Incidental Vocabulary Learning by EFL Students: The Effect of Marginal Glosses in Online L2 Reading

by

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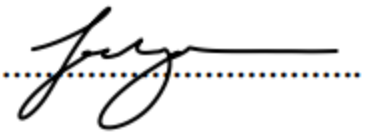

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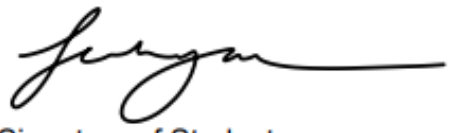

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Abstract

The aim of this study was to investigate the effect of L2 marginal glossing in online second language reading on the incidental vocabulary learning of EFL learners with a high-intermediate to advanced language level. Participants from a secondary school in Spain first read an article containing 10 unknown vocabulary words and completed a vocabulary comprehension pre-test asking multiple-choice questions about the meaning and use of these words in context. Then, participants were split into four groups three weeks later to read the same article containing the same 10 words and complete a vocabulary comprehension post-test. For the post-test, one group read the article with the addition of textual glossing, the second group with pictorial glossing, the third group with textual-pictorial glossing, and the fourth (control) group with no glossing. Repeated Measures ANOVA and post hoc test results found that there was no significant difference in vocabulary test scores between experimental groups, suggesting that glossing in general as well as the type of glossing used in reading does not seem to make a significant difference in performance on post-reading vocabulary comprehension tests. Descriptive statistics and Chi-square tests on Likert-scale questionnaire data found that readers indicated greater preference for textual-pictorial glosses over textual and pictorial ones. It was also found that readers, on average, prefer glossing in general over no glossing at all when reading in an L2.

Keywords: glossing, L2 glossing, second language reading, incidental vocabulary learning, English as a foreign language

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Chapter 1: Introduction

1.1. Background

In order to develop fluency in a second language (L2), learners must first have a knowledge and comprehension of vocabulary. Without vocabulary, there is no comprehension or communication in language (Schmitt, 2010). How do second language learners most effectively acquire the lexicon needed to support fluent communication? Recently, the topic of how learners acquire vocabulary in general both inside and outside the second language classroom has been one of increasing interest. Among many methods of vocabulary acquisition in today's technological world is reading online.

In a 2012 survey conducted by the Pew Research Center's Internet & American Life Project, middle and high school teachers reported that few students were very likely to utilize printed books for research; the majority reported that their students were very likely to consult online reading and research sources (Rainie & Zickhur, 2012). As the world has moved into an increasingly digital age, the world's reading behavior has followed the same trend. Nowadays, people spend more time reading electronically, exhibiting screen-based reading behaviors (Z. Liu, 2005). Research has shown that university students studying English as a foreign language (EFL) tend to read online for academic and informative purposes (Akarsu & Darıyemez, 2014). L2 learners may also be more motivated to read online rather than offline because it is more engaging, and it exposes them to more authentic language use (Seminega & Nginye, 2011). Overall, reading online seems to be the trend among rising generations of readers.

Reading online can be an effective way to learn vocabulary in both a first language (L1) and second language because it often involves a process called incidental vocabulary learning. In fact, in second language learning, incidental vocabulary learning occurs most commonly through

reading (Hulstijn, 2013). Incidental learning is the notion that learners can acquire language implicitly, or without intention of doing so. Although incidental vocabulary learning may have many definitions depending on context and research approach (Sok, 2014), it is defined for the purposes of the present study as acquiring knowledge of words as "a by-product of other cognitive exercises (e.g., reading/listening) involving comprehension" (Gass, 1999, p. 318). This implicit learning process occurs "without metalinguistic awareness" (Ellis, 2009, p. 7), meaning learners are not cognizant of the learning or acquisition process. The present study will examine incidental vocabulary learning through the use of glosses in online reading.

A gloss is a brief notation or summary of the meaning of an unknown or unfamiliar word in a larger text. It can appear in a reading as an interpretation, explanation, or representation. Glossing is "typically located in the side or bottom margins [and] … may help to limit continual dictionary consultation that may hinder and interrupt the L2 reading comprehension process" (Lomicka, 1998, p. 41). Ko (2005) cites four main advantages of glosses in second language reading, being the prevention of incorrect guessing, minimization of interruptions to the reading process, bridge between prior and new knowledge, and allowance for greater student autonomy. These advantages should lead to increased incidental vocabulary learning, which will be measured in this study through a vocabulary comprehension test taken immediately post reading.

1.2. Theoretical Background and Literature Review

The theoretical background will address the topics of second language reading, specifically in online formats; incidental vocabulary learning as a result of reading; reading glosses, including the types and benefits of use; as well as review relevant studies involving vocabulary acquisition by non-beginning English language learners. It is important to note that in this study, no distinction

is made between the terms “learning” and “acquisition,” as they are used interchangeably. Additional terminology is defined throughout the literature review.

1.2.1. Second Language Reading

Second language (L2) reading is a complex process that cannot be easily understood by any one theory or model. Leow (2018) observes that there has yet to be consensus over exactly how L2 learning occurs, specifically how L2 input is processed and subsequently internalized. However, this learning process can be examined through various lenses to better understand the role of the learner, the text, and the environment. The cognitive and sociocultural perspectives are two major lenses used to examine L2 reading. As Abdullah Kamal (2021) explains, “The cognitive process of reading focuses on bottom-up, top-down and interactive reading models and on schemata theory. The sociocultural process of reading is founded on social constructivist theory.”

The cognitive perspective focuses on any process involved in understanding the meaning of written speech. The bottom-up model refers to the process of creating meaning starting with parts or components and progressing towards the whole. In this approach, L2 reading begins with looking at a letter and identifying it, then matching the letter with its phonological representation, and so on, until an entire word, sentence, or paragraph is understood (F. Liu, 2010). Alternatively, the top-down model refers to a kind of reverse process from the bottom-up model. Meaning is encountered by the reader as a whole first, then it is decoded or broken down as necessary. This model is described as “a psycholinguistic guessing game [which] involves an interaction between thought and language” (Goodman, 1976, p. 127) since the reader uses knowledge outside the text, such as structure, pictures, or even prior knowledge (often referred to as schema), in order to create meaning.

The interactive reading model combines both bottom-up and top-down approaches to describe a "balanced literacy approach" that is most useful to second language readers (Shin & Crandall, 2018). The majority of advanced L2 readers employ a more interactive reading model in their own language learning, which can be more completely described as the compensatory model, "which claims that readers tend to employ all the resources in L1 and L2 to compensate for any deficiencies in L2 reading" (Bernhardt, 2010). This model underscores the importance of proficiency in the native language to aid proficient literacy in the second language. These interactive and compensatory models should guide the selection and creation of appropriate L2 reading texts and resources.

The sociocultural process of reading focuses on any process involving the reader and their social environment. This interaction between an individual and the surrounding social environment to construct knowledge is referred to as Social Constructivist theory (Vygotsky, 1978). An important aspect of social constructivism is the Zone of Proximal Development (ZPD), which represents what an individual can do with outside help, or scaffolding. In terms of L2 reading, scaffolding can take the form of support from people like friends or teachers, or interactive resources like dictionaries or the Internet. The ZPD is also defined as the space between what an individual can do alone and what they cannot do at all. While reading, second language learners should be pushed into this space in order to progress (Pritchard & Woollard, 2010). In the EFL classroom, this may look like using level-appropriate readings, encouraging social interaction while reading, or providing outside resources to aid in comprehension or vocabulary learning.

Other theoretical perspectives that relate to L2 reading are Krashen's (1985) Input Hypothesis and Cummins' (1984) Cognitive Academic Language Proficiency (CALP) theory. The Input Hypothesis suggests that language acquisition occurs when learners receive comprehensible

input. This input should be understandable and slightly above the learner's current level. In second language reading, Krashen (1985) defines this input as "i + 1," where "i" represents the learner's interlanguage, or existing level of knowledge and skills, and the "+ 1" represents the next level the learner will acquire. The reading that second language learners should encounter to learn effectively should not be too easy nor too difficult and should allow for the learner to experiment with language as well (Chew & Krashen, 2017).

Cummins' (1984) CALP theory also in part explains the role of L2 reading in developing proficiency. CALP refers to the higher-level language and language skills needed to be successful in an academic setting, usually acquired through reading textbooks and other academic-style texts (Caddy, 2015). CALP involves knowing subject-specific vocabulary, complex written grammar structures, as well as the "ability to compare, classify, synthesize, evaluate, and infer" (Ithindi, 2023, p. 60). Since academic language tasks are highly contextual, developing CALP relies heavily on context, especially when it comes to learning vocabulary. This explains why reading is such a beneficial and effective way to learn vocabulary, since written words embedded in context are easier to understand (Makoe, 2016) and written language provides accessible contextual support through visuals and textbook aids, such as glosses (Perera & Kularatne, 2014).

1.2.1.1. Reading Online

Since the rise of technology in the digital age, online L2 reading material has become more prevalent, and people are spending more time reading electronic documents (Z. Liu, 2005). In a study to explore the reading habits of university students studying English Language and Literature in Turkey, "questionnaire responses indicated that respondents enjoyed reading novels, textbooks, and online information often" (Akarsu & Darıyemez, 2014). With the increase in online reading as well as consistent research showing that technology can enhance L2 learning, it was found that

L2 learners prefer reading online when reading for research (Poole & Mokhtari, 2008), while they prefer reading printed material when reading for pleasure (Tseng, 2007).

Reading online is not an entirely different cognitive process than reading offline. In fact, "while L1 readers read much faster than L2 readers, their attention distribution and performance on reading comprehension test[s] are similar to L2 readers'" (Kang, 2014). However, reading online versus offline does pose some variance as well as unique advantages and challenges. Readers do not tend to read lengthy texts, and they tend to scan or skim online texts rather than read in detail due to increased eye strain from looking at a screen (Johnson, 2013; Tseng, 2008; Mercieca, 2004). This means readers also tend to pay less attention to detail when reading online versus offline. Conversely, in a study on online reading strategies of intermediate and upper-intermediate English as a Second Language (ESL) students, reading for detail seemed influenced by their reading style rather than the medium of the text (Gilbert, 2017). The same study showed that "multitasking was a common on-screen behavior that all participants engaged in."

In terms of challenges of reading online, Tseng's (2010) study with Taiwanese EFL university students revealed that students disliked reading from computer screens due to "eyestrain, inability to take notes or underline text, and skipping lines when reading hypertext on computer screens." These findings are consistent with Utimadini's (2021) study where the two most relevant issues for students were difficulty maintaining focus on the text and health issues related to reading online, most notably eye discomfort and mental fatigue. In addition, the non-linear nature of online reading poses "challenges associated with cognitive overload, disorientation, distraction, and frustration" (Coiro & Dobler, 2007, p. 220), which will be addressed later on in the literature review.

Still, in a digital age, the advantages of L2 learners reading online may outweigh the disadvantages. The largest benefit of reading online versus offline is the potential increase of comprehensible input, due to the sheer amount of authentic reading material online. The more comprehensible input is received by a language learner, the better the language learning environment is (Krashen, 1985). Additionally, learners' preference for reading online text for academic research suggests the advantages of accessibility, ease of navigation, and the use of hypertext and other online resources to aid in comprehension. Because of the presence of hypertext and other online resources, web and online texts have been defined as non-linear, non-hierarchical, and non-sequential in nature, providing those with differing learning and reading preferences alternate paths of reading success beyond the traditional offline, linear, hierarchical, sequential format (Al-Amrani, 2007).

1.2.2. Incidental Vocabulary Learning

Sok (2014) stresses the importance of clarifying the term "incidental" in studies of applied linguistics, therefore the present study adopts Gass' (1999) definition of incidental vocabulary learning as acquiring knowledge of words as "a by-product of other cognitive exercises (e.g. reading/listening) involving comprehension" (p. 318). Hulstijn (2013) expounds upon the definition of incidental learning as "the acquisition of a word or expression without the conscious intention to commit the element to memory, such as 'picking up' an unknown word from listening to someone or from reading a text" (p. 1). Because it is impossible to teach or learn all vocabulary intentionally or explicitly, it is assumed most L1 and L2 vocabulary is acquired incidentally.

However, it is not a learner's intention that determines successful vocabulary acquisition, rather, it is "first and foremost determined by the nature and frequency of the processing of new words" (Hulstijn, 2013, p. 4). In fact, on its own, incidental vocabulary learning through reading

(or, “input only” reading) is described as generally ineffective because it is slow, prone to error, and produces relatively small vocabulary gains (Nation, 2001) because readers do not always notice unknown words, know how to accurately guess their meanings, or are even motivated to learn their meanings depending on relevance or importance.

“Input only” reading can be enhanced by “input plus” reading, which involves having learners engage with unfamiliar vocabulary in order to increase the incidence of vocabulary acquisition (Peters et al., 2009). Examples of this engagement may include looking up the meaning of unfamiliar words, processing their form-meaning relationship, and processing this information again post reading. Without this “input plus,” incidental vocabulary learning, the percentage of vocabulary acquired is relatively low when compared with percentage gains of intentional vocabulary acquisition. With this and Gass’ (1999) assertion in mind that “there is no clear way to show that a word has been learned incidentally, if one means that specific attention is not drawn to that word either by some external force or by the learner,” it seems that additional enhancements to the reading itself or the reading process must be included in order for effective or significant incidental vocabulary learning to occur.

1.2.2.1. Lexical Knowledge

Since incidental vocabulary learning encompasses developing lexical knowledge, it is necessary to define what it means to know a word. Waring and Nation (2004) explain that learning a word involves two stages: first, associating the form-meaning relationship of a word (matching the spelling of a word with its meaning), and second, learning any additional, deeper knowledge needed to have full command of it. This deeper knowledge may include one or more aspects, including “a number of semantic features (its core meaning or meanings, its pragmatic and stylistic meanings, and the collocations in which it frequently occurs) and a number of formal features (its

grammatical word class, its morphophonological make up, its auditory and articulatory phonetic forms, and its orthographic shape)" (Hulstijn, 2013, p. 3). Nation (2001) simply describes vocabulary knowledge as including aspects of form, meaning, and use.

In order to measure lexical knowledge accurately, tests of lexical knowledge must include all aspects, which is often difficult or impossible without multimodality testing and access to adequate technological resources. The present study does not measure all aspects of lexical knowledge, rather, it aims to measure meaning recognition and syntactic use of target lexical items through the use of an offline, multiple-choice vocabulary comprehension test (see Appendices E and G).

1.2.2.2. Frequency of Exposure and Coverage Rate

Two of the most key factors that contribute to incidental vocabulary learning are frequency of exposure and lexical coverage rate. Frequency of exposure refers to the number of times in a text a lexical item is encountered by the reader, either in the same context or in different contexts. Coverage rate refers to the percentage of vocabulary in a text that is known to the reader or able to be recognized on sight.

In an eye-tracking study on the effect of frequency of exposure, it was found that "number of exposures was the strongest predictor of vocabulary learning (form and meaning)" (Godfroid et al., 2018). It is widely accepted that "incidental vocabulary acquisition depends on multiple exposures to a word in different contexts. There is no agreement, however, as to how many and what kinds of exposures are needed" (Huckin & Coady, 1999, p. 185). After a review of some of the most prominent studies on lexical frequency, Pellicer-Sánchez (2016) concluded, "for reliable learning of several lexical aspects, words need to be met around eight to 10 times." The present study does not explore the effect of repetition or frequency of lexical items, as the items were only

encountered twice (once during the pre-test and once during the post-test) in one short text. Although this study does not utilize frequency of exposure, it does make use of multimodal glosses, which enhances incidental vocabulary learning through reading in informative contexts (Restrepo Ramos, 2015). This will be discussed further in the following section on reading glosses.

Lexical coverage of a text often relies on learners' sight-recognition knowledge. Nation and Kyongho (1995) claimed that when learners can recognize 2,000 of the most frequent word families of English on sight, they can usually recognize and use about 84% of the words in a wide range of texts. Although there is still ongoing research concerning coverage rate, it is generally agreed thus far that learners need to know approximately 95-98% of words in a given text in order to successfully infer the meaning of any unknown words (Hu Hsueh-chao & Nation, 2000; Laufer, 1996). The present study utilizes a text with a 98.75% lexical coverage rate (790 out of 800 words are known, while 10 are unknown), fitting well within this optimal threshold.

1.2.2.3. Other Factors Affecting Incidental Vocabulary Learning

In addition to frequency of exposure and lexical coverage rate, there are other factors that affect incidental vocabulary learning in an L2, including the type of reading text, learner motivation, and target word salience.

Regarding the effect of the type of reading text, several studies show that reading that is personally interesting to learners stimulates incidental vocabulary acquisition (e.g., Parry, 1996; Grabe & Stoller). The more invested or engaged a learner is in the input, the more they will gain from it; therefore, reading texts should be tailored to a group or individual for effective vocabulary gain. Furthermore, the contextual quality of a text also seems to influence vocabulary acquisition. In a study investigating the effect of context on recall and recognition of meaning and form of unknown words, Webb (2008) found that quality of context has more of an influence on vocabulary

acquisition meaning, while the frequency of exposure more heavily influences vocabulary acquisition of form. In other words, if the context surrounding a word is informative, the meaning of that word may be learned faster than if the word is encountered in a context that is less informative. Moreover, since it is generally accepted that increased frequency of exposure promotes incidental vocabulary learning, most studies utilize longer, more extensive reading passages rather than shorter, more intensive texts, which aspect will be reviewed in a later section.

Individual learner motivation can also affect vocabulary acquisition. Motivational factors can be related to a number of learning aspects, including personal interest in a reading text or target language item, affective learning filters, previous experiences, perceptions of past performance, personal language goals, and even methods of assessment. In a study on motivational factors and incidental vocabulary learning, Papi (2018) found that participants in a gain condition (a potential for personal reward) generally performed better than those in a loss condition (a potential for personal forfeiture). Similarly, Rafiee and Ketabi (2012) discovered that "learners involved in incidental vocabulary learning were instrumentally motivated." When learning a second language, it seems as though learners are motivated by gain and that increased motivation leads to increased vocabulary learning.

In addition to the type of reading text and learners' motivation, target word salience also has an effect on incidental vocabulary learning. When a word is salient in a text, it is particularly prominent or noticeable by the reader. Even though the term "incidental" infers unconscious learning, Schmidt (1992) asserts that there needs to be at least some degree of conscious attention given for incidental learning to take place. This necessary degree of attention and awareness (or noticing) was first outlined in Schmidt's (1990) as the Noticing Hypothesis. The Noticing Hypothesis has been further supported in subsequent studies, where more awareness of target items

resulted in higher acquisition levels, and learners spend more time processing unfamiliar words than familiar ones (Godfroid et al., 2013; Pellicer-Sánchez, 2016; Mohamed, 2018).

In order to make unknown words more salient so learners notice them, these words are often enhanced in some way, which is called the Theory of Input Enhancement (Smith, 1991). Input enhancement is the notion that L2 input (in this study, unknown vocabulary embedded in a reading passage) can be enhanced in some way to help the learner acquire language features from the input more effectively and efficiently (Smith, 1993). The most common input enhancement techniques for learning vocabulary through reading are lexical elaboration (providing definitions for unknown words), repetition of words or phrases, and typographical enhancements such as underlining, boldface, or color-coding. Studies investigating the effect of input enhancement on incidental vocabulary acquisition have been largely inconclusive, some finding significant benefits to reading enhanced text (e.g. Duan, 2018), while others finding no significant benefits (e.g., Leow, 2001; Petchko, 2011). In studies involving lexical elaboration and typographical enhancement, results have varied as to whether or not these techniques are beneficial in L2 reading (e.g., Kim, 2006; Sohbati et al., 2021).

1.2.3. Reading Glosses

In line with the theory of input enhancement, glossing is a form of textual input modification or lexical elaboration aimed at aiding L2 learners in acquiring vocabulary from reading. As defined previously, a gloss is a brief notation or summary of the meaning of an unknown or unfamiliar word in a larger text. It can appear in a reading as an interpretation, explanation, or representation. Glossing is "typically located in the side or bottom margins [and] … may help to limit continual dictionary consultation that may hinder and interrupt the L2 reading comprehension process" (Lomicka, 1998, p. 41). To fully understand the scope of glossing used in this study, several types

of glosses, the benefits of using glosses, and relevant educational and second language theories will be discussed in the following sections.

1.2.3.1. Types of Glosses

Reading glosses come in various forms based on their location, language, and mode. Concerning location, glosses can be found before the reading itself (pre-text), after the reading itself (post-text), within the reading or between lines of reading (in-text/interlinear), or to either side of the reading in the margins (sidebar/marginal). Since marginal glosses appear to be the least intrusive to the linear reading process, and margins are familiar and highly utilized in computerized reading, marginal glosses were chosen as the location of glossing in the present study. This decision is further supported by Zarei and Hasani's (2011) study which found no significant difference in vocabulary learning between L2 pre-text, post-text, interlinear, and marginal glosses.

Glosses can also be written in the L1 or L2 or in both simultaneously as a translation. Within L2 reading, L1 glosses tend to stand out more, increasing the amount of awareness given to the unknown words that are glossed. L1 gloss conditions have been found to promote incidental vocabulary acquisition more than no-gloss conditions (e.g., Ouyang et al., 2020). Among lower-proficiency language learners, L1 glosses are typically favored over L2 glosses (Vela, 2015; Ertürk, 2016), while higher-proficiency learners tend to favor L2 glosses over L1 glosses (Miyasako, 2002; Ko, 2005; Ko, 2012). While some have concluded that L1 glossing is more effective in stimulating incidental vocabulary learning, others that L2 glossing is more effective, and still others that both are just as effective (Yoshii, 2006; Vela, 2015), it is generally accepted that either gloss language is more beneficial than no glossing at all. This may be in part because any kind of glossing elicits more attention or awareness from learners than none at all.

In terms of mode, glosses are often categorized by the different types of media involved, including textual, pictorial (visual), and aural (auditory) glosses, with varying multimedia combinations. Textual glosses appear as definitions or explanations of unknown words which only make use of words and text; pictorial glosses appear as visual representations of unknown words utilizing still pictures; textual-pictorial glosses are the combination of textual and pictorial glosses, and so on.

The effectiveness of these modes in L2 vocabulary learning have been under increasing recent investigation by researchers. Chun and Plass (1996) found that learners' recall for words annotated visually (textual-pictorial or textual-audiovisual) was higher than for words annotated with text alone. In a study with EFL students in Turkey, the multimodal glosses including text and another mode produced better vocabulary acquisition and reading comprehension than just textual glosses (Akbulut, 2007). Similar findings were reported in Asllani and Paçarizi (2021) where "L2 definition + image is more effective in enhancing L2 incidental vocabulary learning compared to non-multimedia reading environment and L2 definition + audio." This may be due to the fact that the use of multimedia, as opposed to a single medium, increases a learners' involvement load, which will be discussed in the following section. On the contrary, some studies have shown single glosses to be more effective than multiple/multimodal types (e.g., Yoshii, 2013), and others have indicated no significant difference in vocabulary acquisition between different glossing modes (e.g., Yanagisawa et al., 2020), so results have yet to be wholly conclusive.

1.2.3.2. Benefits of Using Glosses

Ko (2005) asserts that "the two most important reasons to use glosses are to assist reading comprehension and aid vocabulary learning" (p. 126). In effect, vocabulary glossing, as opposed to other types of vocabulary teaching and representation (not glossing), enhances interlanguage

development (Sahebkheir, 2019). There are four main advantages of glosses in second language reading: the prevention of incorrect guessing, minimization of interruptions to the reading process, bridging between prior and new knowledge, and allowance for greater student autonomy (Ko, 2005).

First, using glosses prevents L2 learners from incorrectly guessing the meanings of unknown words. It can be difficult or even impossible for readers to correctly guess meaning purely from context. Readers may not possess the adequate language or language skills needed to accurately infer meaning from context and therefore may not try to infer at all or may infer incorrectly, ultimately damaging the development of a fruitful mental lexicon (e.g., Bensoussan & Laufer, 1984; Hulstijn, 1992; Nation, 2001). Glossing can prevent these negative effects by either explicitly providing the meanings of words through meaning-given glosses, such as textual glosses, and/or providing a degree of aid in the guessing process through meaning-inferred glosses, such as pictorial glosses. Even dictionaries may hinder vocabulary learning, as locating the correct definition in a dictionary may be challenging enough to lead to misinformation (e.g., Luppescu & Day, 1993)

Second, glosses minimize interruptions to the reading process. Without glosses, it may be necessary for L2 readers to stop reading and look up low-frequency unknown words (Nation, 1990; Nation, 2001). In actuality, this amount of effort needed to learn new words may discourage or stop learners from reading any text that contains unfamiliar words. Glossing, especially marginal glossing, makes this research accessible, easy, and quick, as readers do not need to shift their attention far from the text itself in order to learn unknown words.

Third, glosses act as a bridge between prior and new knowledge, which supports the educational theory of constructivism. Constructivism claims that learners build on previous

experience and background to construct new knowledge (von Glasersfeld, 1974; Vygotsky, 1978). While reading, learners connect what they are reading with previous personal experiences as well as experiences with the language encountered in the text. Glosses provide information beyond context, allowing readers supplementary points of contact from which to construct new knowledge (in this case, new lexicon).

Fourth and lastly, using glosses while reading allows for greater student autonomy. When learners are able to access and utilize learning resources on their own, empowering them as they learn within the Zone of Proximal Development. Not all learners are the same, which means not all learners need the same help or know the same words. Reading glosses allow individual learners to just look up the words they have issues understanding (Nation, 1990; Jacobs, 1994). Because glossing permits learners to make use of only what is personally pertinent, more effort and involvement can be spent learning what is most beneficial to them individually, which increases the effectiveness of what is learnt, according to Laufer and Hulstijn's (2001) Involvement Load Hypothesis.

Involvement load "consists of one motivation aspect, need, which represents the importance of knowing a word to the learner, and two cognitive, information processing aspects, search and evaluation. Search is the learner's attempt to find the meaning of the unknown word, while evaluation is the comparison of that word or meaning with other words and meanings to assess whether it fits in a specific context. The hypothesis is that incidental vocabulary learning tasks that include these variables to a high degree require more depth of processing from learners and, subsequently, result in more learning" (Thomas, 2020, p. 51). Numerous studies show that students who increase their cognitive involvement load in vocabulary learning tasks perform better on vocabulary tests (e.g., Luppescu & Day, 1993; Al-Shehri & Gitsaki, 2010).

1.2.4. Other Relevant Studies

On top of the preceding review of literature and relevant theory, it is important to note several factors affecting the measurement of incidental vocabulary learning in an L2, as well as review other empirical studies with similar methodologies and research questions as the present study with the purpose of identifying strengths of and later identifying gaps in the research that require further investigation.

A number of major factors affecting the measurement of L2 incidental vocabulary learning include, but are not limited to, the inconclusiveness surrounding the inner workings of incidental learning, the types of testing used, and the use of artificial lexicon in research. Although there exist many theories and hypotheses concerning the cognitive processes involved in incidental vocabulary learning, there has yet to be a real consensus as to what actually takes place in a learner's mind as they incidentally learn L2 vocabulary. Without knowing the intricacies of this process, testing for vocabulary acquisition only remains a feeble attempt to measure real learning.

The types of testing used in vocabulary acquisition research is arguably the biggest factor affecting the measurement of incidental vocabulary learning because tests are often thought of as synonymous to measurement. Lomicka (1998) mentions varying types of measures/tests as one of the reasons many vocabulary studies yield inconsistent findings. Waring and Nation (2004) point out, "It is clearly very difficult to ascertain the level of knowledge of all aspects of word knowledge and so typically vocabulary gains from reading are assessed by form-meaning type tests such as multiple-choice or translation tests that assess only the first level of word knowledge" (p. 15). Furthermore, without careful consideration of type and timing of testing, some researchers claim that recall or post-reading tests may measure memory or short-term recall rather than actual learning (e.g., Myers, 1990). One solution to this problem is to use several types of testing, which

more likely presents “a fuller picture of learning” (Waring & Nation, 2004, p. 16). However, using multiple measures may not always be possible depending on the sample and available resources.

In an attempt to create this “fuller picture of learning,” it is a popular practice for researchers to incorporate artificial lexicon in their reading studies, but this also presents some problems. Including artificial lexicon, or pseudo/non-words, either exclusively or among real/authentic words, theoretically increases the validity of vocabulary learning results by avoiding the possibility that readers construct knowledge of the target words based on previous exposure or knowledge of morphemes. In other words, if a reader encounters an artificial word, knowledge constructed about it would represent “real” learning. However, in an authentic reading environment, authentic words are the most common words encountered, and it is debatably part of the learning process for readers to use previous language knowledge of authentic language. In summation, Leow (2018) asserts that using artificial lexicon in reading studies does not reflect the processing of natural languages.

In an eye-tracking study using pseudo words with advanced second language learners, Mohamed (2018) investigated how frequency of exposure and amount of attention given to unknown versus known vocabulary words affect incidental vocabulary learning online. Results show that learners spend more time reading unknown words, and repeated exposure helps learners recognize word form but not necessarily recognize or recall word meaning. What’s more, the more attention learners give to unknown words, the better their learning of those words, even beyond the effects of repeated exposure. On account of these results, the present study does not focus on frequency of exposure and instead focuses on increasing readers’ attention to unknown words. Findings from Mohamed’s (2018) study are particularly salient because it centered around word learning in online reading.

Glosses have shown to greatly increase learners' attention towards unknown words in L2 reading. In an eye-tracking study conducted with Chinese university-level EFL learners (Ouyang et al., 2020), the influence of glossing on vocabulary test scores was examined. This study concluded that glossing, rather than no glossing, as well as greater given attention to vocabulary words, correlated to higher vocabulary test scores. However, this study investigated L1 glosses rather than L2 glosses, so these results cannot be readily applied to L2 reading. In Ko's (2012) study using Korean university students, results revealed that on immediate and delayed vocabulary tests, L2 glossed reading groups outperformed the no-gloss reading group, but in the delayed test there was not any significant difference between two groups. Due to these results, the present study includes only immediate vocabulary tests and excludes the use of delayed tests.

It is clear that studies involving advanced EFL learners indicate reading glosses are effective for vocabulary learning, therefore, the investigation of which types of glosses are most effective has been of recent academic and pedagogical interest. In a study involving high-proficiency language learners in Taiwan, Lin and Huang (2008) found that bold-faced glosses fostered attention to unknown words and that both meaning-inferred and meaning-given glosses stimulate incidental vocabulary learning, although meaning-inferred glosses are more effective for vocabulary learning and retention. Like Ouyang et al. (2020), however, only L1 glossing was explored in this study, thus it is evident that further investigation is needed in regards to the effectiveness of L2 glossing in learning vocabulary.

Concerning the mode type of glossing, Sakar and Ercetin (2005) found that "learners preferred visual annotations significantly more than textual and audio annotations," and Warren et al. (2018) found that picture-only glosses best promoted retention of word meaning. This eye-tracking study essentially exposed each participant to each gloss type in a single reading passage,

with the same pseudo words repeated three times, each time in a different gloss type (textual, pictorial, and textual-pictorial). Even though this experimental design has its advantages, frequency of exposure and the influence of which gloss type appears first in the reading passage likely interfered with the validity of the results, so the participants in the present study are grouped by separate gloss type instead. Although some researchers have found pictorial glosses to be most effective, others have further concluded that textual-pictorial glosses best support incidental vocabulary learning compared to other gloss types (Yoshii & Flaitz, 2002; Shahrokni, 2009; Moradan & Vafaei, 2016).

Besides the gloss type, the type of reading plays a role in how readers learn the embedded vocabulary. Since it is generally accepted that increased frequency of exposure promotes incidental vocabulary learning, most studies utilize longer, more extensive reading passages rather than shorter, more intensive texts. However, it is of use to investigate incidental vocabulary learning with intensive texts containing 800-1,000 words or less. In a study with advanced Japanese EFL students, Day et al. (1991) found that vocabulary acquired from intensive reading in the classroom was learned at least in the short-term. However, this study only looked into reading for entertainment, so this gap informed the decision to look into reading for information in the present study. In a more recent study involving an intensive, online text of 543 words and vocabulary glossing, results indicated that university-level L2 students "all multimedia gloss groups noticed and recognized significantly more of the target words than the control group" although the glosses were exclusively in the L1 (Yanguas, 2009).

Finally, despite the number of studies concerning the effectiveness of glossing, there remains qualitative data collected concerning readers' preferences and attitudes about glossing. In Sakar and Ercetin's (2005) study, adult intermediate students "had positive attitudes towards

annotations," and Ko's (2012) survey results "revealed participants preferred [L2] glosses in their L2 reading materials." These findings suggest overall positivity regarding glosses in L2 reading, but more evidence needs to be collected, especially in the digital age of increased online reading.

1.3. Aims of the Study

As ample studies have shown, reading is an effective method for learning L2 vocabulary. Even in the transition to the digital age, online reading remains a prominent way for second language readers to learn new vocabulary. Even though studies on computerized L2 reading texts have been carried out since the 1990s, specific research involving glosses still calls for the collection of more data as the use of technology in language learning grows. As for research in the effects of glossing, many studies solely examine L1 glossing or compare L1 to L2 glossing. Because of the rise of English being learned in a second language as English becomes the new lingua franca, English L2 glossing demands more attention in the research field. Additionally, more data needs to be collected concerning the L2 glossing preferences of EFL students. Still, a great deal of research employs artificial lexicon, which introduces major empirical drawbacks. Furthermore, the field of L2 research can benefit from more studies involving intensive reading rather than extensive reading, as shorter reading passages reduce participant reading fatigue and enable a better control of experimental variables, among other advantages.

The aim of the present study is to investigate the effect of glossing in online second language reading on the incidental vocabulary learning of learners with an advanced English level. The study aims to discover whether second language readers benefit from using glossing in online reading, specifically whether this helps readers perform better on post-reading vocabulary comprehension tests, and which type of glossing is the most beneficial to readers. In addition, the

study aims to observe which gloss type readers prefer using to learn vocabulary when reading in a second language. These aims ultimately endeavor to improve L2 learning, particularly the L2 reading and vocabulary learning experience, from a pedagogical standpoint.

1.4. Research Questions and Hypotheses

Based on the theoretical background and review of relevant literature, the research questions guiding this study are as follows:

RQ1: Do L2 glosses in online reading help learners perform better than no gloss in post-reading vocabulary comprehension tests?

RQ2: Which gloss type (textual, pictorial, or textual-pictorial) helps learners perform better in post-reading vocabulary comprehension tests?

RQ3: Which gloss type (textual, pictorial, or textual-pictorial) do learners prefer in online L2 reading?

The conjectured hypotheses are as follows:

H*o* 1 = There is no significant difference in learner comprehension of unknown L2 vocabulary when textual, pictorial, or textual-pictorial glossing is used in L2 online reading.

Hα 1 = There is a significant difference in learner comprehension of unknown L2 vocabulary when textual, pictorial, or textual-pictorial glossing is used in L2 online reading.

H*o* 2 = Glosses do not help learners perform better in post-reading vocabulary comprehension tests.

Hα 2 = Textual-pictorial glosses help learners perform better in post-reading vocabulary comprehension tests.

H*o* 3 = Learners do not prefer glossing in online L2 reading.

Hα 3 = Learners prefer textual glossing in online L2 reading.

Chapter 2: Method

2.1. Research Design

The present study follows an experimental design with a pre-test and a post-test. 36 high school students from two combined classes of 40 students participated in the study and included those whose consent forms were filled in and returned to the researcher. The participants were not selected on the basis of any predefined criteria, so the sample can be considered somewhat randomized. The study involves the statistical analysis of quantitative data.

This study was conducted in accordance with the research practices of the European Union and was approved by the Universitat Rovira i Virgili (URV) ethics board, the Ethics Committee for Research in People, Society and the Environment (CEIPSA). The study was attributed the following reference: CEIPSA-2024-TFM-0024 (see Appendix A).

2.2. Sample

This study was conducted in an EFL setting at a semi-private Catalonian high school, Carmelites Collegi Mare de Deu del Carme, in Tarragona, Spain. The sample consisted of 36 total participants, all of whom were students in their last year of secondary schooling (2nd of Baccalaureate) before going on to study at university. It is relevant to note that these last two years of secondary education are not compulsory in Spain, so it was the students' and/or their parents' decision to enroll them, therefore the sample may represent a more motivated group of second language learners. Participants were between the ages of 17 and 18, with 13 being 18 years old and 23 being 17 years old. The students made up two English classes taught by the same teacher, and the experiment was conducted during the third and fourth quarters of the academic year. Additionally, because this

study involved reading text on a computer screen, all participants had normal or corrected-to-normal vision.

Regarding the participants' linguistic background, all were native Spanish and/or Catalan speakers, with most being raised bilingual. 15 reported both Spanish and Catalan as their L1, 10 with Spanish, and 11 with Catalan. The group had approximately a B2 Common European Framework of Reference for Languages (CEFR) English level, working to achieve a C1 level. Since the participants only have three 50-minute English classes per week as part of their curriculum and learn in an EFL setting rather than an ESL setting, their use of English is still limited. Their English level was not formally tested by the researcher prior to this study, as the school they were attending regularly assesses language level and places the students in classes accordingly. Participants were asked to self-report their English level as part of the pre-test questionnaire. Three reported themselves to be at a B1+ level, 15 at a B2 level, three at a C1 level, one at a C2 level, and 14 reported "Not sure." Most participants had been studying English for at least 10 years at the time of the study, with most having studied it for more than 12 years. One participant reported to have studied English for less than four years, one for four to six years, three for seven to nine years, seven for 10-12 years, and 23 for more than 12 years. Table 1 shows all participants' background information (see Appendix B).

2.2.1. Ethical Considerations

Because this study utilized some participants who were minors (students under the age of 18) their participation was authorized by their legal representatives, namely their parents or guardians. Legal representatives were provided the Participant Information Sheet (see Appendix C) as well as the Informed Consent Form (see Appendix D). Participants over the age of 18 were permitted

to sign for themselves on the Informed Consent Form. These forms were provided to the participants and their parents/guardians in Catalan to avoid any miscommunication.

This study posed minor potential risks to the participant, which they were informed of via the Participant Information Sheet. Participants may miss one or two short periods of instruction in their regular English class if they are not present during the class period in which the class participates in this study. For example, they may not be able to participate in a speaking activity or a grammar review with the rest of the class during the time they are asked to spend 20 minutes completing the pre-test or post-test. Failing this, the study posed no risk to the participant.

2.3. Materials

Participants were given a pre-test and post-test to measure the differences between reading with and without glosses. The pre-test consisted of an online questionnaire (see Appendix E), an online reading passage containing no glosses (see Appendix F), and a multiple-choice vocabulary comprehension test (see Appendix E). The post-test consisted of an online questionnaire (see Appendix G), an online reading passage containing one of the three gloss types (see Appendix F), and a multiple-choice vocabulary comprehension test (see Appendix G). After completing the post-test, participants were given a post-questionnaire to measure their preferences and opinions regarding second language reading, glossing, and the overall experiment (see Appendix I).

Prior to the study, the researcher consulted with the participants' English teacher to determine an appropriate data collection procedure and select an appropriate reading text to be used in the study. To ensure the students had no formal previous study or explanation of the target vocabulary, a reading text was selected from their class workbook, *Gateway C1 Workbook*. This workbook was not ever used in class for reading practice or vocabulary exercises, and the teacher

confirmed that the students had never encountered the selected text before. In order to control as many variables as possible, the same reading passage, "The Power of the Doodle" (Holley, 2017), was used in the pre- and post-test. The post-test was administered three weeks after the pre-test, and the participants were not informed they would read the same passage for the post-test in order to reduce the chance of test scores being influenced by inadvertent memorization or recognition of the reading passage.

The links to each phase of the experiment, including the pre-test, post-test, and post-questionnaire were distributed by the participants' teacher using their class Microsoft Teams (MS Teams) page. Each participant used their personal computer to access these links and read the passage. This allowed participants to use the device they would normally use to read online L2 texts, utilizing their preferred screen size, page zoom, and screen brightness.

The target lexical items in the reading passage consisted of seven target words identified by *Gateway C1 Workbook* and three more identified by the researcher. These items, along with their glossing details, are outlined in Appendix H.

2.4. Procedure

In this section, the experimental procedure is outlined chronologically, starting with pilot testing, administration of the pre-test, post-test, and post-questionnaire, and ending with the data collection method.

2.4.1. Pilot Testing

Prior to conducting the study with the participants, drafts of the pre-test, post-test, and post-questionnaire were distributed for pilot testing to six URV master's students for the purpose of revising and editing all materials for the study for clarity and effectiveness. Pilot testers also

completed the vocabulary comprehension test to ensure the questions were clear and answers were consistent.

2.4.2. Pre-test

The pre-test was given using MS Forms and included a link to the reading passage and questions to collect participant background information such as age, native language, CEFR language level, and the number of years spent studying English. This information was used to give insight into the participants' background. The reading passage was displayed using a shared Google Doc accessed by a link embedded in the MS Forms pre-test.

The 800-word reading passage for the pre-test was adapted from the article "The Power of the Doodle" (Holley, 2017) from *Gateway C1 Workbook*. The original article identified seven target vocabulary words, and three more were identified and added to the list of target words assessed in this experiment. In order to emulate an online article, the text of the article was formatted to be displayed in Arial 12-point font with a pageless layout, enabling participants to "scroll" to read just as they would in an online format.

To minimize cheating or access to online materials, the vocabulary comprehension test was distributed and completed offline after participants finished reading and had put away their computers. This test was composed of 20 multiple-choice questions about the meaning and use of the 10 unknown words that appeared in the reading. The vocabulary comprehension test aimed to measure incidental vocabulary learning through knowledge of the contextual denotation and applied grammatical use of the target words. Each target word was tested through two questions: the first question asked readers to choose the correct meaning of the target word as used in the article, while the second question asked readers to choose the sentence which correctly used the target word. Each question provided the target word's part of speech to aid in answering the

questions and remain consistent with the glossing which appeared in three of the later post-test readings.

2.4.3. Post-test

The post-test was given using one of four MS Forms which included a link to the reading passage corresponding to the respective experimental group (i.e. participants in the textual gloss group received the "Post-test 2" MS Form with the link to the reading passage glossed using textual glosses, etc.). The participants' teacher distributed the links to each post-test by dividing the students into groups on MS Teams and sending the links in a message to each corresponding group. This way, students in the textual gloss experimental group did not have access to other groups' post-tests or reading passages. The same vocabulary comprehension test was given offline as in the pre-test, with the order of the questions and answer choices randomized to prevent any inadvertent memorization or recognition of the order of the questions, as well as to prevent cheating from pre-test to post-test.

The reading passages for the post-test were developed by simply adding marginal glossing to the pre-test reading passage. To eliminate the need for scrolling to find the corresponding gloss for each unknown word in the text, the reading passage was formatted in a two-column table, with the article text in the left column and the glosses in the right column, taking care that each gloss lined up with the corresponding target vocabulary word. The table borders were transparent so as not to distract from the reading itself.

2.4.4. Post-questionnaire

The post-questionnaire was given via MS Forms and was distributed by the participants' teacher on their class MS Teams page. The questionnaire was designed to assess participants' glossing preferences and their perceptions of the study. Because the participants were only exposed to the

gloss type in their post-test reading passage (and the participants in the control group were not exposed to any gloss type), brief explanations of glosses and each gloss type were provided, and participants were asked to read these descriptions before answering the questions in the form.

The questions were formatted as statements with 5-point Likert-scale of agreement answer options (1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree or Disagree, 4 = Agree, and 5 = Strongly Agree). Four questions asked whether participants preferred the use of reading glosses at all, four questions asked about the preference of textual glosses, four questions asked about the preference of pictorial glosses, and four questions asked about the preference of textual-pictorial glosses, totaling 16 questions about glossing preferences. Four questions were asked about the same topic but worded slightly differently to ensure participants understood the statements and answered them congruously.

The post-questionnaire also contained questions regarding participants' perceptions of the study. This section of the questionnaire was included to gather data intended to improve this study for future research and gather feedback for how to replicate this study with improvements in the future. Eight statements with 5-point Likert-scale of agreement answer options were provided, concerning the article, their overall experience participating in the study, the vocabulary comprehension test, and the likelihood they would use reading glosses in the future. One short answer question gave participants the opportunity to express any opinions, comments, or suggestions as well as ask any questions about the study.

2.4.5. Data Collection

Participation in this study was elicited by announcing the general aims and premise of the study in two classes of 2nd Baccalaureate students. Participation was encouraged by their teacher as it gave students additional reading practice in preparation for their state exams. A digital version of the

Participant Information Sheet (see Appendix B) and a paper version of the Informed Consent Form (see Appendix C) were distributed to students and their parents/guardians. Both documents were provided to participants in Catalan rather than English to ensure participants were fully informed and there were no communication errors or misunderstandings.

The pre-test was administered using MS Forms and included background questions and a link to the reading passage. Participants accessed the pre-test and read the article during a 20-minute period in their regular English class. After answering the questions and reading the article, participants were instructed to put away their computers to complete the vocabulary comprehension test. This test was then distributed on paper, and participants were given as much time as they needed to complete it. Participants were previously told they would answer questions about the reading, but the topic of the questions was not specified. The paper tests were collected by the researcher and then given a percentage score according to correct answers. Since the vocabulary comprehension test contained 20 questions, the score was calculated by dividing the number of correct answers by 20.

The post-test was administered three weeks after completing the pre-test. It was also given via MS Forms and was formatted exactly like the pre-test, excluding the background information questions in the questionnaire portion. Depending on which experimental group the participants were a part of, the link to the reading passage differed. An online randomizer was used to determine which group the participants were put in (textual gloss group, pictorial gloss group, textual-pictorial gloss group, or no gloss group). The completion of the post-test followed the same procedure as the pre-test. Students who were not in attendance during either class period the pre-tests or post-tests were completed took the tests individually during following class periods.

Participants were then given a post-questionnaire, asking about their gloss preferences while reading as well as their perceptions of the study. This questionnaire was distributed via MS Forms and was given immediately following the vocabulary comprehension post-test. Within this questionnaire, brief but clear descriptions of the three gloss types were provided, and participants were asked to answer 16 Likert-scale questions regarding which gloss type they prefer or would prefer in their own L2 reading and vocabulary learning. They were also asked to answer eight Likert-scale questions and one short-answer question about their overall experience participating in the study and their perceptions of it.

Once the pre-test, post-test, and post-questionnaire were completed, the data was compiled and coded into a Microsoft Excel sheet, and the paper vocabulary comprehension tests were then destroyed so as not to tie any background information, test scores, or questionnaire answers to any specific participant.

2.5. Statistical Analysis

Once the data was compiled and appropriately coded, data analysis was conducted using the statistical software JASP (version 0.18.1.0).

Because each experimental group only contained nine participants (N = 9), the small sample size does not allow for strong statistical power in running statistical tests. In other words, it would take rather large differences to get p-values smaller than 0.05. Therefore, large p-values may suggest that there is no effect, but this may also be simply that there is not enough data to reliably spot the effect. Bearing this in mind, the following statistical tests were chosen to analyze the data from this study.

To analyze the pre- and post-test scores, a Shapiro-Wilk Normality Test was done to determine the distribution. Because the test scores were normally distributed and considered paired data, a Repeated Measures ANOVA and accompanying Holm's Post Hoc test were performed to determine significant differences between the pre- and post-test scores and compare the scores across experimental groups.

To analyze the Likert-scale responses about glossing preferences and participants' perceptions of the study for all participants (N = 36), descriptive statistics were done to determine mean, standard deviation, and mode. To extrapolate the data, a non-parametric Chi-square test, the Chi-square Goodness of Fit Test, was run to count the frequency of Likert responses and determine if they were based on chance or not.

Chapter 3: Results

3.1. Vocabulary Comprehension Test

In this section, the pre- and post-test scores are reported, separated by experimental group, and the results from a Shapiro-Wilk Test of Normality are presented. Then, the results from a Repeated Measures ANOVA and subsequent post hoc analyses are reported, as well as descriptive statistics.

3.1.1. Pre- and Post-test Scores

The pre-test and post-test scores from the vocabulary comprehension test, along with the difference in scores, for each experimental group are summarized in Tables 1, 2, 3, and 4 below. It is important to note that the scores for the tests are percentage scores calculated by dividing the number of correct answers by the number of total questions (20). Negative numbers in the difference in scores columns indicate a decrease in score from pre-test to post-test, while positive numbers indicate an increase or improvement in score from pre-test to post-test.

The vocabulary comprehension pre- and post-test scores for the No Gloss (or Control) Group are summarized below in Table 1.

Table 1

Percentage Test Scores for No Gloss Group (Control)

Participant	Pre-test	Post-test	Difference in Scores
5	65	40	-25
11	45	40	-5
15	70	60	-10
16	80	85	5
17	30	30	0
20	45	20	-25
22	30	75	45
29	50	65	15
32	40	15	-25

The vocabulary comprehension pre- and post-test scores for the Textual Gloss Group are summarized below in Table 2.

Table 2

Percentage Test Scores for Textual Gloss Group

Participant	Pre-test	Post-test	Difference in Scores
1	45	70	25
2	60	80	20
8	65	45	-20
12	35	60	25
18	50	45	-5
23	60	100	40
26	60	85	25
30	85	90	5
33	55	85	30

The vocabulary comprehension pre- and post-test scores for the Pictorial Gloss Group are summarized below in Table 3.

Table 3

Percentage Test Scores for Pictorial Gloss Group

Participant	Pre-test	Post-test	Difference in Scores
3	25	30	5
6	50	45	-5
9	60	50	-10
13	35	50	15
19	30	85	55
24	65	75	10
27	70	80	10
31	65	75	10
35	60	65	5

The vocabulary comprehension pre- and post-test scores for the Textual-pictorial Gloss Group are summarized below in Table 4.

Table 4

Percentage Test Scores for Textual-pictorial Group

Participant	Pre-test	Post-test	Difference in Scores
4	45	65	20
7	55	90	35
10	45	40	-5
14	30	40	10
21	70	80	10
25	70	100	30
28	30	45	15
34	65	95	30
36	70	95	25

Once the groups were separated in a data file, the pre-tests of the four groups were compared using the Shapiro-Wilk test (see Table 5). Since the p-values of all four groups are greater than 0.05, this indicates that the data is not skewed and is normally distributed. Therefore, a parametric test, namely the Repeated Measures ANOVA, was used to compare the data.

Table 5

Shapiro-Wilk Test for Pre-test Scores

Descriptive Statistics

	ControlPre	TextPre	PicPre	TextPicPre
Valid	9	9	9	9
Mean	50.556	57.222	51.111	53.333
Std. Deviation	17.579	13.944	16.915	16.583
Shapiro-Wilk	0.926	0.947	0.874	0.855
P-value of Shapiro-Wilk	0.440	0.654	0.137	0.085
Minimum	30.000	35.000	25.000	30.000
Maximum	80.000	85.000	70.000	70.000

3.1.2. Repeated Measures ANOVA

The Repeated Measures ANOVA was conducted to compare the performance of the four groups from the pre-test to the post-test (see Table 6). The results show that the difference between the Groups is not significant F (3, 24) = 1.529, p = 0.233. However, the results show that the Testing is significant, F (1, 8) = 11.256, p = 0.010, with a medium to high effect size (η^2= 0.078). Similar

to the grouping, the results for Group * Testing was not found to be significant, F (3, 24) = 2.447, p = 0.088.

Table 6

Repeated Measures ANOVA Results

Within Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Group	2803.819	3	934.606	1.529	0.233	0.106
Residuals	14674.306	24	611.429			
Testing	2058.681	1	2058.681	11.256	0.010	0.078
Residuals	1463.194	8	182.899			
Group ✻ Testing	1251.042	3	417.014	2.447	0.088	0.047
Residuals	4089.583	24	170.399			

Note. Type III Sum of Squares

Between Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p
Residuals	4100.694	8	512.587		

Note. Type III Sum of Squares

For an easy comparison of the means and standard deviations for each group on each test, see the descriptive statistics in Table 7 below.

Table 7

Descriptive Statistics Showing the Differences by Group for Pre-test and Post-test

Group	Testing	N	Mean	SD	SE	Coefficient of variation
Text	Pre-test	9	57.222	13.944	4.648	0.244
	Post-test	9	73.333	19.685	6.562	0.268
Pic	Pre-test	9	51.111	16.915	5.638	0.331
	Post-test	9	61.667	18.708	6.236	0.303
TextPic	Pre-test	9	53.333	16.583	5.528	0.311
	Post-test	9	72.222	25.139	8.380	0.348
Control	Pre-test	9	50.556	17.579	5.860	0.348
	Post-test	9	47.778	24.636	8.212	0.516

In order to get a better understanding of where the differences are, the Holm Post Hoc test was calculated with a confidence interval of 95% for the Testing (see Table 8). According to the post hoc results, there is a difference in general from the pre-test to post-test. However, when looking at the post hoc analysis with a confidence interval of 95% for the Testing * Group, none of the pre-tests show that they are significantly different from any of the post-tests (see Table 9).

Table 8

Post Hoc Analysis for the Testing with a Confidence Interval at 95%

			95% CI for Mean Difference				
		Mean Difference	Lower	Upper	SE	t	p_{holm}
Pre-test	Post-test	−10.694	−18.045	−3.344	3.188	−3.355	0.010

Note. Results are averaged over the levels of: Group

Table 9

*Post Hoc Analysis for the Group * Testing with a Confidence Interval at 95%*

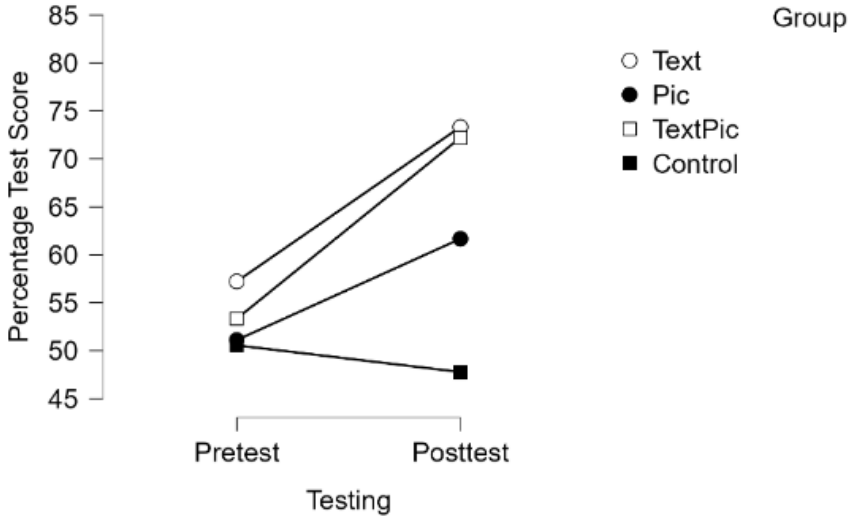
			95% CI for Mean Difference				
		Mean Difference	Lower	Upper	SE	t	p_{holm}
Text, Pre-test	Pic, Pre-test	6.111	−25.307	37.529	9.320	0.656	1.000
	TextPic, Pre-test	3.889	−27.529	35.307	9.320	0.417	1.000
	Control, Pre-test	6.667	−24.751	38.085	9.320	0.715	1.000
	Text, Post-test	−16.111	−37.274	5.052	6.210	−2.594	0.355
	Pic, Post-test	−4.444	−35.969	27.080	9.358	−0.475	1.000
	TextPic, Post-test	−15.000	−46.524	16.524	9.358	−1.603	1.000
	Control, Post-test	9.444	−22.080	40.969	9.358	1.009	1.000
Pic, Pre-test	TextPic, Pre-test	−2.222	−33.640	29.196	9.320	−0.238	1.000
	Control, Pre-test	0.556	−30.862	31.973	9.320	0.060	1.000
	Text, Post-test	−22.222	−53.746	9.302	9.358	−2.375	0.527
	Pic, Post-test	−10.556	−31.718	10.607	6.210	−1.700	1.000
	TextPic, Post-test	−21.111	−52.635	10.413	9.358	−2.256	0.632
	Control, Post-test	3.333	−28.191	34.857	9.358	0.356	1.000
TextPic, Pre-test	Control, Pre-test	2.778	−28.640	34.196	9.320	0.298	1.000
	Text, Post-test	−20.000	−51.524	11.524	9.358	−2.137	0.786
	Pic, Post-test	−8.333	−39.857	23.191	9.358	−0.891	1.000
	TextPic, Post-test	−18.889	−40.052	2.274	6.210	−3.042	0.131
	Control, Post-test	5.556	−25.969	37.080	9.358	0.594	1.000
Control, Pre-test	Text, Post-test	−22.778	−54.302	8.746	9.358	−2.434	0.478
	Pic, Post-test	−11.111	−42.635	20.413	9.358	−1.187	1.000
	TextPic, Post-test	−21.667	−53.191	9.857	9.358	−2.315	0.578
	Control, Post-test	2.778	−18.385	23.940	6.210	0.447	1.000
Text, Post-test	Pic, Post-test	11.667	−19.751	43.085	9.320	1.252	1.000
	TextPic, Post-test	1.111	−30.307	32.529	9.320	0.119	1.000
	Control, Post-test	25.556	−5.862	56.973	9.320	2.742	0.254
Pic, Post-test	TextPic, Post-test	−10.556	−41.973	20.862	9.320	−1.133	1.000
	Control, Post-test	13.889	−17.529	45.307	9.320	1.490	1.000
TextPic, Post-test	Control, Post-test	24.444	−6.973	55.862	9.320	2.623	0.329

Note. P-value and confidence intervals adjusted for comparing a family of 28 estimates (confidence intervals corrected using the bonferroni method).

To understand the results fully, the difference from pre-test to post-test can be seen in the descriptive plots diagram (see Figure 1). As can be seen in the diagram, the post-test scores for the Textual, Pictorial, and Textual-pictorial Groups are higher than the pre-test scores. However, the post-test scores for the Control Group are lower than that of the pre-test.

Figure 1

Descriptive Plots Diagram Showing the Difference from Pre-test to Post-test for Each Group



3.2. Reader Glossing Preferences

In this section, the results of the descriptive statistical analyses on participants' glossing preference category scores are reported. Then, the findings from the descriptive analyses and Chi-square Goodness of Fit tests performed on participants' responses to each individual Likert statement within each category are presented. Participants' data from all experimental groups was combined in this section.

3.2.1. Likert-scale Data

The raw Likert-scale data on glossing preferences from the post-questionnaire is reported in detail in Tables J1, J3, J5, and J7 (see Appendix J).

Four Likert-scale statements, each weighted out of five, comprised each statement category. In order to compare the Likert responses between question categories, the mean and standard deviation of students' responses to the questions within the "Glossing in General," "Textual Glossing," "Pictorial Glossing," and "Textual-pictorial Glossing" categories are stated in

Table 10 below. Participants' mean aggregate "Glossing in General" category score was 4.181; their mean aggregate "Pictorial" category score was 3.174; their mean aggregate "Textual" category score was 3.826; and their mean aggregate "Textual-pictorial" category score was 3.986. This suggests that the readers, on average, agreed that they preferred glossing in general, slightly less likely to agree that they prefer textual-pictorial or textual glossing the most, and even less likely to agree that they prefer pictorial glossing the most (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree).

Table 10

Descriptive Statistics Showing Aggregate Scores for Each Glossing Preference Category

	Likert Response			
	Glossing in General	Pic	Text	TextPic
Valid	144	144	144	144
Missing	0	0	0	0
Mean	4.181	3.174	3.826	3.986
Std. Deviation	0.874	1.124	1.033	1.003
Minimum	1.000	1.000	1.000	1.000
Maximum	5.000	5.000	5.000	5.000

3.2.2. Preferences for Glossing in General: Descriptives and Chi-square Tests

The mean, standard deviation, and mode of participants' responses to each question within the "Glossing in General" category are stated in Table 11 below. The findings reveal that readers, on average, agreed that (1) they prefer using glosses when reading in English (M = 4.139, SD = 0.867), (2) glossing is helpful for them when reading in English (M = 4.361, SD = 0.867), (3) using reading glosses would help them learn vocabulary better (M = 4.5, SD = 0.609). Students were on average slightly less likely to agree that (4) they prefer using reading glosses to learn vocabulary (M = 3.722, SD = 0.944).

Table 11

Descriptive Statistics Showing Preferences for Glossing in General by Individual Question

Statement	Mean	SD	Mode
1. I prefer using glosses when reading in English.	4.139	0.867	4.000
2. Glossing is helpful for me when reading in English.	4.361	0.867	5.000
3. Using reading glosses would help me learn vocabulary better.	4.500	0.609	5.000
4. I prefer using reading glosses to learn vocabulary.	3.722	0.944	4.000

Chi-square Goodness of Fit tests were conducted to determine whether participants' responses to each question would be expected in the general population of secondary-level language learners (see Table 12 below). The results show that participant responses to all questions are significant: the p-value of each Chi-square test is less than .001. Therefore, similar responses can be expected if the study were repeated using a similar population.

Table 12

Chi-square Test Results for Preferences for Glossing in General

Statement	χ^2	df	p
1. I prefer using glosses when reading in English.	26.500	4	< .001
2. Glossing is helpful for me when reading in English.	38.167	4	< .001
3. Using reading glosses would help me learn vocabulary better.	47.333	4	< .001
4. I prefer using reading glosses to learn vocabulary.	20.944	4	< .001

To visualize the counts for each Likert response, a Chi-square descriptive statistics table is found in Table J2, and plots for each statement are found in Figures J1, J2, J3, and J4 (see Appendix J).

3.2.3. Textual Glossing Preferences: Descriptives and Chi-square Tests

The mean, standard deviation, and mode of participants' responses to each question within the "Textual Glossing" category are stated in Table 13 below. The findings reveal that readers, on average, agreed that (3) reading definitions of the vocabulary while reading would help them learn vocabulary the best (M = 4.25, SD = 0.806). Students were on average slightly less likely to agree that (1) they prefer using textual glosses the most (M = 3.639, SD = 1.046), (2) glossing with just

text/words is the most beneficial to them as readers and learners of English (M = 3.611, SD = 1.076), and (4) textual glosses are the most helpful for them when reading (M = 3.806, SD = 1.091).

Table 13

Descriptive Statistics Showing Textual Glossing Preferences by Individual Question

Statement	Mean	SD	Mode
1. I prefer using textual glosses the most.	3.639	1.046	3.000
2. Glossing with just text/words is the most beneficial to me as a reader and learner of English.	3.611	1.076	3.000
3. Reading definitions of the vocabulary while reading would help me learn vocabulary the best.	4.250	0.806	4.000
4. Textual glosses are the most helpful for me when reading.	3.806	1.091	4.000

Chi-square Goodness of Fit tests were conducted to determine whether participants' responses to each question would be expected in the general population of secondary-level language learners (see Table 14 below). The results show that participant responses to all questions are significant: the p-value of each Chi-square test is less than .05. Therefore, similar responses can be expected if the study were repeated using a similar population.

Table 14

Chi-square Test Results for Textual Glossing Preferences

Statement	χ^2	df	p
1. I prefer using textual glosses the most.	14.000	4	0.007
2. Glossing with just text/words is the most beneficial to me as a reader and learner of English.	11.500	4	0.021
3. Reading definitions of the vocabulary while reading would help me learn vocabulary the best.	36.500	4	< .001
4. Textual glosses are the most helpful for me when reading.	17.056	4	0.002

To visualize the counts for each Likert response, a Chi-square Descriptives table is found in Table J4 and plots for each statement are found in Figures J5, J6, J7, and J8 (see Appendix J).

3.2.4. Pictorial Glossing Preferences: Descriptives and Chi-square Tests

The mean, standard deviation, and mode of participants' responses to each question within the "Pictorial Glossing" category are stated in Table 15 below. The findings reveal that readers, on

average, disagreed that (4) glossing with just pictures is the most beneficial to them as readers and learners of English (M = 2.639, SD = 1.099). Students were on average slightly more likely to agree that (1) they prefer using pictorial glosses while reading in English (M = 3.278, SD = 1.085), (2) pictorial glossing is the most helpful for them when reading in English (M = 3.083, SD = 0.996), and (3) looking at pictures of what the vocabulary means while reading would help them learn vocabulary the best (M = 3.694, SD = 1.091).

Table 15

Descriptive Statistics Showing Pictorial Glossing Preferences by Individual Question

Statement	Mean	SD	Mode
1. I prefer using pictorial glosses while reading in English.	3.278	1.085	3.000
2. Pictorial glossing is the most helpful for me when reading in English.	3.083	0.996	3.000
3. Looking at pictures of what the vocabulary means while reading would help me learn vocabulary the best.	3.694	1.091	4.000
4. Glossing with just pictures is the most beneficial to me as a reader and learner of English.	2.639	1.099	2.000

Chi-square Goodness of Fit tests were conducted to determine whether participants' responses to each question would be expected in the general population of secondary-level language learners (see Table 16 below). The results show that participant responses to all questions are significant: the p-value of each Chi-square test is less than .05. Therefore, similar responses can be expected if the study were repeated using a similar population.

Table 16

Chi-square Test Results for Pictorial Glossing Preferences

Statement	χ^2	df	p
1. I prefer using pictorial glosses while reading in English.	13.167	4	0.010
2. Pictorial glossing is the most helpful for me when reading in English.	14.278	4	0.006
3. Looking at pictures of what the vocabulary means while reading would help me learn vocabulary the best.	12.889	4	0.012
4. Glossing with just pictures is the most beneficial to me as a reader and learner of English.	15.944	4	0.003

To visualize the counts for each Likert response, a Chi-square Descriptives table is found in Table J6 and plots for each statement are found in Figures J9, J10, J11, and J12 (see Appendix J).

3.2.5. Textual-pictorial Glossing Preferences: Descriptives and Chi-square Tests

The mean, standard deviation, and mode of participants' responses to each question within the "Textual-pictorial Glossing" category are stated in Table 17 below. The findings reveal that readers, on average, agreed that (2) looking at pictures and reading definitions of vocabulary while reading would help them learn vocabulary the best (M = 4.194, SD = 0.786). Students were on average slightly less likely to agree that (1) textual-pictorial glosses are the most helpful for them (M = 3.861, SD = 0.99), (3) they prefer using textual-pictorial glosses while reading in English (M = 3.917, SD = 1.105), and (4) glossing with text/words and pictures would be the most beneficial to them as readers and learners of English (M = 3.972, SD = 1.108).

Table 17

Descriptive Statistics Showing Textual-pictorial Glossing Preferences by Individual Question

Statement	Mean	SD	Mode
1. Textual-pictorial glosses are the most helpful for me.	3.861	0.990	4.000
2. Looking at pictures and reading definitions of vocabulary while reading would help me learn vocabulary the best.	4.194	0.786	4.000
3. I prefer using textual-pictorial glosses while reading in English.	3.917	1.105	5.000
4. Glossing with text/words and pictures would be the most beneficial to me as a reader and learner of English.	3.972	1.108	4.000

Chi-square Goodness of Fit tests were conducted to determine whether participants' responses to each question would be expected in the general population of secondary-level language learners (see Table 18 below). The results show that participant responses to all questions are significant: the p-value of each Chi-square test is less than .05. Therefore, similar responses can be expected if the study were repeated using a similar population.

Table 18

Chi-square Test Results for Textual-pictorial Glossing Preferences

Statement	χ^2	df	p
1. Textual-pictorial glosses are the most helpful for me.	15.389	4	0.004
2. Looking at pictures and reading definitions of vocabulary while reading would help me learn vocabulary the best.	38.722	4	< .001
3. I prefer using textual-pictorial glosses while reading in English.	15.389	4	0.004
4. Glossing with text/words and pictures would be the most beneficial to me as a reader and learner of English.	22.056	4	< .001

To visualize the counts for each Likert response, a Chi-square Descriptives table is found in Table J8 and plots for each statement are found in Figures J13, J14, J15, and J16 (see Appendix J).

3.3. Participant Perceptions of the Study

In this section, the findings from the descriptive analyses and Chi-square Goodness of Fit tests performed on participants' responses to each individual Likert statement are reported. Then, the qualitative data from the short-answer question on the post-questionnaire are presented. Participants' data from all experimental groups was combined in this section.

3.3.1. Likert-scale Data

Eight Likert-scale statements, each weighted out of five, comprised the "Perceptions of the Study" section of the post-questionnaire. The Likert-scale data from the post-questionnaire concerning participants' perceptions of the present study are reported in Table K1 (see Appendix K).

3.3.2. Descriptive Statistics and Chi-square Tests

The mean, standard deviation, and mode of participants' responses to each question related to their perceptions of the study in Table 19 below. The findings reveal that participants, on average, agreed that they (5) learned something new during this study (M = 4.167, SD = 0.609), (7) would like to use reading glosses to help them learn vocabulary in the future (M = 4.278, SD = 0.815), and (8) enjoyed participating in this study (M = 4.167, SD = 0.91). Students were on average

slightly less likely to agree that (1) they enjoyed reading the article (M = 3.556, SD = 0.969), (2) they found the article interesting and engaging (M = 3.667, SD = 0.894), (3) the article was at their language level (M = 3.194, SD = 1.091), (4) participating in this study was beneficial to them (M = 3.889, SD = 0.82), and (6) the vocabulary comprehension test was clear and easy to understand (M = 3.778, SD = 1.017). It is useful to note that statement (7) possesses a bimodal data set, meaning that two Likert responses (4 and 5) occurred at the same frequency.

Table 19

Descriptive Statistics Showing Participants' Perceptions of the Study

Statement	Mean	SD	Mode
1. I enjoyed reading the article.	3.556	0.969	4.000
2. I found the article interesting and engaging.	3.667	0.894	4.000
3. The article was at my language level (not too easy and not too difficult to read).	3.194	1.091	3.000
4. Participating in this study was beneficial to me.	3.889	0.820	4.000
5. I learned something new during this study.	4.167	0.609	4.000
6. The Vocabulary Comprehension Test was clear and easy to understand.	3.778	1.017	4.000
7. I would like to use reading glosses to help me learn vocabulary in the future.	4.278	0.815	4.000, 5.000
8. I enjoyed participating in this study.	4.167	0.910	5.000

Chi-square Goodness of Fit tests were conducted to determine whether participants' responses to each question would be expected in the general population of secondary-level language learners (see Table 20 below). The results show that participant responses to all questions are significant: the p-value of each Chi-square test is less than .05. Therefore, similar responses can be expected if the study were repeated using a similar population.

Table 20

Chi-square Tests for Participants' Perceptions of the Study

Statement	χ^2	df	p
1. I enjoyed reading the article.	26.222	4	< .001
2. I found the article interesting and engaging.	27.889	4	< .001
3. The article was at my language level (not too easy and not too difficult to read).	9.556	4	0.049
4. Participating in this study was beneficial to me.	23.444	4	< .001
5. I learned something new during this study.	47.333	4	< .001
6. The Vocabulary Comprehension Test was clear and easy to understand.	13.722	4	0.008
7. I would like to use reading glosses to help me learn vocabulary in the future.	36.222	4	< .001
8. I enjoyed participating in this study.	25.111	4	< .001

To visualize the counts for each Likert response, the descriptive statistics for each Chi-square test is summarized in Table 21 below.

Table 21

Chi-square Descriptives for Participants' Perceptions of the Study

Statement	Likert Response	Observed	Expected: H_0 (a)	95% Confidence Interval	
				Lower	Upper
I enjoyed reading the article.	1 Strongly Disagree	2	7.200	0.245	6.719
	2 Disagree	2	7.200	0.245	6.719
	3 Neither Agree nor Disagree	10	7.200	5.112	16.267
	4 Agree	18	7.200	11.852	24.148
	5 Strongly Agree	4	7.200	1.120	9.382
I found the article interesting and engaging.	1 Strongly Disagree	0	7.200	0.000	3.506
	2 Disagree	5	7.200	1.680	10.619
	3 Neither Agree nor Disagree	7	7.200	2.950	12.969
	4 Agree	19	7.200	12.775	25.054
	5 Strongly Agree	5	7.200	1.680	10.619
The article was at my language level (not too easy and not too difficult to read).	1 Strongly Disagree	1	7.200	0.025	5.230
	2 Disagree	10	7.200	5.112	16.267
	3 Neither Agree nor Disagree	11	7.200	5.885	17.319
	4 Agree	9	7.200	4.363	15.193
	5 Strongly Agree	5	7.200	1.680	10.619
Participating in this study was beneficial to me.	1 Strongly Disagree	0	7.200	0.000	3.506
	2 Disagree	1	7.200	0.025	5.230
	3 Neither Agree nor Disagree	11	7.200	5.885	17.319
	4 Agree	15	7.200	9.185	21.328
	5 Strongly Agree	9	7.200	4.363	15.193
I learned something new during this study.	1 Strongly Disagree	0	7.200	0.000	3.506
	2 Disagree	0	7.200	0.000	3.506
	3 Neither Agree nor Disagree	4	7.200	1.120	9.382
	4 Agree	22	7.200	15.647	27.669
	5 Strongly Agree	10	7.200	5.112	16.267
The Vocabulary Comprehension Test was clear and easy to understand.	1 Strongly Disagree	0	7.200	0.000	3.506
	2 Disagree	5	7.200	1.680	10.619
	3 Neither Agree nor Disagree	8	7.200	3.641	14.095
	4 Agree	13	7.200	7.496	19.360
	5 Strongly Agree	10	7.200	5.112	16.267
I would like to use reading glosses to help me learn vocabulary in the future.	1 Strongly Disagree	0	7.200	0.000	3.506
	2 Disagree	2	7.200	0.245	6.719
	3 Neither Agree nor Disagree	2	7.200	0.245	6.719
	4 Agree	16	7.200	10.057	22.285
	5 Strongly Agree	16	7.200	10.057	22.285
I enjoyed participating in this study.	1 Strongly Disagree	0	7.200	0.000	3.506
	2 Disagree	2	7.200	0.245	6.719
	3 Neither Agree nor Disagree	6	7.200	2.294	11.812
	4 Agree	12	7.200	6.680	18.349
	5 Strongly Agree	16	7.200	10.057	22.285

Note. Confidence intervals are based on independent binomial distributions.

In order to further visualize the counts for each Likert response, descriptive statistics plots for each individual statement are found in Figures K1-K8 (see Appendix K).

3.3.3. Qualitative Data

A limited amount of qualitative data was collected from the post-questionnaire regarding overall thoughts of the study as well as opinions about learning new vocabulary using glosses and the article read as part of the study. Participants' comments on these topics were revised for grammatical correctness and clarity, and organized and summarized in Table 22 below.

Table 22

Perceptions of the Study Short-Answer Responses by Topic

Topic	Participant Responses
Overall Thoughts	It was cool to do.
	I think that it is really interesting.
	It's a well-planned and well-rounded study.
	The study was good.
	All fantastic.
	I think that it was fun and helpful.
	I think this study was very interesting and well prepared.
	I think it was interesting as I have never done it before. It was very easy to participate.
	I think that it is a very interesting topic!
	Everything was clear.
	All good!
	The study is interesting.
	I really enjoyed it!
	I really liked the interest that the researcher showed toward the topic.
Learning New Vocabulary	I didn't know most of the new vocabulary, so the method of doing the study was very interesting.
	I have learned new vocabulary in a different way, and I like it a lot. I think that seeing a picture and a description to understand new vocabulary is a very effective way to learn because if you have photographic memory, it will facilitate your knowledge.
	I enjoyed learning new words.
	I think this is a good idea to learn more vocabulary.
	I think that this study is very interesting and that it will help improve the way we learn vocabulary in the future.
	It has been very interesting to participate in this study because I was able to learn new vocabulary, which is always good. I do not have any suggestions at all.
Reading the Article	I consider the topic of the reading very interesting.
	For me, the theme of the article was very interesting.
	I suggest using four different articles, each one with its own unique vocabulary and a different kind of gloss (including none). That way, the research wouldn't be contaminated by memorization.

Note. Responses were elicited by the short-answer question in the post-questionnaire, "Overall, what did you think of this study? Do you have any questions, comments, or suggestions for the researcher?" Only 20 out of the 36 participants chose to answer this question, as it was optional.

Because this data has not been extrapolated, these responses represent only the sample in this study.

Chapter 4: Discussion

4.1. Glossing and Incidental Vocabulary Learning

The first hypothesis predicted that there would be a significant difference in learner comprehension of unknown L2 vocabulary when textual, pictorial, or textual-pictorial glossing was used in L2 online reading. This was informed by numerous earlier studies which show that any glossing is better than no glossing when it comes to incidental vocabulary learning. Findings from the Repeated Measures ANOVA test found that there were no significant differences between groups (no gloss, textual gloss, pictorial gloss, and textual-pictorial gloss), $F (3, 24) = 1.529$, $p = 0.233$. Although the results show that the testing was significant, $F (1, 8) = 11.256$, $p = 0.010$, with a medium to high effect size ($\eta^2 = 0.078$), differences between groups were not. This means that there was no significant difference in learner comprehension of unknown vocabulary when no glossing versus glossing was used in L2 online reading. Based on these results, the alternative hypothesis has been rejected.

4.2. Gloss Type and Incidental Vocabulary Learning

The second hypothesis predicted that textual-pictorial glosses would help learners perform better in post-reading vocabulary comprehension tests. This was informed by previous research which showed that multimedia glosses, particularly textual-pictorial glosses, yielded greater incidental vocabulary learning. According to the Holm Post Hoc test calculated with a confidence interval of 95% for the testing, there was a difference in general from the pre-test to post-test, $p_{holm} = 0.01$. However, when looking at the post hoc analysis with a confidence interval of 95% for the testing * group, none of the pre-tests show that they are significantly different from any of the post-tests, $F (3, 24) = 2.447$, $p = 0.088$, meaning that the grouping (or the gloss conditions) was not found to

influence pre- to post-test scores. Textual-pictorial glosses did not help learners perform better on post-reading vocabulary comprehension tests compared to the other gloss groups, therefore, the alternative hypothesis has been rejected.

4.3. Reader Glossing Preferences

The third and final hypothesis predicted that learners would prefer textual glossing in online L2 reading. This was informed by the researcher's personal experience teaching second language readers and receiving feedback from students that textual glosses in coursebooks aided in vocabulary understanding. Results from the descriptive statistics show that, on average, learners prefer textual-pictorial glossing over textual glossing and pictorial glossing. Their mean aggregate score for textual-pictorial glossing was 3.986, while it was 3.826 for textual glossing and 3.174 for pictorial glossing. This suggests that learners, on average, were slightly less likely to agree that they prefer textual-pictorial the most and even less likely to agree that they prefer textual glossing or pictorial glossing the most (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree).

Accompanying Chi-square tests confirm that the participants' responses analyzed using descriptive statistics have significant p-values, meaning the responses fit the expected distribution and were not based on chance. Indeed, all Chi-square test results produced p-values lower than 0.05. Results from the Chi-square tests for the textual-pictorial gloss preference group in particular were, (1) "Textual-pictorial glosses are the most helpful for me" with a p-value of 0.004, (2) "Looking at pictures and reading definitions of vocabulary while reading would help me learn vocabulary the best" with a p-value of less than 0.001, (3) "I prefer using textual-pictorial glosses while reading in English" with a p-value of 0.004, and (4) "Glossing with text/words and pictures

would be the most beneficial to me as a reader and learner of English" with a p-value less than 0.001. Based on these results, the alternative hypothesis has been rejected.

An unintended finding of this study is that readers do prefer glossing in general over no glossing in online L2 reading. Results from the descriptive statistics confirm this, with the mean aggregate category score for "Glossing in General" as 4.181, suggesting that learners, on average, agreed that glossing in general was beneficial to them when reading in English. Accompanying Chi-square tests confirm that the participants' responses analyzed using descriptive statistics have significant p-values, meaning the responses fit the expected distribution and were not based on chance. Results from the Chi-square tests for the glossing in general preference group revealed that all statements had p-values less than 0.001: (1) "I prefer using glosses when reading in English," (2) "Glossing is helpful for me when reading in English," (3) "Using reading glosses would help me learn vocabulary better," and (4) "I prefer using reading glosses to learn vocabulary."

4.4. Participant Perceptions of the Study

Additional data was collected in a post-questionnaire after carrying out the experiment regarding participants' perceptions of the study in order to offer suggestions and improvements for future research. Results from the descriptive statistics show that, on average, participants agreed that they (5) learned something new during this study (M = 4.167), (7) would like to use reading glosses to help them learn vocabulary in the future (M = 4.278), and (8) enjoyed participating in this study (M = 4.167). Students were on average slightly less likely to agree that (1) they enjoyed reading the article (M = 3.556), (2) they found the article interesting and engaging (M = 3.667), (3) the article was at their language level (M = 3.194), (4) participating in this study was beneficial to

them (M = 3.889), and (6) the vocabulary comprehension test was clear and easy to understand (M = 3.778).

Subsequent Chi-square tests confirm that the participants' responses analyzed using descriptive statistics fit the expected distribution and were not based on chance. Results from these tests revealed that all statements had p-values less than 0.05. (1) I enjoyed reading the article," (2) "I found the article interesting and engaging," (4) "Participating in this study was beneficial to me," (5) "I learned something new during this study," (7) "I would like to use reading glosses to help me learn vocabulary in the future," and (8) "I enjoyed participating in this study" had p-values less than 0.001; (6) "The Vocabulary Comprehension Test was clear and easy to understand" had a p-value of 0.008; and (3) "The article was at my language level (not too easy and not too difficult to read)" had a p-value of 0.049.

Responses collected from the short-answer question in the post-questionnaire provide insight into participants' voluntary thoughts on the study. Most participants expressed positive thoughts of the study overall and positive experiences encountering new vocabulary and using reading glosses, and some mentioned that the article they read was interesting. One participant wrote a particularly valuable suggestion for improvement or future research to "use four different articles, each one with its own unique vocabulary and a different kind of gloss (including none)" to avoid contaminating the data by memorization. These qualitative results, although not extrapolated to reflect similar samples, show that the participants in this study had an overall positive experience reading online in a second language using glosses and found the article interesting to read.

4.5. Pedagogical Implications

Among seeking to answer the three research questions, the ultimate aim of this study is to help students and teachers improve the L2 reading and vocabulary learning experience. The results from this study and succeeding discussion of the results provide several insights to the L2 learning process and can help second language instructors better guide their students in this process.

The finding that there were no significant differences between the no-gloss group and the gloss groups on post-reading vocabulary tests suggests that other factors may play a larger role in incidental vocabulary learning when compared to glossing. For example, learners' reading strategies or even affective filters may promote their L2 vocabulary uptake more than using glosses. These results may also display the extensive individuality of learners in that all students come from very specific and unique backgrounds and therefore use and benefit from very specific resources in an L2 setting, which may or may not be the types of glossing examined in this study. L2 instructors should help their students explore which types of resources help them learn vocabulary best and offer a variety of resources in their instruction and classroom settings.

When comparing the effectiveness of textual, pictorial, and textual-pictorial gloss groups, the findings that no one gloss type proved more beneficial in learning vocabulary suggest similar implications. Perhaps there is truly no significant difference between using different types of glossing, rather, the most significant differences may lie in using the most effective resources for oneself. Perhaps significant differences in vocabulary learning outcomes exist between other types of glosses, excluding the specific three types examined in this study. Again, these findings suggest that L2 instructors should be open to many learning resources, exposing their students to as many

as possible in order for them to experience and decide for themselves which to adopt in their personal language learning.

Glossing in general being preferred by readers points to a preference in the digital world that necessary information be in the same place for learning to be most efficient. Marginal glosses allow readers to put in just enough effort to increase their involvement load but not too much to become overwhelming, demotivating, or inefficient to use. In computerized or web-based settings, necessary information can often be loaded onto the same page or window, so L2 instructors should not shy away from these kinds of conveniences in their teaching. Preference for glossing in general may also suggest the decline of traditional dictionaries in favor of online dictionaries. Textual-pictorial glossing being the highest preferred out of textual glossing and pictorial glossing may indicate the growing preference for multimedia resources over single medium. These findings on glossing preferences, along with the fact that participants from this study had overall positive experiences with marginal glosses in online second language reading, should encourage teachers to use glossing resources and technological resources where available.

4.6. Limitations of the Study

As with all empirical studies, there were many limitations to this study. Four aspects of the study stand out as the most considerable limitations: time, materials, testing procedure, and sample size.

First, time was a major limitation to the research design of this study. The experiment was carried out over four weeks, with participants completing the pre-test during the first week and then the post-test and post-questionnaire three weeks later. Being cognizant of the participants' teacher and their planned classroom time needed to cover curriculum and administer assessments, the researcher made an effort to limit the class time needed for the experiment. To limit class time

needed, the researcher implemented immediate vocabulary post-testing instead of potentially more fruitful delayed post-testing as well as the use of shorter, less detailed, and therefore potentially less effective materials.

The materials used also present a limitation to this study. Because of time and curriculum constraints, the reading passage was selected from one of the participants' class workbooks. The reading was therefore less authentic than if an online article from a magazine or journal had been used. Relatedly, limited time in collaborating with the participants' teacher also presented time constraints in developing the reading glosses and vocabulary comprehension test; both could have been developed more thoroughly to include features like repeated encounters of unknown words or the testing of more aspects of lexical knowledge such as production instead of simple recognition. Additionally, the Likert-scale questions in the post-questionnaire may not have been phrased in the most effective way to yield the most accurate results, as they were susceptible to response bias.

The third limitation was the testing procedure. In an attempt to control as many variables as possible, a pre-test/post-test design was implemented, with the pre-test reading passage and vocabulary test being the same as the post-test reading passage and vocabulary test (excluding the difference in glosses). Due to this, the same 10 unknown vocabulary words had been encountered several times by the time participants completed the vocabulary post-test and this could have skewed the results. Furthermore, some students not taking the pre- and post-tests with the rest of the class, the possibility of cheating during or after the tests, and class distractions while taking the tests posed a threat to obtaining accurate test scores.

Fourth and lastly, the small sample size was the most major limitation of this study. The study only utilized 36 total participants, with nine comprising each experimental group. Small

numbers of participants likely caused inaccuracy in the statistical analysis of the data, as more dramatic differences may have been needed for the statistics to even indicate significant differences. Bearing this major limitation in mind, a replication of this study with an increased number of participants would yield more valid and possibly dramatically different results, therefore the alternative hypotheses could still be considered and accepted.

Chapter 5: Conclusion

5.1. Key Findings

The aim of this study was to investigate the effect of glossing in online second language reading on the incidental vocabulary learning of learners with intermediate to advanced English level. The study aimed to discover whether second language readers benefit from using glossing in online reading, specifically whether this helps readers perform better on post-reading vocabulary comprehension tests. It was found that glossing did not seem to make a significant difference in performance on vocabulary comprehension tests.

This study also aimed to discover which type of glossing is the most beneficial to readers, specifically which type helps readers perform better on post-reading vocabulary comprehension tests. Findings indicated that the type of glossing made no significant difference in performance on post-reading vocabulary tests.

In addition, the study aimed to observe which gloss type readers prefer using to learn vocabulary when reading in a second language. Although preference scores were on average very similar, analyses of these scores exhibited greater preference for textual-pictorial glosses over textual and pictorial ones. It was also found that readers on average prefer glossing in general over no glossing at all.

5.2. Suggestions for Future Research

Based on the findings of the current study, suggestions for future research on the topics of second language reading, incidental vocabulary learning, and glossing are recommended as follows.

First and foremost, a replication of this study or further research on these topics should involve an increased number of participants. Ideally, each of the experimental groups should

contain 30 or more participants instead of only nine, as this would likely yield more accurate results.

To improve the vocabulary pre-test and post-test, the researcher suggests using a multi-test format (instead of using only a multiple-choice test) to test more in-depth lexical knowledge of the words. This multi-test format could include measures to investigate word form and meaning recall, recognition, and production, rather than just one or two of these aspects. The inclusion of online and offline measures could also improve future research and add additional insight into L2 reading behaviors. For example, using an eye-tracker (online measure) to determine where readers spend the most time looking when glosses are involved, as well as an in-depth paper test (offline measure) to determine lexical knowledge would provide more well-rounded measures.

To improve the testing procedure, it is suggested to take students out of class individually to complete the pre-test and post-test to reduce cheating and distractions. Additionally, delayed post-testing as well immediate post-testing could reveal insight and data on how well lexical knowledge is retained over time when it is learned through reading glosses.

Concerning the target vocabulary, a more careful selection of images for the pictorial glosses is recommended, as several people during the pilot testing phase commented on the ambiguity of some of the images. To avoid participants simply memorizing the vocabulary from pre-test to post-test, it is suggested to include non-target vocabulary to the reading passage and comprehension test to act as distractors from the target vocabulary.

Considering these recommendations, there is certainly much to be discovered concerning L2 reading, incidental vocabulary learning, and the use of marginal glosses. It is hoped that the conclusions and recommendations of this study prove valuable to educators and future researchers.

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Appendix A

Ethics Form

UNIVERSITAT ROVIRA i VIRGILI

Responsible statement on the ethical aspects of the Final Master Project (TFM) / Final Degree Project (TFG)

Ethical aspects are fundamental for Rovira i Virgili University. Therefore, you need to perform the following ethical evaluation on your final master project (TFM) / final degree project (TFG), as appropriate. Answer **YES** / **NO** to the questions below. If all of your answers are **NO**, no more details are needed than your signature. If, on the other hand, you answer **YES** to any of the following questions, it is required, depending on the object of study and the competent evaluation and monitoring committee:

- CEIm-IISPV:.... Favourable report
- CEEA:..... Favourable report
- CEIPSA:..... Responsible statement and formal commitment of the teachers and students involved in terms of monitoring the applicable regulations, as stated at the end of the document.

Name of the teacher/s in charge:
Andrea Bellot
Name of the student/s:
Leah Gaush
Name of Master's / Bachelor's Degree:
Teaching and Learning English as a Second/Foreign Language
Title of the ☒ TFM / ☐ TFG (check the appropriate box)
The Effect of Glossing in Online L2 Reading on Incidental Vocabulary Learning
Brief description of the TFM / TFG (max. 1000 characters, spaces included):
This is an investigation of the effects of vocabulary glossing on incidental vocabulary learning in English as a second language while reading in an online format. I will examine the differences in L2 glossing between textual, pictorial, and textual-pictorial glossing. To measure incidental learning, I will investigate the learner's ability to define unknown vocabulary (identify a correct dictionary definition) and use the vocabulary in context (produce a comprehensible sentence using the word) as part of a comprehension test. Participants will read a passage on a computer monitor while being tracked by a Tobii Studio 2.2 eye-tracker, which will follow their eye movements across the glossed vocabulary, and then complete the comprehension test. Eye-tracking measurements of total fixation time will answer whether readers notice/look at one gloss type more than another, and comprehension test scores will answer whether one gloss type over another leads to better vocabulary comprehension.

Indicate whether the TFM / TFG you want to develop includes any of these aspects.

Section	Yes	No

1. Human Embryos/foetuses		
Does your research involve Human Embryonic Stem Cells (HESCs)?	☐	☒
Does your research involve the use of human embryos?	☐	☒
Does your research involve the use of human tissues / cells?	☐	☒
2. Humans		
Does your research involve human participants?	☒	☐
• Are they volunteers for social or human sciences research?	☐	☒
• Are they persons unable to give informed consent?	☐	☒
• Are they vulnerable individuals or groups?	☐	☒
• Are they children / minors?	☐	☒
• Are they patients?	☐	☒
• Are they healthy volunteers for medical studies?	☐	☒
Does your research involve physical interventions on the study participants?	☐	☒
3. Human cells / tissues		
Does your research involve human cells or tissues (other than from Human Embryos / Foetuses, i.e. section 1)?	☐	☒
4. Personal data and privacy		
Does your research involve personal data and / or processing?	☐	☒
• Does it involve the collection and / or processing of sensitive personal data (e.g.: Health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction?	☐	☒
• Does it involve processing of genetic information?	☐	☒
• Does it involve technological tracking or observation of participants (such as surveillance or location data, and WAN data, such as IP address, MAC, cookies, etc.)?	☐	☒
Does it involve the processing of personal data collected prior to this TFG / TFM (secondary use)?	☐	☒
5. Animals		
Does your research involve animals?	☐	☒
6. Third countries		
In case non-EU countries are involved, do the research related activities undertaken in these countries raise potential ethics issues?	☐	☒
Do you plan to use local resources (e.g. animal and / or human tissue samples, genetic material, live animals, human remains of historical value, endangered fauna or flora samples, etc.)?	☐	☒

Do you plan to import any material –including personal data- from non-EU countries into the EU?	☐	☒
Do you plan to export any material –including personal data- from the EU to non-EU countries?	☐	☒
In case your research involves low and / or lower middle-income countries, are any benefits-sharing actions planned?	☐	☒
Could the situation in the country put the individuals taking part in the research at risk?	☐	☒
7. Environment / Health and safety		
Does your research involve the use of elements that may cause harm to the environment, to animals or plants?	☐	☒
Does your research deal with endangered fauna and / or flora and / or protected areas?	☐	☒
Does your research involve the use of elements that may cause harm to humans, including research staff?	☐	☒
8. Dual use		
Does your research involve dual-use items in the sense of Regulation 428/2009[1] or other items for which an authorisation is required?	☐	☒
9. Exclusive focus on civils applications		
Could your research raise concerns regarding the exclusive focus on civil applications?	☐	☒
10. Misuse		
Does your research have the potential for misuse of research results?	☐	☒
11. Other ethics issues		
Are there any other ethics issues that should be taken into consideration? Please, specify:	☐	☒

We confirm that we have assessed all the ethical aspects described above and that, if so, the signatories formally undertake, according to the object of study and the competent evaluation and monitoring committee, to:

- CEIm-IISPV:.... Prepare a description of the ethics issues involved and the required documentation, in accordance with the instructions in the Researcher's Guide.

[1] Dual-use products are those products, including software, and technology that can be used for both civilian and military uses and that include all products that can be used for both non-explosive purposes and the manufacture of nuclear weapons or other explosive nuclear devices. See Reglament CE 428/2009 del Consell de 5 de maig de 2009.

- CEEA: ..... Prepare a description of the ethics issues involved and the required documentation, in accordance with the instructions in the Researcher's Guide.

- CEIPSA: ..... Act in accordance with applicable regulations if the work in question has ethical implications and respect the ethical recommendations emanating from this Committee.

  Follow the guidelines established in the "Researcher's Guide" and the "Guide on the protection of personal data in the Final Degree and Master's Thesis at Rovira i Virgili University".

  Respect the confidentiality of personal data that may be obtained in the RDI activity, both in terms of academic use and in terms of their public dissemination. If we consider that any result of the RDI activity could affect or be of interest to the people or groups participating, we will communicate this in advance.

  Not to use the personal data obtained in the project for other different studies. In the latter case, we will first request the corresponding authorization of this Committee.

Tarragona , 29 January 2024

BELLOT - - - ANDREA ROXANA - X6943676E

Firmado digitalmente por BELLOT - - - ANDREA ROXANA - X6943676E
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Signature of the teacher/s in charge **Signature of the student/s**

Note: Once completed, convert the document to PDF, sign digitally and send to the address carlos.garcia@urv.cat

Appendix B

Participant Background Information

Table B1

Participant Background Information

Participant	Age	L1	Years of English Study	Self-reported English CEFR Level
1	17	Spanish, Catalan	>12	Not sure
2	17	Spanish, Catalan	>12	B2
3	17	Catalan	>12	Not sure
4	17	Spanish, Catalan	7-9	Not sure
5	17	Catalan	>12	B2
6	17	Spanish, Catalan	>12	C1
7	18	Spanish	>12	C1
8	18	Spanish	4-6	Not sure
9	18	Spanish, Catalan	>12	Not sure
10	18	Spanish, Catalan	<4	B2
11	17	Spanish, Catalan	10-12	Not sure
12	17	Spanish, Catalan	>12	B2
13	18	Spanish	>12	C1
14	17	Spanish	>12	B1+
15	17	Spanish	>12	B2
16	17	Spanish, Catalan	10-12	C2
17	18	Spanish, Catalan	7-9	Not sure
18	17	Catalan	10-12	Not sure
19	18	Catalan	10-12	B2
20	18	Catalan	>12	Not sure
21	17	Spanish	10-12	B2
22	17	Catalan	7-9	B1+
23	17	Spanish, Catalan	>12	B2
24	18	Catalan	>12	Not sure
25	17	Spanish, Catalan	>12	B2
26	18	Catalan	>12	B2
27	17	Catalan	10-12	Not sure
28	17	Spanish, Catalan	>12	B2
29	17	Spanish, Catalan	>12	B2
30	17	Catalan	7-9	Not sure
31	18	Spanish, Catalan	>12	B2
32	18	Spanish	10-12	B1+
33	17	Spanish	>12	Not sure
34	17	Catalan	>12	Not sure
35	17	Spanish	>12	B2
36	18	Spanish	>12	B2

Appendix C

Participant Information Sheet (English Version)

TITLE OF THE STUDY

The Effect of Glossing in Online L2 Reading on Incidental Vocabulary Learning

PRINCIPAL INVESTIGATOR / MASTER'S STUDENT

Leah Gaush

Email:

Telephone:

Postal address: 43003 Tarragona Spain

CENTER

Faculty of Arts – Universitat Rovira i Virgili (URV)

INTRODUCTION

We are writing to inform you about the research study in which you are invited to participate. This study has been approved by the Ethics Committee for Research in People, Society, and the Environment (CEIPSA) of the Universitat Rovira i Virgili.

VOLUNTARY PARTICIPATION

You should know that your participation in this study is voluntary and that you may decide not to participate or to change your decision and withdraw your consent at any time.

GENERAL DESCRIPTION OF THE STUDY

This study aims to investigate the effect of vocabulary glossing on incidental vocabulary learning while reading online in a second language (English) in learners with an upper-intermediate English level.

This study aims to discover if the use of vocabulary glosses in online reading help learners acquire vocabulary better than using no glosses in. If so, this study also aims to discover which reading gloss type is most beneficial to learners and which type they prefer to use while reading. Participants will complete a pre-test and post-test, which consists of reading a short text on a computer screen and answering questions about the reading. The pre-test and post-test will each take no longer than 20 minutes to complete.

Participants will be contacted at school during their regular English class hours. Their data will be processed by the researcher through Microsoft Forms.

BENEFITS AND RISKS

By participating in this study, participants will be exposed to new vocabulary and level-appropriate reading material, allowing them to practice their reading and vocabulary comprehension skills. Participants will be exposed to and learn how to use vocabulary glosses in reading, which is beneficial to second language learning. This may aid participants in practicing or studying for their state exams and/or the Cambridge Assessment of English.

Participants may miss one or two short periods of instruction in their regular English class if they are not present during the class period in which the class participates in this study. For example, they may not be able to participate in a speaking activity or a grammar review with the rest of the class during the time they are asked to spend 20 minutes completing the pre-test or post-test for the study. Failing this, the study poses no risk to the participant.

CONFIDENTIALITY AND DATA PROTECTION

All the information collected on the participants in the framework of this study will be kept strictly confidential and with the application of the corresponding security measures that guarantee, in addition to its confidentiality, its integrity, availability, authenticity and traceability. Information collected through URV Microsoft Forms will be kept under password protection through the researcher's URV Microsoft account.

The personal data collected for the study will be identified by a code and only the main researcher or her collaborators will be able to relate this data to the participants. Participants will never be identified in any report, presentation, or publication arising from this study. Therefore, your identity will not be revealed to any person, except when required by the Ethics Committee to which the study is submitted in order to verify the study data and procedures.

For the processing of the data, the Rovira i Virgili University's own information system installed in its computer network will be used, applying the information security measures established by Royal Decree 3/2010 that regulates the National Security scheme. Specifically, data will be collected through Microsoft Forms. Subsequently, the program JASP will be used to analyze the data.

The research staff of the study agree to comply with Organic Law 3/2018, of December 5, on the protection of personal data and guarantee of digital rights, in addition to Regulation (EU) No. 2016/679, of the European Parliament and of the Council, of April 27, 2016, on the protection of natural persons with regard to the processing of personal data and will sign a commitment to participation and confidentiality.

The purpose of data processing is participation in the study in accordance with the consent of the participant or his/her legal guardian.

The participant may discontinue participation in the study by withdrawing his/her consent at any time, without justification being required. In this case, the data cannot be deleted in order to guarantee the validity of the results and to comply with the legal obligations applicable to the study, but they will be coded in such a way that it is not possible to link them to your person.

EXTENDED INFORMATION ON THE PROCESSING OF PERSONAL DATA

In accordance with the provisions of current legislation on data protection applicable to the Rovira i Virgili University (URV) and published in the "Applicable legislation" section of the "Protection of personal data" area of the Electronic Office (https: //seuelectronica.urv.cat/rgpd/), the following information is brought to the attention of interested parties:

a) Who is responsible for the processing of your data?

· **Identification**	Universitat Rovira i Virgili CIF: Q9350003A
· **Mailing Address**	Carrer de l'Escorxador, s/n 43003 Tarragona
· **DPD contact details**	DPD – Delegats de Protecció de Dades de la URV E-mail: dpd@urv.cat

b) What personal data do we process and for what purpose?

Personal data are processed for the purpose of participating in the Master's Thesis on the terms described in the Participant Information Sheet. In the event that the study provides for the publication, dissemination and reuse of

the results obtained including personal data, personal data will be used for this purpose provided that the interested party has given his/her consent.

c) To which recipients will your data be communicated?

Within the framework of the aforementioned processing, your data will not be passed on to third parties unless there is a legal obligation to do so or unless expressly stated in the Participant Information Sheet.

d) What is the legitimacy for the processing of your data?

The legitimacy of this treatment is based on the consent given by the person concerned expressly.

e) What security measures do we apply in the processing of your data?

The University is responsible for applying the security measures and other obligations arising from the legislation for the protection of personal data, in accordance with the National Security Scheme, Royal Decree 3/2010.

In this sense, the Rovira i Virgili University has provided a Security Policy that can be consulted in the section on "Legislation and regulations" of the University website within "Own regulations" and "Other regulations", http://www.urv.cat/ca/universitat/normatives/altres-normes/.

In addition, the Participant Information Sheet specifies some specific safety measures that will be taken into account during the study.

f) What are the rights of data subjects?

The data subject has the right to access their personal data; to request the rectification of inaccurate data; to request cancellation and deletion; to object to the processing, including profiling; to limit until a certain date the processing of your data; and their portability in electronic format.

The participant can discontinue their participation in the study by withdrawing their consent at any time, without giving explanations. In this case, the data cannot be deleted to guarantee the validity of the results and comply with the legal obligations applicable to the study, but it will not be possible to link them to your person.

You can exercise the rights of access, rectification, cancellation, opposition, limitation and portability through written communication, detailing the request, addressed to the General Registry (Carrer de l'Escorxador, s/n, 43003 , Tarragona) or by submitting it to the General Registry of the University, in person or online, as indicated in https://seuelectronica.urv.cat/registre.html.

We also inform you that you have the right to lodge a complaint with the Catalan Data Protection Authority through the mechanism they establish. You can find more information at https://apdcat.gencat.cat/ca/inici.

Finally, we inform you that you can request information related to the protection of personal data by email to our data protection delegates at the address dpd@urv.cat.

g) How long will your data be kept?

The period of conservation of the data is 5 years once the study is completed, unless the Participant Information Sheet establishes a different period. In any case, the data will be kept until the revocation of the consent by the person concerned.

Appendix D

Informed Consent Form (English Version)

Title of the Master's Thesis:
The Effect of Glossing in Online L2 Reading on Incidental Vocabulary Learning

Principal researcher's contact details:
Leah Gaush
Email:
Telephone:
Postal address: 43003 Tarragona Spain

I ..... (full name of the participant) holder of identity card number .....

- I have read the copy that I have received of the Participant Information Sheet regarding the study.
- I have been able to ask and have received answers to my personal questions regarding the study and my participation in it.
- I understand that I am participating in this study in accordance with the specifications in the participant information document and in accordance with the answers that I have received to my questions, and I understand the risks and benefits that this entails.
- I accept that my participation is voluntary, and I freely agree to participate in the study.
- I understand that I can withdraw at any time from participating in the study and that my withdrawal will not affect me negatively in any way.
- I have been informed about how my personal data will be processed.
- I give my consent for my data to be accessed and used under the conditions specified in the document containing information on the study addressed to the participant.
  ☐**Yes** ☐**No**
- Once the research has been completed, the data obtained may be of interest to other related studies. In this regard, the following options are offered:
  ☐ **NOT TO AUTHORISE** the use of the data in other related research projects.
  ☐ **TO AUTHORISE** the use of the data in other related research projects.

To express their consent, the participant signs the present consent form on ..... in .....:

Signature of the participant .....

To express their consent, the legal representative of the participant signs the present consent form on ..... in .....:

Name of the legal representative.....
Relationship of the legal representative with the participant .....

Signature of the legal representative.....

Research Projects / Doctoral Theses / Master's Thesis / Bachelor's Thesis of the URV
Basic Data Protection Information

BASIC INFORMATION ON PERSONAL DATA PROTECTION	
Data Controller	The data controller is the Universitat Rovira i Virgili with Tax Identification Number Q9350003A and based at Carrer de l'Escorxador, s/n, 43003, Tarragona.
Purpose	To participate in the Master's Thesis under the terms described in the participant information sheet. If the study intends to publish, disseminate and reuse the results obtained, including personal data, the personal data will be used for these purposes provided that the interested party has given their consent.
Rights	The individuals concerned can exercise their right to access, rectify, remove, move, limit or oppose the processing of their data in writing to the General Registry of the URV at the same address as the URV, or in person at the General Registry of the URV or telematically in accordance with the instructions at https://seuelectronica.urv.cat/registre.html.
Further information	Individuals can find additional information about the processing of personal data in the *Master's Thesis at the URV* and about their rights at the URV's Processing Registry, which is published at https://seuelectronica.urv.cat/rgpd, where they will also find the Privacy Policy of the URV. They may also find this information on the Participant's Information Document regarding the study. Furthermore, they may ask our data protection officers any question regarding the protection of personal data by sending an email to dpd@urv.cat.

Appendix E

Pre-test

The Pre-test consisted of an online questionnaire, an online reading passage, and an offline vocabulary comprehension test. The online questionnaire is included as copied text from the online MS Form, and the vocabulary comprehension test is included exactly as it appeared to the participants in paper form.

Questionnaire

TFM Pre-test

This is the pre-test that will be used for research data for Leah Gaush's master's thesis. Your answers will be kept confidential and will not be shared with anyone. Please answer every question honestly. You will NOT be graded on this. This test will only be used to measure your progress. In total, the pre-test will take about 20 minutes to complete.

Participant Information

1. What is your full name?
2. What is your age?
3. What is your native language? (If "Other," please write which language)
    a. Spanish
    b. Catalan
    c. (Other)
4. How many years have you been studying English?
    a. Less than 4
    b. 4-6

c. 7-9

d. 10-12

e. More than 12

5. What is your current or most recent Cambridge English level?

    a. B1+

    b. B2

    c. C1

    d. C2

    e. I'm not sure because I have never taken the Cambridge English Assessment

Reading

Please read the following article carefully, as you will answer questions about it after you finish. Do not worry if you do not understand everything.

Link to reading passage:

https://docs.google.com/document/d/1LyZqu5OFSYD84N2ViZddKWCmfwSOAQWXvOIj11StOjc/edit?usp=sharing

6. Have you finished reading the article?

    a. Yes

    b. No

Thank you for your response!

You have finished reading for the Pre-test and may submit this survey. The researcher will now provide a paper reading test to complete.

Vocabulary Comprehension Test

Name:_____ Date:_____

Vocabulary Comprehension Test

Please answer the following questions about the vocabulary you saw in the article. The vocabulary words may have multiple meanings, so be sure to answer *according to the meaning and form used in context of the reading*. Do not worry if you cannot remember or do not know the answers. Just answer all the questions as best as you can.

1. What is the correct meaning of wandering (adjective) as used in the article?
    a. characterized by aimless, slow, or pointless movement
    b. a slow or relaxed walk
    c. to walk around in a relaxed way or without any direction
    d. to start talking about a different subject from the one you were originally discussing
2. Which sentence correctly uses the word wandering (adjective)?
    a. After a *wander* around the park, we returned home.
    b. He often has a *wandering* mind when sitting in boring meetings.
    c. We've been *wandering* from the point and need to get back on topic.
    d. She spent the afternoon *wandering* around town.

3. What is the correct meaning of reprimand (verb) as used in the article?
    a. a piece of strong criticism of a person or their behavior
    b. to make someone feel ashamed
    c. to tell someone officially that they have done something wrong
    d. to give a formal talk to a group of people, often at a university
4. Which sentence correctly uses the word reprimand (verb)?
    a. She was *reprimanded* by her teacher for biting another girl.
    b. It *reprimands* me that I treated her so badly.
    c. The teacher *reprimanded* the class after they all passed their exams.
    d. His boss gave him a severe *reprimand* for being late.

5. What is the correct meaning of spate (noun) as used in the article?
    a. an amount of something that has been collected
    b. a number of things that you should have done before and must do now
    c. objects positioned one on top of another
    d. an unusually large number of events that happen suddenly and at about the same time
6. Which sentence correctly uses the word spate (noun)?
    a. He had a *spate* of papers on his desk.
    b. Police are investigating a *spate* of burglaries in the area.
    c. Waves on the beach formed *spates* of sand.

d. I've got a huge *spate* of work to do.

7. What is the correct meaning of swindle (verb) as used in the article?
    a. to take something illegally from someone
    b. a situation in which someone gets money dishonestly from another person
    c. to do something quickly or effectively
    d. to cheat or trick someone in order to get money from them
8. Which sentence correctly uses the word swindle (verb)?
    a. What's the *swindle* to get this chair to fold up?
    b. They *swindled* local businesses out of thousands of euros.
    c. He likes to *swindle* his classmates to get them to do his homework for him.
    d. We were *swindled* out of our cell phones on the street.

9. What is the correct meaning of flattering (adjective) as used in the article?
    a. making something look or seem better or more attractive than usual
    b. to praise someone in order to make them feel important
    c. relating to the enjoyment or study of beauty
    d. the act of praising someone
10. Which sentence correctly uses the word flattering (adjective)?
    a. Their *flattering* remarks about me made me angry.
    b. Those beautiful buildings have little *flattering* appeal.
    c. Because he liked the product, he wrote a *flattering* review of it online.
    d. I knew she was only *flattering* me because she wanted to borrow some money.

11. What is the correct meaning of idleness (noun) as used in the article?
    a. to run or function very slowly
    b. something that is not useful
    c. without any particular purpose
    d. the state of being lazy and not willing to work
12. Which sentence correctly uses the word idleness (noun)?
    a. Give the child some *idleness* to calm down before going home.
    b. Jumping into an exercise routine after weeks of *idleness* can make you sore.
    c. A busy factory exhibits a lot of *idleness*.
    d. The woman was hired immediately because she was so *idle*.

13. What is the correct meaning of pre-emptive (adjective) as used in the article?
    a. not improving a complicated situation
    b. making someone less likely to do something by making it difficult for them to do it
    c. difficult to use, do, or deal with
    d. done before someone else can act, especially to prevent them doing what they had planned
14. Which sentence correctly uses the word pre-emptive (adjective)?
    a. The instructions were badly written and *pre-emptive*.

b. The mother grabbed the child's hand as a *pre-emptive* measure against her running into the street.
c. My car is quite *pre-emptive* to drive.
d. The *pre-emptive* to attending university is submitting your application.

15. What is the correct meaning of kinaesthetic (adjective) as used in the article?
    a. connected with the ability to know where the parts of your body are and how they are moving
    b. relating to sight or seeing
    c. connected with the physical sense of smell
    d. extremely or unusually strong or severe
16. Which sentence correctly uses the word kinaesthetic (adjective)?
    a. The dancers improvised their dance movements in response to their *kinaesthetic* experience.
    b. My friend has a very *kinaesthetic* nose because he can tell which ingredients are in a recipe without even tasting it!
    c. The *kinaesthetic* was so impactful that I wrote an essay about it.
    d. The artist was praised for his *kinaesthetic* talent in painting pictures of the ocean.

17. What is the correct meaning of eradicate (verb) as used in the article?
    a. the process of destroying something
    b. to move, especially quickly and powerfully
    c. to get rid of something completely or destroy something bad
    d. to move people from a dangerous place to somewhere safe
18. Which sentence correctly uses the word eradicate (verb)?
    a. The disease that once claimed millions of lives has now been *eradicated*.
    b. As a teacher, she played an important role in the *eradication* of language errors.
    c. The fire *eradicated* through the house and burned the top floor.
    d. Because of the incoming storm, they *eradicated* people to safety.

19. What is the correct meaning of inadvertently (adverb) as used in the article?
    a. unable to be removed
    b. in a way that is intentional
    c. in a way that is not intentional
    d. unwise and likely to have unwanted results, and therefore worth avoiding
20. Which sentence correctly uses the word inadvertently (adverb)?
    a. Nobody can take away our *inadvertent* right to freedom of speech.
    b. She was assigned a seat on the plane, so she *inadvertently* sat in her assigned seat.
    c. I gave my best friend good advice, which was *inadvertent.*
    d. We *inadvertently* threw away an important receipt.

Appendix F

Online Reading Passages

The reading passages which participants read for the pre-test and post-test were adapted from an informative article-style reading in *Gateway C1 Workbook* (Holley, 2017). Three different versions of the reading were created, which are included below exactly as they appeared online to the participants, excluding the page breaks, which did not appear in the experiment in order to most accurately imitate reading an online article.

Pre-test and Control Group

The Power of the Doodle

Long dismissed as a waste of time, doodling is finding new respect. Neuroscientists and researchers now say that it has benefits, above all for students.

A doodle is a **wandering** thought, untidy, uninhibited. Doodling is considered to be anti-intellectual and counter to serious learning, and any student caught doing it in class can expect to be **reprimanded**. This wouldn't be a problem if it weren't for the fact that it is now thought to be a tool that actually facilitates the learning process.

A recent **spate** of books and seminars has sparked a whole new interest in the practice. According to Sunni Brown, author of *The Doodle Revolution*, our society is so intensely focused on verbal information that we've become blind to the real value of doodling. She describes it as a powerful visual form of language that can have a profound impact on the way we process information and solve problems.

There is, she says, a disconnect between the way society perceives the activity, and the reality. If someone had looked the word up in a dictionary in the 17th century, for example, they would have found that a doodle was a simpleton or fool. In the 18th century, the word became a verb, and it meant to **swindle** or to make fun of someone. In the 19th century, a doodle was a corrupt politician. And today, dictionaries offer the following definitions: 'to make meaningless marks,' 'to do something of little value,' or, perhaps the least **flattering** of all, 'to do nothing.' In other words, doodling implies **idleness** and time-wasting.

The press tends to reinforce this idea. If an important person happens to doodle at a conference, it makes headlines across the globe. Newspapers typically use words such as ‘discovered’ or ‘caught’ or ‘found out’ to report the event, as if a criminal act had been committed.

However, rather than something we do when we’re not concentrating, doodling is often a **pre-emptive** measure that prevents us from losing focus. When listening, we tend to daydream, but the simple act of drawing can stop our minds from wandering.

What’s more, Brown believes that doodling has an impact on problem-solving. There are four ways that learners take in information to make decisions, she explains. These are visual, auditory, **kinaesthetic**, and written communication. In order for us to process information effectively, at least two of those modalities need to be engaged. If a student is listening and doodling at the same time, they are engaging more of these modalities. So rather than **eradicate** doodling from classrooms, Brown suggests that it’s in precisely that situation that it should be encouraged.

Artists and scientists throughout history have used doodling as a way to generate and refine ideas. For instance, the Polish mathematician Stanislaw Ulam started drawing a spiral of numbers on his paper while sitting in a conference. He then absent-mindedly circled all of the prime numbers and noticed a pattern – the primes were arranged along the diagonals of the spiral. Ulam had **inadvertently** discovered a hidden mathematical pattern for prime numbers, just through doodling.

Alexander Pushkin would draw the faces and people from his poems along the edges of his manuscripts, presumably allowing them to come to life in his imagination. Dostoyevky did the same. And J.K. Rowling would draw the characters and settings from her novels so that she could refer to them when writing and describe them with more clarity.

Virtually everyone has doodled at some point in their lives so it may be hard-wired in our brains. After all, making marks predates language as a means to convey ideas. We only need to look at cave drawings for evidence of this. And anthropological research into artistic activity in children shows that all children exhibit the same evolution in visual logic. In other words, there’s a predictable order in which visual language develops as they grow, in much the same way as there is in verbal language. If we eradicated doodling altogether, perhaps we would be denying a basic human impulse.

Doodling isn’t limited to those with artistic ability. As Brown points out, if it were about

creating great works of art, it would be like saying only those with literary talent should ever write. Even a very simple drawing can lead to insights and discoveries that may not be possible by words alone. And in these days of technology, for the digitally-minded, there are any number of apps on the market that allow you to doodle something on a screen, in near-infinite colours, using your index finger.

So the next time you find yourself doodling, don't stop. It may be that it's helping you to learn or boosting your creativity. In fact, if you're lucky, you might come up with your most inspired ideas.

Textual Gloss Group

The Power of the Doodle

Long dismissed as a waste of time, doodling is finding new respect. Neuroscientists and researchers now say that it has benefits, above all for students.

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wandering (adjective): characterized by aimless, slow, or pointless movement

reprimand (verb): to tell someone officially that they have done something wrong

A recent **spate** of books and seminars has sparked a whole new interest in the practice. According to Sunni Brown, author of *The Doodle Revolution*, our society is so intensely focused on verbal information that we've become blind to the real value of doodling. She describes it as a powerful visual form of language that can have a profound impact on the way we process information and solve problems.

spate (noun): an unusually large number of events that happen suddenly and at about the same time

There is, she says, a disconnect between the way society perceives the activity, and the reality. If someone had looked the word up in a dictionary in the 17th century, for example, they would have found that a doodle was a simpleton or fool. In the 18th century, the word became a verb, and it meant to **swindle** or to make fun of someone.

swindle (verb): to cheat or trick someone in order to get money from them

In the 19th century, a doodle was a corrupt politician. And today, dictionaries offer the following definitions: ‘to make meaningless marks,’ ‘to do something of little value,’ or, perhaps the least **flattering** of all, ‘to do nothing.’ In other words, doodling implies **idleness** and time-wasting.

flattering (adjective): making something look or seem better or more attractive than usual

idleness (noun): the state of being lazy and not willing to work

The press tends to reinforce this idea. If an important person happens to doodle at a conference, it makes headlines across the globe. Newspapers typically use words such as ‘discovered’ or ‘caught’ or ‘found out’ to report the event, as if a criminal act had been committed.

However, rather than something we do when we’re not concentrating, doodling is often a **pre-emptive** measure that prevents us from losing focus. When listening, we tend to daydream, but the simple act of drawing can stop our minds from wandering.

pre-emptive (adjective): done before someone else can act, especially to prevent them doing what they had planned

What’s more, Brown believes that doodling has an impact on problem-solving. There are four ways that learners take in information to make decisions, she explains. These are visual, auditory, **kinaesthetic**, and written communication. In order for us to process information effectively, at least two of those modalities need to be engaged. If a student is listening and doodling at the same time, they are engaging more of these modalities. So rather than **eradicate** doodling from classrooms, Brown suggests that it’s in precisely that situation that it should be encouraged.

kinaesthetic (adjective): connected with the ability to know where the parts of your body are and how they are moving

eradicate (verb): to get rid of something completely or destroy something bad

Artists and scientists throughout history have used doodling as a way to generate and refine ideas. For instance, the Polish mathematician Stanislaw Ulam started drawing a spiral of numbers on his paper while sitting in a conference. He then absent-mindedly circled all of the prime numbers and noticed a pattern – the primes were arranged along the diagonals of the spiral. Ulam had **inadvertently** discovered a hidden mathematical pattern for prime numbers, just through doodling.

inadvertently (adverb): in a way that is not intentional

Alexander Pushkin would draw the faces and people from

his poems along the edges of his manuscripts, presumably allowing them to come to life in his imagination. Dostoyevky did the same. And J.K. Rowling would draw the characters and settings from her novels so that she could refer to them when writing and describe them with more clarity.

Virtually everyone has doodled at some point in their lives so it may be hard-wired in our brains. After all, making marks predates language as a means to convey ideas. We only need to look at cave drawings for evidence of this. And anthropological research into artistic activity in children shows that all children exhibit the same evolution in visual logic. In other words, there's a predictable order in which visual language develops as they grow, in much the same way as there is in verbal language. If we eradicated doodling altogether, perhaps we would be denying a basic human impulse.

Doodling isn't limited to those with artistic ability. As Brown points out, if it were about creating great works of art, it would be like saying only those with literary talent should ever write. Even a very simple drawing can lead to insights and discoveries that may not be possible by words alone. And in these days of technology, for the digitally-minded, there are any number of apps on the market that allow you to doodle something on a screen, in near-infinite colours, using your index finger.

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Pictorial Gloss Group

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wandering (adjective)

A recent **spate** of books and seminars has sparked a whole new interest in the practice. According to Sunni Brown, author of *The Doodle Revolution*, our society is so intensely focused on verbal information that we've become blind to the real value of dodoodling. She describes it as a powerful visual form of language that can have a profound impact on the way we process information and solve problems.

reprimand (verb)

spate (noun)

There is, she says, a disconnect between the way society perceives the activity, and the reality. If someone had looked the word up in a dictionary in the 17th century, for example, they would have found that a doodle was a simpleton or fool. In the 18th century, the word became a verb, and it meant to **swindle** or to make fun of someone. In the 19th century, a doodle was a corrupt politician. And today, dictionaries offer the following definitions: 'to make meaningless marks,' 'to do something of little value,' or, perhaps the least **flattering** of all, 'to do nothing.' In other words, doodling implies **idleness** and time-wasting.

swindle (verb)

flattering (adjective)

The press tends to reinforce this idea. If an important person happens to doodle at a conference, it makes headlines across the globe. Newspapers typically use words such as 'discovered' or 'caught' or 'found out' to report the event, as if a criminal act had been committed.

idleness (noun)

However, rather than something we do when we're not concentrating, doodling is often a **pre-emptive** measure that prevents us from losing focus. When listening, we tend to daydream, but the simple act of drawing can stop our minds from wandering.

pre-emptive (adjective)

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kinaesthetic (adjective)

eradicate (verb)

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inadvertently (adverb)

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Textual-pictorial Gloss Group

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wandering (adjective): characterized by aimless, slow, or pointless movement

reprimand (verb): to tell someone officially that they have done something wrong

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spate (noun): an unusually large number of events that happen suddenly and at about the same time

swindle (verb): to cheat or trick someone in order to get money from them

flattering (adjective): making something look or seem better or more attractive than usual

idleness (noun): the state of being lazy and not willing to work

pre-emptive (adjective): done before someone else can act, especially to prevent them doing what they had planned

kinaesthetic (adjective): connected with the ability to know where the parts of your body are and how they are moving

eradicate (verb): to get rid of something completely or destroy something bad

Artists and scientists throughout history have used doodling as a way to generate and refine ideas. For instance, the Polish mathematician Stanislaw Ulam started drawing a spiral of numbers on his paper while sitting in a conference. He then absent-mindedly circled all of the prime numbers and noticed a pattern – the primes were arranged along the diagonals of the spiral. Ulam had **inadvertently** discovered a hidden mathematical pattern for prime numbers, just through doodling.

inadvertently
(adverb): in a way that is not intentional

Alexander Pushkin would draw the faces and people from his poems along the edges of his manuscripts, presumably allowing them to come to life in his imagination. Dostoyevky did the same. And J.K. Rowling would draw the characters and settings from her novels so that she could refer to them when writing and describe them with more clarity.

Virtually everyone has doodled at some point in their lives so it may be hard-wired in our brains. After all, making marks predates language as a means to convey ideas. We only need to look at cave drawings for evidence of this. And anthropological research into artistic activity in children shows that all children exhibit the same evolution in visual logic. In other words, there's a predictable order in which visual language develops as they grow, in much the same way as there is in verbal language. If we eradicated doodling altogether, perhaps we would be denying a basic human impulse.

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Appendix G

Post-test

The post-test consisted of an online questionnaire, an online reading passage, and an offline vocabulary comprehension test. The online questionnaire is included as copied text from the online MS Form. The only place where the questionnaire differed from group to group was the "Link to reading passage," which appeared as a different link depending on which experimental group the participants were a part of. The vocabulary comprehension test is included exactly as it appeared to the participants in paper form.

Questionnaire

TFM Post-test

This is the pre-test that will be used for research data for Leah Gaush's master's thesis. Your answers will be kept confidential and will not be shared with anyone. Please answer every question honestly. You will NOT be graded on this.

Participant Information

1. What is your full name?

Reading

Please read the following article carefully, as you will answer questions about it after you finish. Do not worry if you do not understand everything.

Link to reading passage: [link]

7. Have you finished reading the article?
    a. Yes
    b. No

Thank you for your response!

You have finished reading for the Post-test and may submit this survey. The researcher will now provide a paper reading test to complete.

Vocabulary Comprehension Test

Name:_____ Date:_____

Vocabulary Comprehension Post-test

Please answer the following questions about the vocabulary you saw in the article. The vocabulary words may have multiple meanings, so be sure to answer *according to the meaning and form used in context of the reading*. Do not worry if you cannot remember or do not know the answers. Just answer all the questions as best as you can.

1. What is the correct meaning of idleness (noun) as used in the article?
    a. something that is not useful
    b. the state of being lazy and not willing to work
    c. without any particular purpose
    d. to run or function very slowly
2. Which sentence correctly uses the word idleness (noun)?
    a. A busy factory exhibits a lot of *idleness*.
    b. Jumping into an exercise routine after weeks of *idleness* can make you sore.
    c. The woman was hired immediately because she was so *idle*.
    d. Give the child some *idleness* to calm down before going home.

3. What is the correct meaning of inadvertently (adverb) as used in the article?
    a. unable to be removed
    b. unwise and likely to have unwanted results, and therefore worth avoiding
    c. in a way that is not intentional
    d. in a way that is intentional
4. Which sentence correctly uses the word inadvertently (adverb)?
    a. Nobody can take away our *inadvertent* right to freedom of speech.
    b. I gave my best friend good advice, which was *inadvertent.*
    c. She was assigned a seat on the plane, so she *inadvertently* sat in her assigned seat.
    d. We *inadvertently* threw away an important receipt.

5. What is the correct meaning of wandering (adjective) as used in the article?

a. to start talking about a different subject from the one you were originally discussing
b. characterized by aimless, slow, or pointless movement
c. a slow or relaxed walk
d. to walk around in a relaxed way or without any direction

6. Which sentence correctly uses the word wandering (adjective)?
    a. She spent the afternoon *wandering* around town.
    b. He often has a *wandering* mind when sitting in boring meetings.
    c. We've been *wandering* from the point and need to get back on topic.
    d. After a *wander* around the park, we returned home.

7. What is the correct meaning of swindle (verb) as used in the article?
    a. to do something quickly or effectively
    b. a situation in which someone gets money dishonestly from another person
    c. to take something illegally from someone
    d. to cheat or trick someone in order to get money from them
8. Which sentence correctly uses the word swindle (verb)?
    a. They *swindled* local businesses out of thousands of euros.
    b. What's the *swindle* to get this chair to fold up?
    c. He likes to *swindle* his classmates to get them to do his homework for him.
    d. We were *swindled* out of our cell phones on the street.

9. What is the correct meaning of eradicate (verb) as used in the article?
    a. to move people from a dangerous place to somewhere safe
    b. the process of destroying something
    c. to move, especially quickly and powerfully
    d. to get rid of something completely or destroy something bad
10. Which sentence correctly uses the word eradicate (verb)?
    a. The fire *eradicated* through the house and burned the top floor.
    b. Because of the incoming storm, they *eradicated* people to safety.
    c. The disease that once claimed millions of lives has now been *eradicated*.
    d. As a teacher, she played an important role in the *eradication* of language errors.

11. What is the correct meaning of kinaesthetic (adjective) as used in the article?
    a. connected with the ability to know where the parts of your body are and how they are moving
    b. extremely or unusually strong or severe
    c. relating to sight or seeing
    d. connected with the physical sense of smell
12. Which sentence correctly uses the word kinaesthetic (adjective)?
    a. My friend has a very *kinaesthetic* nose because he can tell which ingredients are in a recipe without even tasting it!
    b. The artist was praised for his *kinaesthetic* talent in painting pictures of the ocean.
    c. The *kinaesthetic* was so impactful that I wrote an essay about it.

d. The dancers improvised their dance movements in response to their *kinaesthetic* experience.

13. What is the correct meaning of reprimand (verb) as used in the article?
    a. to give a formal talk to a group of people, often at a university
    b. to tell someone officially that they have done something wrong
    c. to make someone feel ashamed
    d. a piece of strong criticism of a person or their behavior
14. Which sentence correctly uses the word reprimand (verb)?
    a. It *reprimands* me that I treated her so badly.
    b. His boss gave him a severe *reprimand* for being late.
    c. She was *reprimanded* by her teacher for biting another girl.
    d. The teacher *reprimanded* the class after they all passed their exams.

15. What is the correct meaning of pre-emptive (adjective) as used in the article?
    a. not improving a complicated situation
    b. done before someone else can act, especially to prevent them doing what they had planned
    c. making someone less likely to do something by making it difficult for them to do it
    d. difficult to use, do, or deal with
16. Which sentence correctly uses the word pre-emptive (adjective)?
    a. My car is quite *pre-emptive* to drive.
    b. The instructions were badly written and *pre-emptive*.
    c. The mother grabbed the child's hand as a *pre-emptive* measure against her running into the street.
    d. The *pre-emptive* to attending university is submitting your application.

17. What is the correct meaning of spate (noun) as used in the article?
    a. an amount of something that has been collected
    b. a number of things that you should have done before and must do now
    c. an unusually large number of events that happen suddenly and at about the same time
    d. objects positioned one on top of another
18. Which sentence correctly uses the word spate (noun)?
    a. Police are investigating a *spate* of burglaries in the area.
    b. I've got a huge *spate* of work to do.
    c. He had a *spate* of papers on his desk.
    d. Waves on the beach formed *spates* of sand.

19. What is the correct meaning of flattering (adjective) as used in the article?
    a. the act of praising someone
    b. relating to the enjoyment or study of beauty
    c. making something look or seem better or more attractive than usual
    d. to praise someone in order to make them feel important

20. Which sentence correctly uses the word flattering (adjective)?
    a. Their *flattering* remarks about me made me angry.
    b. Because he liked the product, he wrote a *flattering* review of it online.
    c. Those beautiful buildings have little *flattering* appeal.
    d. I knew she was only *flattering* me because she wanted to borrow some money.

Appendix H

Vocabulary from the Reading Passage

The 10 vocabulary words from the reading passage and the resources used in the vocabulary comprehension test as well as the pictorial and textual-pictorial reading glosses are outlined below.

"Wandering" is an adjective "characterized by aimless, slow, or pointless movement" (Merriam-Webster, Incorporated, n.d.). According to the Cambridge Dictionary, the verb "wander" is categorized as a B2 level word (Cambridge University Press, n.d.). The image used to represent this word in the reading glosses is shown in Figure H1 below (*Mind-wandering over matter*, 2014).

Figure H1

Wandering

"Reprimand" is a verb meaning "to tell someone officially that they have done something wrong" (Cambridge University Press, n.d.). The correct example sentence from the vocabulary comprehension test was also taken from Cambridge Dictionary online. The image used to represent this word in the reading glosses is shown in Figure H2 below (Suteeratat, n.d.).

Figure H2

Reprimand

"Spate" is a noun meaning "an unusually large number of events that happen suddenly and at about the same time (Cambridge University Press, n.d.). The correct example sentence from the vocabulary comprehension test was adapted from Cambridge Dictionary online. The image used to represent this word in the reading glosses is shown in Figure H3 below (BoxerX, n.d.).

Figure H3

Spate

"Swindle" is a verb meaning "to cheat or trick someone in order to get money from them (Cambridge University Press, n.d.). The correct example sentence from the vocabulary comprehension test was taken from this dictionary. The image used to represent this word in the reading glosses is shown in Figure H4 below (Vectorlab2D, n.d.).

Figure H4

Swindle

"Flattering" is an adjective meaning "making something look or seem better or more attractive than usual (Cambridge University Press, n.d.). The correct example sentence from the vocabulary comprehension test was taken from this dictionary. The image used to represent this word in the reading glosses is shown in Figure H5 below (*Flattering adjective*, 2020).

Figure H5

Flattering

"Idleness" is a noun meaning "the state of being lazy and not willing to work (Cambridge University Press, n.d.). Cambridge Dictionary classifies "idle" as a C1 level word. The correct example sentence from the vocabulary comprehension test was taken from this dictionary. The image used to represent this word in the reading glosses is shown in Figure H6 below (Lemono, n.d.).

Figure H6

Idleness

"Pre-emptive" is an adjective meaning "done before someone else can act, especially to prevent them doing what they had planned (Cambridge University Press, n.d.). The correct example sentence from the vocabulary comprehension test was taken from this dictionary. The image used to represent this word in the reading glosses is shown in Figure H7 below (Vectorjuice, n.d.).

Figure H7

Pre-emptive

"Kinaesthetic" is an adjective meaning "connected with the ability to know where the parts of your body are and how they are moving (Cambridge University Press, n.d.). The correct example sentence from the vocabulary comprehension test was taken from this dictionary. The image used to represent this word in the reading glosses is shown in Figure H8 below (Nazyuliya, n.d.).

Figure H8

Kinaesthetic

"Eradicate" is a verb meaning "to get rid of something completely or destroy something bad (Cambridge University Press, n.d.). According to the Cambridge Dictionary, this is a C2 level word. The correct example sentence from the vocabulary comprehension test was taken from this dictionary. The image used to represent this word in the reading glosses is shown in Figure H9 below (Kamysh, n.d.).

Figure H9

Eradicate

"Inadvertently" is an adverb meaning "in a way that is not intentional (Cambridge University Press, n.d.). The correct example sentence from the vocabulary comprehension test was taken from this dictionary. The image used to represent this word in the reading glosses is shown in Figure H10 below (Kojilive, n.d.).

Figure H10

Inadvertently

Appendix I

Post-questionnaire

As a part of the post-test, participants were given an online questionnaire to evaluate their preferences regarding reading glosses and their opinions regarding the experiment itself. The questions from the questionnaire are included below as copied text from the online MS Form.

TFM Reader Preferences and Perceptions

After completing the Post-test and Vocabulary Comprehension Test, please answer the questions in this survey about your experience reading. There are no right or wrong answers, so please answer honestly.

Participant Information

1. What is your full name?

Preferences

Please read the description of glosses and gloss types before answering the questions.

The reading passage you have just read may have contained glosses, which aid in vocabulary learning.

A gloss is a brief notation or summary of the meaning of an unknown or unfamiliar word, usually found as a note in the margin. Glosses can be interpretations, explanations, or representations.

A reading passage without glossing may bold or highlight unknown words but not provide any explanations of the words.

There are 3 different types of reading glosses: textual, pictorial, and textual-pictorial.

1) A textual gloss is a word, definition, or written explanation of an unknown or unfamiliar word.

2) A pictorial gloss is a picture, photo, or other visual representation that matches an unknown or unfamiliar word.

3) A textual-pictorial gloss is a combination of textual and pictorial glosses which provides a written and a visual explanation of an unknown or unfamiliar word.

Answer to what degree you agree with the statements below, from Strongly Disagree to Strongly Agree.

1. I prefer using glosses when reading in English.
2. I prefer using textual glosses the most.
3. Glossing is helpful for me when reading in English.
4. Textual-pictorial glosses are the most helpful for me.
5. Using reading glosses would help me learn vocabulary better.
6. Glossing with just text/words is the most beneficial to me as a reader and learner of English.
7. I prefer using reading glosses to learn vocabulary.
8. Looking at pictures and reading definitions of vocabulary while reading would help me learn vocabulary the best.
9. I prefer using pictorial glosses while reading in English.
10. Pictorial glossing is the most helpful for me when reading in English.
11. Glossing with just pictures is the most beneficial to me as a reader and learner of English.
12. Reading definitions of the vocabulary while reading would help me learn vocabulary the best.

13. Textual glosses are the most helpful for me when reading.
14. I prefer using textual-pictorial glosses while reading in English.
15. Looking at pictures of what the vocabulary means while reading would help me learn vocabulary the best.
16. Glossing with text/words and pictures would be the most beneficial to me as a reader and learner of English.

Perceptions

The following questions concern your overall experience participating in this study. Answer honestly to what degree you agree with the statements below, from Strongly Disagree to Strongly Agree.

1. I enjoyed reading the article.
2. I found the article interesting and engaging.
3. The article was at my language level (not too easy and not too difficult to read)
4. Participating in this study was beneficial to me.
5. I learned something new during this study.
6. The Vocabulary Comprehension Test was clear and easy to understand.
7. I would like to use reading glosses to help me learn vocabulary in the future.
8. I enjoyed participating in this study.

The following question is an optional short-answer question.

9. Overall, what did you think of this study? Do you have any questions, comments, or suggestions for the researcher?

Appendix J

Reader Glossing Preferences

Glossing in General

Table J1

Likert-scale Responses for Reader Preferences for Glossing in General

Participant	Statement			
	I prefer using glosses when reading in English.	Glossing is helpful for me when reading in English.	Using reading glosses would help me learn vocabulary better.	I prefer using reading glosses to learn vocabulary.
1	3	4	3	3
2	4	5	5	4
3	5	5	5	4
4	5	5	5	3
5	4	5	4	2
6	3	3	5	1
7	5	5	5	5
8	5	5	5	5
9	5	5	5	4
10	4	4	3	4
11	5	5	5	5
12	4	5	5	3
13	5	5	5	5
14	4	5	5	4
15	3	4	4	4
16	2	5	4	3
17	4	5	4	3
18	3	4	4	5
19	2	2	4	4
20	4	5	4	4
21	5	5	5	4
22	5	5	4	4
23	4	5	5	3
24	5	5	5	3
25	4	5	5	4
26	5	4	5	4
27	5	4	5	4
28	5	4	4	3
29	4	3	4	3
30	4	4	4	2
31	4	4	5	5
32	4	3	4	4
33	5	5	5	3
34	4	4	4	4
35	4	4	5	5
36	3	2	4	4

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree.

Table J2

Chi-square Descriptives for Preferences for Glossing in General

Statement	Likert Response	Observed	Expected: H_0 (a)	95% Confidence Interval	
				Lower	Upper
I prefer using glosses when reading in English.	1 Strongly Disagree	0	7.200	0.000	3.506
	2 Disagree	2	7.200	0.245	6.719
	3 Neither Agree nor Disagree	5	7.200	1.680	10.619
	4 Agree	15	7.200	9.185	21.328
	5 Strongly Agree	14	7.200	8.331	20.353
Glossing is helpful for me when reading in English.	1 Strongly Disagree	0	7.200	0.000	3.506
	2 Disagree	2	7.200	0.245	6.719
	3 Neither Agree nor Disagree	3	7.200	0.631	8.089
	4 Agree	11	7.200	5.885	17.319
	5 Strongly Agree	20	7.200	13.715	25.943
Using reading glosses would help me learn vocabulary better.	1 Strongly Disagree	0	7.200	0.000	3.506
	2 Disagree	0	7.200	0.000	3.506
	3 Neither Agree nor Disagree	2	7.200	0.245	6.719
	4 Agree	14	7.200	8.331	20.353
	5 Strongly Agree	20	7.200	13.715	25.943
I prefer using reading glosses to learn vocabulary.	1 Strongly Disagree	1	7.200	0.025	5.230
	2 Disagree	2	7.200	0.245	6.719
	3 Neither Agree nor Disagree	10	7.200	5.112	16.267
	4 Agree	16	7.200	10.057	22.285
	5 Strongly Agree	7	7.200	2.950	12.969

Note. Confidence intervals are based on independent binomial distributions.

Figure J1

Chi-square Descriptives Plot for "I prefer using glosses when reading in English."

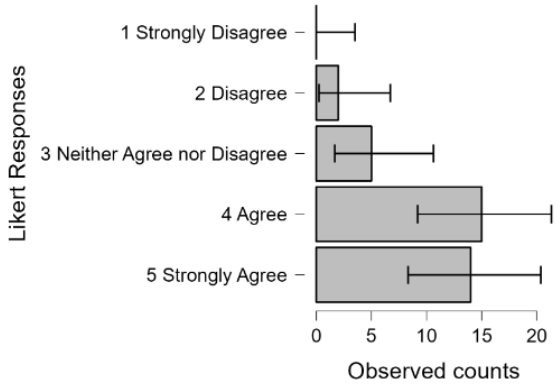


Figure J2

Chi-square Descriptives Plot for "Glossing is helpful for me when reading in English."

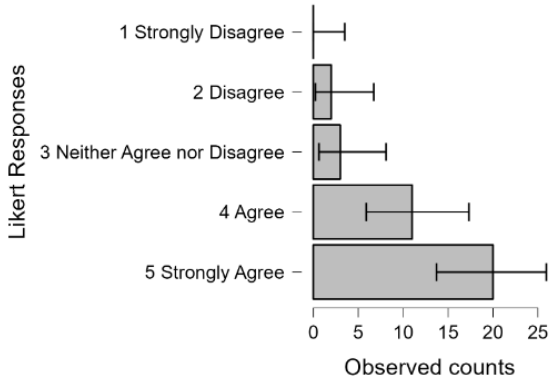


Figure J3

Chi-square Descriptives Plot for "Using reading glosses would help me learn vocabulary better."

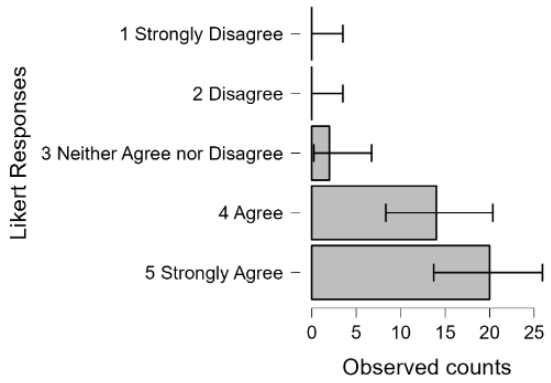
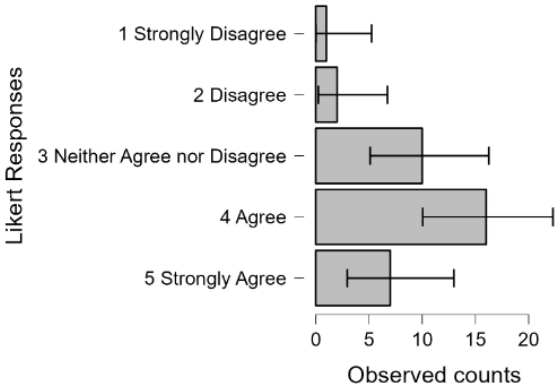


Figure J4

Chi-square Descriptives Plot for "I prefer using reading glosses to learn vocabulary."



Textual Glossing

Table J3

Likert-scale Responses for Reader Preferences for Textual Glossing

Participant	Statement			
	I prefer using textual glosses the most.	Glossing with just text/words is the most beneficial to me as a reader and learner of English.	Reading definitions of the vocabulary while reading would help me learn vocabulary the best.	Textual glosses are the most helpful for me when reading.
1	3	3	4	4
2	4	5	4	5
3	3	3	4	4
4	5	3	5	4
5	4	2	4	4
6	3	3	3	1
7	2	2	5	1
8	5	5	5	5
9	1	1	5	2
10	3	3	4	3
11	5	5	5	5
12	3	3	4	4
13	5	5	5	5
14	4	4	5	5
15	3	4	4	4
16	3	4	2	3
17	5	5	4	3
18	3	5	5	5
19	4	3	2	4
20	3	4	4	4
21	5	5	5	5
22	5	4	5	5
23	4	3	5	4
24	2	4	4	3
25	5	4	5	4
26	3	2	4	4
27	4	4	5	4
28	4	3	4	3
29	3	4	4	3
30	5	3	4	5
31	2	5	5	5
32	4	4	3	4
33	4	5	5	4
34	3	2	4	3
35	4	3	4	4
36	3	3	4	2

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree.

Table J4

Chi-square Descriptives for Textual Glossing Preferences

Statement	Likert Response	Observed	Expected: H_0 (a)	95% Confidence Interval	
				Lower	Upper
I prefer using textual glosses the most.	1 Strongly Disagree	1	7.200	0.025	5.230
	2 Disagree	3	7.200	0.631	8.089
	3 Neither Agree nor Disagree	13	7.200	7.496	19.360
	4 Agree	10	7.200	5.112	16.267
	5 Strongly Agree	9	7.200	4.363	15.193
Glossing with just text/words is the most beneficial to me as a reader and learner of English.	1 Strongly Disagree	1	7.200	0.025	5.230
	2 Disagree	4	7.200	1.120	9.382
	3 Neither Agree nor Disagree	12	7.200	6.680	18.349
	4 Agree	10	7.200	5.112	16.267
	5 Strongly Agree	9	7.200	4.363	15.193
Reading definitions of the vocabulary while reading would help me learn vocabulary the best.	1 Strongly Disagree	0	7.200	0.000	3.506
	2 Disagree	2	7.200	0.245	6.719
	3 Neither Agree nor Disagree	2	7.200	0.245	6.719
	4 Agree	17	7.200	10.946	23.225
	5 Strongly Agree	15	7.200	9.185	21.328
Textual glosses are the most helpful for me when reading.	1 Strongly Disagree	2	7.200	0.245	6.719
	2 Disagree	2	7.200	0.245	6.719
	3 Neither Agree nor Disagree	7	7.200	2.950	12.969
	4 Agree	15	7.200	9.185	21.328
	5 Strongly Agree	10	7.200	5.112	16.267

Note. Confidence intervals are based on independent binomial distributions.

Figure J5

Chi-square Descriptives Plot for "I prefer using textual glosses the most."

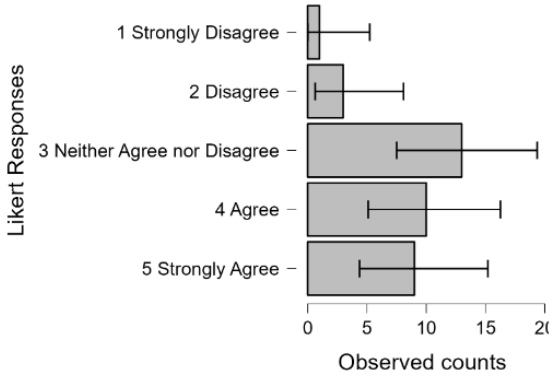


Figure J6

Chi-square Descriptives Plot for "Glossing with just text/words is the most beneficial to me as a reader and learner of English."

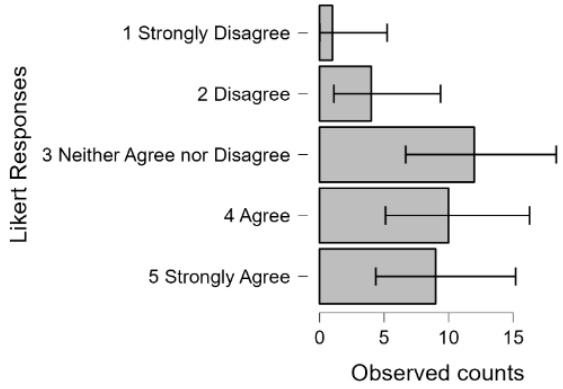


Figure J7

Chi-square Descriptives Plot for "Reading definitions of the vocabulary while reading would help me learn vocabulary the best."

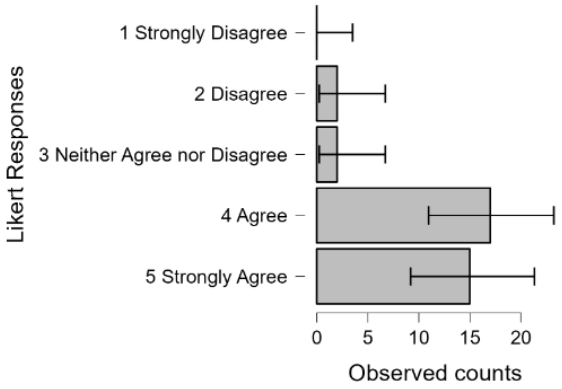
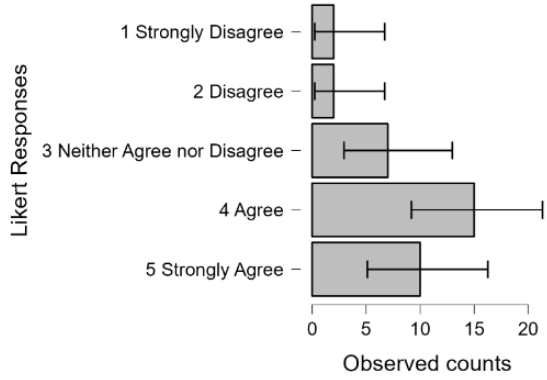


Figure J8

Chi-square Descriptives Plot for "Textual glosses are the most helpful for me when reading."



Pictorial Glossing

Table J5

Likert-scale Responses for Reader Preferences for Pictorial Glossing

Participant	Statement			
	I prefer using pictorial glosses while reading in English.	Pictorial glossing is the most helpful for me when reading in English.	Looking at pictures of what the vocabulary means while reading would help me learn vocabulary the best.	Glossing with just pictures is the most beneficial to me as a reader and learner of English.
1	3	3	3	2
2	2	1	2	1
3	3	3	4	3
4	4	3	4	2
5	4	4	2	2
6	3	3	3	1
7	5	4	5	2
8	5	5	5	3
9	3	3	5	3
10	4	4	4	3
11	4	3	5	2
12	3	3	4	2
13	5	4	5	4
14	3	4	4	4
15	4	4	4	4
16	3	3	3	3
17	1	2	4	2
18	4	4	4	4
19	4	2	4	2
20	3	2	3	4
21	2	2	5	2
22	4	3	5	5
23	2	2	4	2
24	4	4	4	2
25	3	2	3	2
26	4	4	4	2
27	4	3	4	4
28	1	3	1	1
29	3	3	4	3
30	2	2	2	2
31	5	5	5	5
32	3	4	2	3
33	3	3	3	2
34	4	4	5	4
35	3	2	3	2
36	1	1	2	1

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree.

Table J6

Chi-square Descriptives for Pictorial Glossing Preferences

Statement	Likert Response	Observed	Expected: H_0 (a)	95% Confidence Interval	
				Lower	Upper
I prefer using pictorial glosses while reading in English.	1 Strongly Disagree	3	7.200	0.631	8.089
	2 Disagree	4	7.200	1.120	9.382
	3 Neither Agree nor Disagree	13	7.200	7.496	19.360
	4 Agree	12	7.200	6.680	18.349
	5 Strongly Agree	4	7.200	1.120	9.382
Pictorial glossing is the most helpful for me when reading in English.	1 Strongly Disagree	2	7.200	0.245	6.719
	2 Disagree	8	7.200	3.641	14.095
	3 Neither Agree nor Disagree	13	7.200	7.496	19.360
	4 Agree	11	7.200	5.885	17.319
	5 Strongly Agree	2	7.200	0.245	6.719
Looking at pictures of what the vocabulary means while reading would help me learn vocabulary the best.	1 Strongly Disagree	1	7.200	0.025	5.230
	2 Disagree	5	7.200	1.680	10.619
	3 Neither Agree nor Disagree	7	7.200	2.950	12.969
	4 Agree	14	7.200	8.331	20.353
	5 Strongly Agree	9	7.200	4.363	15.193
Glossing with just pictures is the most beneficial to me as a reader and learner of English.	1 Strongly Disagree	4	7.200	1.120	9.382
	2 Disagree	16	7.200	10.057	22.285
	3 Neither Agree nor Disagree	7	7.200	2.950	12.969
	4 Agree	7	7.200	2.950	12.969
	5 Strongly Agree	2	7.200	0.245	6.719

Note. Confidence intervals are based on independent binomial distributions.

Figure J9

Chi-square Descriptives Plot for "I prefer using pictorial glosses while reading in English."

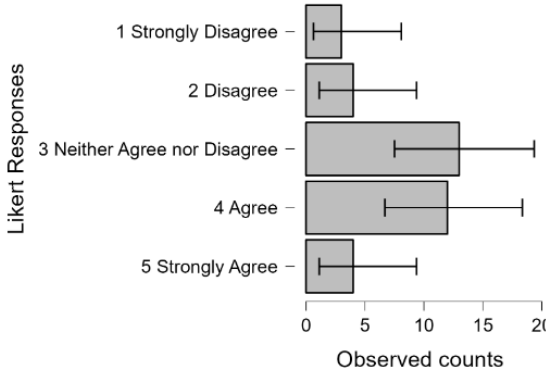


Figure J10

Chi-square Descriptives Plot for "Pictorial glossing is the most helpful for me when reading in English."

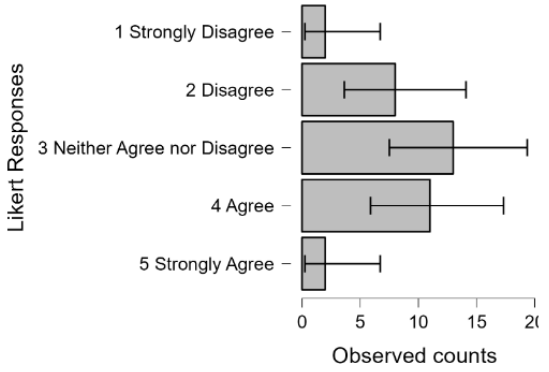


Figure J11

Chi-square Descriptives Plot for "Looking at pictures of what the vocabulary means while reading would help me learn vocabulary the best."

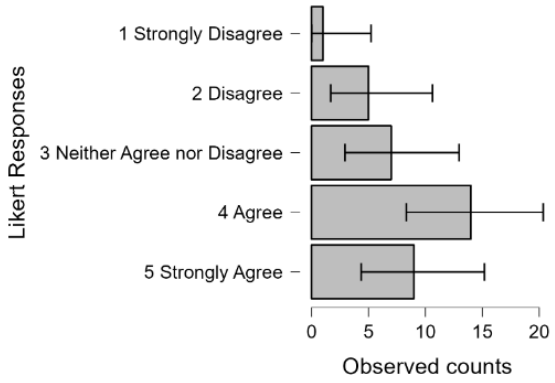
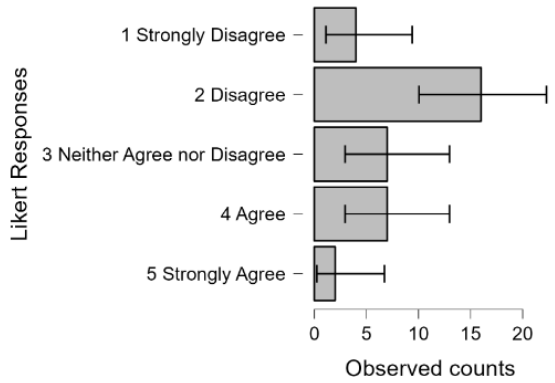


Figure J12

Chi-square Descriptives Plot "Glossing with just pictures is the most beneficial to me as a reader and learner of English."



Textual-pictorial Glossing

Table J7

Likert-scale Responses for Reader Preferences for Textual-pictorial Glossing

Participant	Statement			
	Textual-pictorial glosses are the most helpful for me.	Looking at pictures and reading definitions of vocabulary while reading would help me learn vocabulary the best.	I prefer using textual-pictorial glosses while reading in English.	Glossing with text/words and pictures would be the most beneficial to me as a reader and learner of English.
1	4	4	4	3
2	2	2	2	1
3	4	4	3	3
4	3	5	3	5
5	5	5	5	4
6	3	3	1	1
7	5	5	5	2
8	5	5	5	5
9	5	4	5	5
10	4	4	4	4
11	2	4	5	5
12	4	5	5	4
13	5	5	4	5
14	3	4	5	5
15	4	5	4	4
16	3	5	3	4
17	2	4	3	5
18	4	4	4	4
19	4	4	2	4
20	3	4	3	3
21	4	4	4	4
22	4	4	5	5
23	5	5	5	5
24	5	5	5	4
25	4	4	3	4
26	5	5	5	4
27	4	4	4	4
28	2	4	2	2
29	4	4	4	4
30	3	4	3	4
31	5	5	5	5
32	3	3	4	5
33	3	2	4	3
34	5	5	5	5
35	5	4	5	5
36	4	4	3	4

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree.

Table J8

Chi-square Descriptives for Textual-pictorial Glossing Preferences

Statement	Likert Response	Observed	Expected: H_0 (a)	95% Confidence Interval	
				Lower	Upper
Textual-pictorial glosses are the most helpful for me.	1 Strongly Disagree	0	7.200	0.000	3.506
	2 Disagree	4	7.200	1.120	9.382
	3 Neither Agree nor Disagree	8	7.200	3.641	14.095
	4 Agree	13	7.200	7.496	19.360
	5 Strongly Agree	11	7.200	5.885	17.319
Looking at pictures and reading definitions of vocabulary while reading would help me learn vocabulary the best.	1 Strongly Disagree	0	7.200	0.000	3.506
	2 Disagree	2	7.200	0.245	6.719
	3 Neither Agree nor Disagree	2	7.200	0.245	6.719
	4 Agree	19	7.200	12.775	25.054
	5 Strongly Agree	13	7.200	7.496	19.360
I prefer using textual-pictorial glosses while reading in English.	1 Strongly Disagree	1	7.200	0.025	5.230
	2 Disagree	3	7.200	0.631	8.089
	3 Neither Agree nor Disagree	8	7.200	3.641	14.095
	4 Agree	10	7.200	5.112	16.267
	5 Strongly Agree	14	7.200	8.331	20.353
Glossing with text/words and pictures would be the most beneficial to me as a reader and learner of English.	1 Strongly Disagree	2	7.200	0.245	6.719
	2 Disagree	2	7.200	0.245	6.719
	3 Neither Agree nor Disagree	4	7.200	1.120	9.382
	4 Agree	15	7.200	9.185	21.328
	5 Strongly Agree	13	7.200	7.496	19.360

Note. Confidence intervals are based on independent binomial distributions.

Figure J13

Chi-square Descriptives Plots for "Textual-pictorial glosses are the most helpful for me."

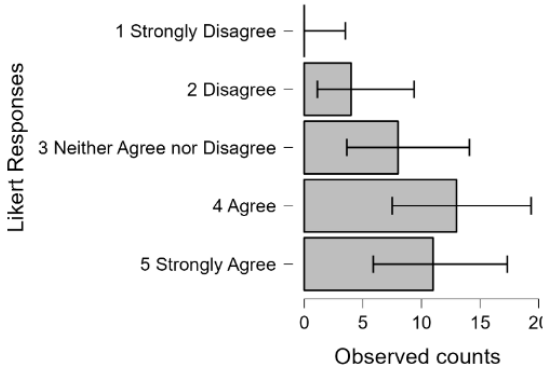


Figure J14

Chi-square Descriptives Plot for "Looking at pictures and reading definitions of vocabulary while reading would help me learn vocabulary the best."

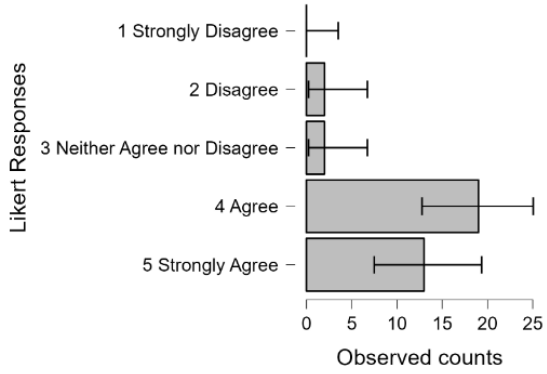


Figure J15

Chi-square Descriptives Plot for "I prefer using textual-pictorial glosses while reading in English."

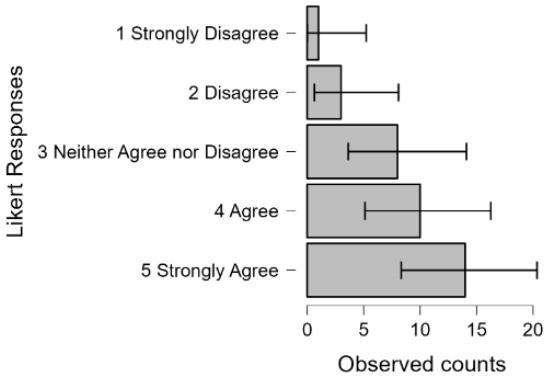
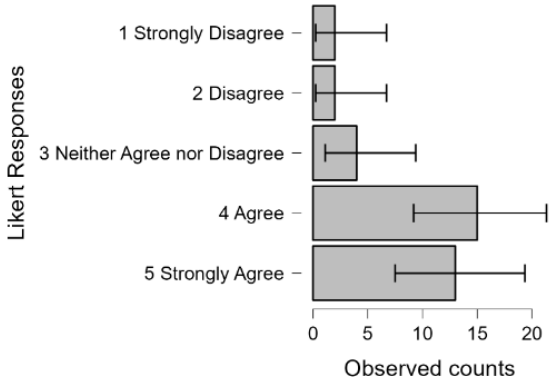


Figure J16

Chi-square Descriptives Plot for "Glossing with text/words and pictures would be the most beneficial to me as a reader and learner of English."



Appendix K

Participant Perceptions of the Study

Table K1

Likert-scale Responses for Participant Perceptions of the Study

Participant	Statement							
	I enjoyed reading the article.	I found the article interesting and engaging.	The article was at my language level (not too easy and not too difficult to read).	Participating in this study was beneficial to me.	I learned something new during this study.	The vocabulary comprehension test was clear and easy to understand.	I would like to use reading glosses to help me learn vocabulary in the future.	I enjoyed participating in this study.
1	4	4	3	3	3	3	4	4
2	4	4	5	5	5	3	4	5
3	3	3	2	4	4	2	4	4
4	5	4	5	4	4	4	5	5
5	3	3	4	3	4	4	4	3
6	5	5	3	5	5	5	5	5
7	4	5	5	5	5	5	5	5
8	5	5	3	5	5	5	5	5
9	3	4	2	5	3	2	5	3
10	4	4	2	3	4	3	4	4
11	2	2	2	4	4	2	5	4
12	3	4	4	4	4	3	4	5
13	4	4	3	5	4	3	5	5
14	3	3	1	3	4	2	5	3
15	4	4	4	3	4	4	4	4
16	4	5	3	3	4	5	2	5
17	1	4	2	3	5	2	4	4
18	2	2	3	3	4	4	4	3
19	4	2	2	4	4	4	3	2
20	4	4	3	3	4	5	4	4
21	3	4	3	4	4	4	5	5
22	4	4	4	4	4	4	4	4
23	3	4	4	4	5	5	5	4
24	4	4	3	4	4	4	5	5
25	4	4	4	3	5	5	4	5
26	4	4	3	4	4	3	5	5
27	3	3	2	4	4	4	4	4
28	4	2	3	2	3	5	2	2
29	3	2	2	3	3	4	3	3
30	1	3	4	4	4	4	5	3
31	4	4	2	5	5	4	5	5
32	4	3	2	5	4	3	4	4
33	4	4	5	5	5	5	5	5
34	4	4	4	4	4	4	4	5
35	3	3	4	4	4	3	5	4
36	5	5	5	4	5	5	4	5

Note. 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree.

Figure K1

Chi-square Descriptives Plot for "I enjoyed reading the article."

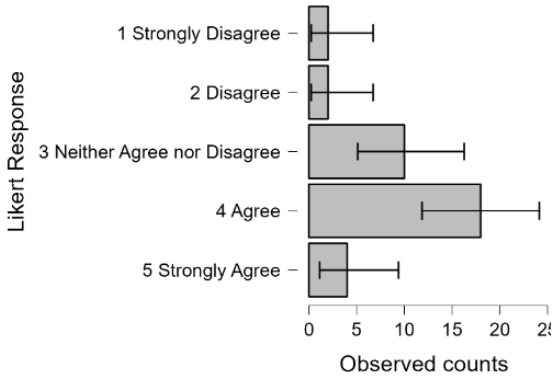


Figure K2

Chi-square Descriptives Plot for "I found the article interesting and engaging."

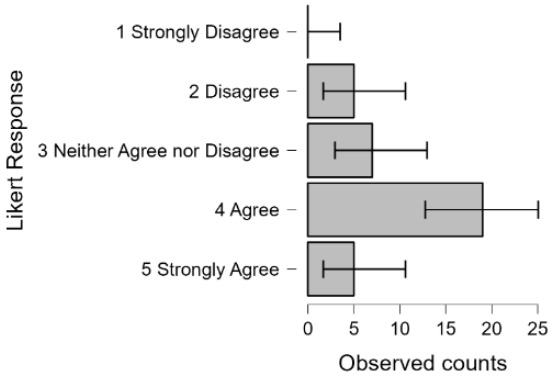


Figure K3

Chi-square Descriptives Plot for "The article was at my language level (not too easy and not too difficult to read)."

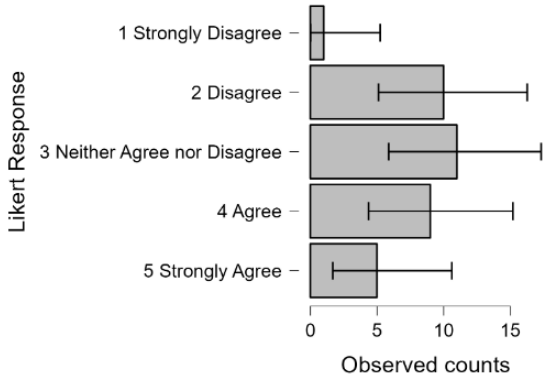


Figure K4

Chi-square Descriptives Plot for "Participating in this study was beneficial to me."

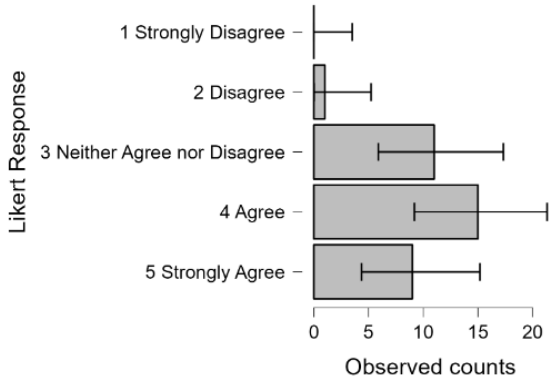


Figure K5

Chi-square Descriptives Plot for "I learned something new during this study."

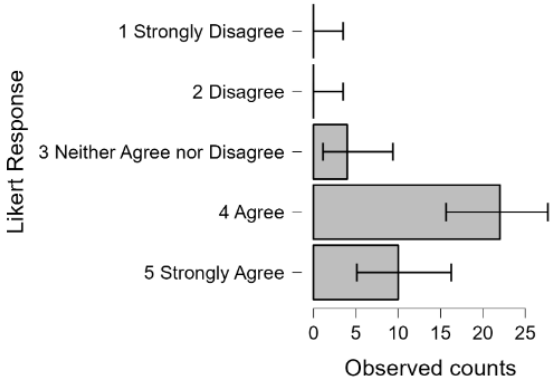


Figure K6

Chi-square Descriptives Plot for "The Vocabulary Comprehension Test was clear and easy to understand."

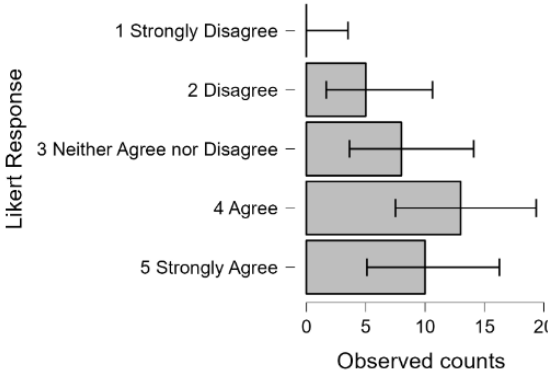


Figure K7

Chi-square Descriptives Plot for "I would like to use reading glosses to help me learn vocabulary in the future."

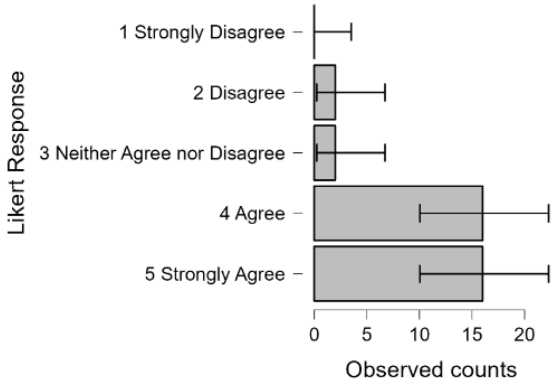


Figure K8

Chi-square Descriptives Plot for "I enjoyed participating in this study."