental groups supporting the original analysis. Although using raw scores on the checklist test did partially confirm the finding that incidental vocabulary learning could occur through viewing, it also suggested that the checklist test might not be a decisive test format to investigate vocabulary learning through different modes of input.

2.7.2   Pedagogical Implications

The findings of this study provide more support for learning words incidentally through the reading, listening, and viewing. The research also provides further evidence

indicating the value of viewing L2 television programs to promote vocabulary learning (Peters & Webb, in press; Rodgers, 2013; Rodgers & Webb, 2011; Webb & Rodgers, 2009; Webb, 2015; Webb & Nation, 2017). The lack of differences between the different modes suggests that materials other than more traditional reading and listening activities may also be effective. Perhaps then greater variety in learning through different modes of input might have a positive impact on vocabulary learning.

The current study also provided some implications for English for Specific Purposes (ESP) learning. The utility of a full-length television documentary may help to guide the vocabulary learning activities in ESL/EFL classes, especially in ESP classes. Documentaries and other kinds television programs that are aimed at informing viewers about topics are widely available and their broad range of topics may often be relevant to ESP programs. The findings of this study suggest that L2 television programs may be very useful as a meaning-focused resource to help fuel vocabulary acquisition.

Moreover, the present study illustrated that similar amounts of vocabulary knowledge could be acquired through different modes of input. This suggests that breaking down viewing material into different modes of input or providing audiovisual support together with written text may sustain its learning effect on incidental vocabulary acquisition. This would provide learners with more flexibility over how they choose their learning materials and allow them to better adapt their learning styles to learning materials.

2.8   Limitations

Several limitations of the current study should be considered when interpreting the data. First is the lack of diversity in the test formats and the aspects of vocabulary knowledge being measured. An alternative of the checklist test could be a scale type of yes/no test, such as the ones used in Vidal (2003, 2011) and Zimmerman (1997). This could help to reduce variation in responses caused by sophisticated guessing and personal response styles (Huibregtse, Admiraal, & Meara, 2002) and still keep the advantage of quick testing (Meara, 1992).

Another limitation is that only two factors (prior vocabulary knowledge, frequency of occurrence) that may affect incidental vocabulary learning in different modes of input were examined. Research has proposed several learner-related factors that could affect L2 vocabulary acquisition through reading, such as topic familiarity (Lee & Pulido, 2017; Pulido, 2007) and cultural background knowledge (Pulido, 2004). When it comes to multimedia input, the time learners devote to the captions or the images in video could affect their vocabulary gain in captioned viewing modes (Bisson, Heuven, Conklin, & Tunney, 2015; Montero Perez et al., 2015). It would be useful to specifically investigate how a wide range of factors affect vocabulary learning in different modes of input.

2.9   Conclusion

The present study indicated that L2 incidental vocabulary learning could occur through reading, listening, viewing with captions, viewing without captions, and silent viewing with captions using a full-length TV documentary. The finding that there were no significant differences between the vocabulary gain in these modes of input suggested that viewing, listening, and reading could provide similar amounts of vocabulary learning. This suggests that there is value in making learners familiar with a range of modes of input in order to help them to find the mode which best suits their learning preference. This could motivate greater autonomous learning through meaning-focused input, and in turn greater incidental vocabulary learning.

Chapter 3

3 Conclusion

This chapter provides an overview of the findings of the present study in response to the research questions. Implications to future studies are summarized.

3.1 Findings and Implications

The present study indicated that L2 incidental vocabulary learning could occur through reading, listening, viewing with captions, viewing without captions, and silent viewing with captions using a full-length TV documentary. As a direct indicator of the vocabulary gain, the multiple-choice test demonstrated that the average raw vocabulary gain was 4.22 target words through all the five experimental conditions. Viewing with captions resulted in the greatest raw gain, 4.74 target words. Because there were averagely 16.49 out of the 43 target words unknown by the participants in the pretest, the actual average learning rate of the experimental conditions was 25.59% (4.22/16.49). Similarly, the mean number of target words unknown in the viewing with captions group was 17.39, resulting in an actual learning rate of 27.26% (4.74/17.39). These vocabulary gains were higher than the findings of Rodgers (2013)'s study, which found 5.93 to 6.03 out of 60 target words learned through viewing with captions. While Rodgers (2013) used 10 episodes of TV shows as the research material, the present study used a full-length TV documentary as the input and found greater vocabulary gains than in Rodgers (2013) study, addressing the value of a single full-length television program being an efficient input source of incidental vocabulary learning.

However, there were no significant differences in the vocabulary gains among the five experimental groups, indicating that viewing with captions, viewing without captions, silent viewing with captions, reading, and listening could provide similar amounts of incidental vocabulary learning. These findings were useful in terms of encouraging teachers to use various modes of input to guide L2 learners to enrich their vocabulary knowledge, in turn providing L2 learners with more flexibility when selecting their preferred mode of input for vocabulary acquisition.

Frequency of occurrence was a word-related factor that only affected viewing with captions mode in this study. This was unexpected because previous studies have found that frequency of occurrence had an impact on other modes of input (e.g., Horst et al., 1998; van Zeeland & Schmitt, 2013). One explanation for this was that there could be other word-related factors affecting incidental vocabulary learning. Prior vocabulary knowledge was found to be significantly correlated with only viewing with captions and silent viewing with captions modes.

3.2   Future Research

Based on the implications and limitations of the present study, there are two suggestions for future research.

First, future research should consider measuring other aspects of vocabulary knowledge when investigating L2 incidental vocabulary learning through different modes of input. For example, research has shown that collocations could be incidentally learned through reading-while-listening to stories (Webb et al., 2013). Research on incidental learning collocations through other modes of input will throw some light on the robustness and generalizability of the previous findings, providing deeper understanding of the extent to which vocabulary gain could occur across different modes of input.

Second, other learner-related factors should be considered when investigating incidental vocabulary learning through different modes of input. For example, research has suggested that background knowledge could affect L2 incidental vocabulary learning through reading (Pulido, 2004). It will be useful if future research expands the investigation from reading to other modes of input, such as viewing television. It will also be helpful if future studies examine the extent to which different learner-related factors contribute to L2 incidental vocabulary learning. These possible lines of research will help validate the findings of previous research and shed more light on the proper use of different learning materials to fuel L2 incidental acquisition with respect to learners' uniqueness.

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Appendices

Appendix A: Ethics Approval Notice

Western Research

Research Ethics

Western University Non-Medical Research Ethics Board
NMREB Delegated Initial Approval Notice

Principal Investigator: Dr. Stuart Webb
Department & Institution: Education\Faculty of Education, Western University

NMREB File Number: 108862
Study Title: How does mode of input affect incidental vocabulary learning?

NMREB Initial Approval Date: February 09, 2017
NMREB Expiry Date: February 09, 2018

Documents Approved and/or Received for Information:

Document Name	Comments	Version Date
Recruitment Items	Poster	2017/02/01
Instruments	NVLT	2017/02/01
Instruments	Multiple Choice Test	2017/02/01
Letter of Information & Consent		2017/02/01
Other	Debriefing Letter	2017/02/01
Instruments	Lexical Profile	2017/02/01
Instruments	Checklist test	2017/02/01
Western University Protocol	Received February 2, 2017	
Instruments	Target Words	2017/02/01

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the above named study, as of the NMREB Initial Approval Date noted above.

NMREB approval for this study remains valid until the NMREB Expiry Date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario.

Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB.

The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.

Ethics Officer, on behalf of Dr. Riley Hinson. NMREB Chair or delegated board member

EO: .lyn Harris___ Nicola Morphet ___ Karen Gopaul ___

Appendix B: Checklist Test

Read and listen to the words carefully. For each word: if you know what it means, write Y (for Yes) in the box; if you don't know what it means, or if you are not sure, write N (for No) in the box.

1. ☐component	2. ☐stalwart	3. ☐levy
4. ☐collapse	5. ☐reveal	6. ☐skyscraper
7. ☐rhipps	8. ☐emergency	9. ☐terror
10. ☐return	11. ☐trigger	12. ☐concrete
13. ☐fireproofing	14. ☐strike	15. ☐truss
16. ☐staff	17. ☐trap	18. ☐souz
19. ☐ignite	20. ☐bolt	21. ☐jet
22. ☐manks	23. ☐steel	24. ☐structure
25. ☐fuel	26. ☐lateral	27. ☐lurch
28. ☐state	29. ☐computer	30. ☐stairwell
31. ☐core	32. ☐destruction	33. ☐essential
34. ☐sheetrock	35. ☐phleeze	36. ☐drywall
37. ☐koax	38. ☐aircraft	39. ☐occupy
40. ☐skous	41. ☐gene	42. ☐ladder
43. ☐choice	44. ☐fragment	45. ☐squeegee
46. ☐crucial	47. ☐vertical	48. ☐note
49. ☐evacuate	50. ☐flame	51. ☐quaks
52. ☐crew	53. ☐severe	54. ☐elevate
55. ☐initial	56. ☐intact	57. ☐exterior
58. ☐column	59. ☐mutual	60. ☐photograph

Appendix C: Multiple-choice Test

Please choose the Chinese meaning for the word. If you are not sure about it, choose *"I don't know this word"*.

1. component				
A. 敌人	**B.** 成分	**C.** 伙伴	**D.** 整体	**E.** I don't know this word
2. stalwart				
A. 庞大	**B.** 脆弱	**C.** 坚固	**D.** 渺小	**E.** I don't know this word
3. levy				
A. 税	**B.** 等级	**C.** 杠杆	**D.** 天平	**E.** I don't know this word
4. collapse				
A. 倒塌	**B.** 建立	**C.** 环绕	**D.** 升起	**E.** I don't know this word
5. reveal				
A. 揭示，展现	**B.** 下降	**C.** 隐藏	**D.** 重复	**E.** I don't know this word
6. skyscraper				
A. 天台	**B.** 天梯	**C.** 摩天大楼	**D.** 楼顶	**E.** I don't know this word
7. rhipps				
A. 撕裂	**B.** 倒塌	**C.** 搀扶	**D.** 贴合	**E.** I don't know this word
8. emergency				
A. 出现	**B.** 紧急情况	**C.** 包容	**D.** 大门	**E.** I don't know this word

9. terror				
A. 眼泪	**B.** 恐怖活动	**C.** 破坏	**D.** 安全	**E.** I don't know this word
10. return				
A. 环绕	**B.** 向上	**C.** 返回	**D.** 向下	**E.** I don't know this word
11. trigger				
A. 开关	**B.** 扳机	**C.** 老虎	**D.** 踏板	**E.** I don't know this word
12. concrete				
A. 建筑	**B.** 水泥	**C.** 空心	**D.** 创造	**E.** I don't know this word
13. fireproofing				
A. 易燃	**B.** 防火材料	**C.** 火枪	**D.** 火焰	**E.** I don't know this word
14. strike				
A. 返回	**B.** 跳跃	**C.** 打击	**D.** 环绕	**E.** I don't know this word
15. truss				
A. 信任	**B.** 梯子	**C.** 桁架	**D.** 真相	**E.** I don't know this word
16. staff				
A. 职员	**B.** 物品	**C.** 消防员	**D.** 教授	**E.** I don't know this word
17. trap				
A. 陷入困境	**B.** 容纳	**C.** 救援	**D.** 接受	**E.** I don't know this word

18. souz				
A. 柔和的	**B.** 明亮的	**C.** 昏睡的	**D.** 清晰的	**E.** I don't know this word
19. ignite				
A. 点燃	**B.** 忽视	**C.** 熄灭	**D.** 升起	**E.** I don't know this word
20. bolt				
A. 船	**B.** 插销	**C.** 皮带	**D.** 绳结	**E.** I don't know this word
21. jet				
A. 喷气式飞机	**B.** 直升飞机	**C.** 夹克	**D.** 果冻	**E.** I don't know this word
22. manks				
A. 河岸	**B.** 银行	**C.** 楼梯	**D.** 窗台	**E.** I don't know this word
23. steel				
A. 塑料	**B.** 静止	**C.** 偷窃	**D.** 钢铁	**E.** I don't know this word
24. structure				
A. 挣扎	**B.** 困境	**C.** 空间	**D.** 结构	**E.** I don't know this word
25. fuel				
A. 充满	**B.** 燃料	**C.** 营养	**D.** 燃烧	**E.** I don't know this word
26. lateral				
A. 垂直	**B.** 后来的	**C.** 侧面	**D.** 边缘的	**E.** I don't know this word

27. lurch				
A. 突然倾斜	**B.** 引诱	**C.** 午餐	**D.** 盒子	**E.** I don't know this word
28. state				
A. 雕像	**B.** 文具	**C.** 空间	**D.** 国家；州	**E.** I don't know this word
29. computer				
A. 电脑	**B.** 计算器	**C.** 屏幕	**D.** 键盘	**E.** I don't know this word
30. stairwell				
A. 楼梯井	**B.** 电梯	**C.** 水井	**D.** 天井	**E.** I don't know this word
31. core				
A. 煤炭	**B.** 疼痛	**C.** 寒冷	**D.** 内核	**E.** I don't know this word
32.destruction				
A. 创新	**B.** 建造	**C.** 破坏	**D.** 后退	**E.** I don't know this word
33. essential				
A. 散文	**B.** 基本的	**C.** 简单的	**D.** 本质	**E.** I don't know this word
34. sheetrock				
A. 复合板	**B.** 石膏板	**C.** 天花板	**D.** 地板	**E.** I don't know this word
35. phleeze				
A. 轻柔	**B.** 喷嚏	**C.** 微风	**D.** 火焰	**E.** I don't know this word

36. drywall				
A. 干板墙	**B.** 建筑	**C.** 水泥	**D.** 结构	**E.** I don't know this word
37. koax				
A. 可乐	**B.** 考拉	**C.** 石灰	**D.** 罐头	**E.** I don't know this word
38. aircraft				
A. 空调	**B.** 防空洞	**C.** 气体	**D.** 飞机	**E.** I don't know this word
39. occupy				
A. 间谍	**B.** 供应	**C.** 章鱼	**D.** 使忙碌	**E.** I don't know this word
40. skous				
A. 滑雪	**B.** 学校	**C.** 轨道	**D.** 头骨	**E.** I don't know this word
41. gene				
A. 总体	**B.** 牛仔裤	**C.** 基因	**D.** 宝石	**E.** I don't know this word
42. ladder				
A. 字母	**B.** 后来的	**C.** 兄弟	**D.** 梯子	**E.** I don't know this word
43. choice				
A. 放弃	**B.** 选择	**C.** 合唱团	**D.** 快乐	**E.** I don't know this word
44. fragment				
A. 碎片	**B.** 香味	**C.** 脆弱	**D.** 框架	**E.** I don't know this word

45. squeegee				
A. 橡胶水刮	**B.** 海绵	**C.** 深蹲	**D.** 扫把	**E.** I don't know this word

46. crucial				
A. 不重要的	**B.** 至关重要	**C.** 严厉的	**D.** 无情的	**E.** I don't know this word

47. vertical				
A. 虚拟	**B.** 平行	**C.** 垂直	**D.** 现实	**E.** I don't know this word

48. note				
A. 盒子	**B.** 书	**C.** 笔记	**D.** 水泥	**E.** I don't know this word

49.evacuate				
A. 上升	**B.** 撤离	**C.** 评价	**D.** 进入	**E.** I don't know this word

50. flame				
A. 飞翔	**B.** 框架	**C.** 火焰	**D.** 燃烧	**E.** I don't know this word

51. quaks				
A. 夸克	**B.** 嘎嘎叫	**C.** 四方形	**D.** 品质	**E.** I don't know this word

52. crew				
A. 人员	**B.** 残忍	**C.** 队，组	**D.** 钻头	**E.** I don't know this word

53. severe				
A. 很多	**B.** 严重的	**C.** 轻柔的	**D.** 明亮的	**E.** I don't know this word

54. elevate				
A. 升起	**B.** 下降	**C.** 制造	**D.** 破坏	**E.** I don't know this word
55. initial				
A. 最后的	**B.** 最初的	**C.** 里面的	**D.** 严重的	**E.** I don't know this word
56. intact				
A. 完好无损	**B.** 破碎的	**C.** 攻击	**D.** 摄入	**E.** I don't know this word
57. exterior				
A. 内部	**B.** 外部	**C.** 上部	**D.** 下部	**E.** I don't know this word
58. column				
A. 纵列；圆柱	**B.** 横排	**C.** 楼房	**D.** 钢筋	**E.** I don't know this word
59. mutual				
A. 无声的	**B.** 金属	**C.** 中性的	**D.** 互相的	**E.** I don't know this word
60. photograph				
A. 视频	**B.** 照片	**C.** 风景	**D.** 画册	**E.** I don't know this word

Curriculum Vitae

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