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Digital Corpus Use in Learning L2 Prepositional Collocations: A Pilot Study

Matthew A. Siegel

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Digital Corpus Use in Learning L2 Prepositional Collocations: A Pilot Study

by

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A dissertation submitted in partial fulfillment of the requirements for the degree of
Doctor of Philosophy in Technology in Education and Second Language Acquisition
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ABSTRACT
Because of their prevalence in both spoken and written English, collocations—words that go together—are important for the English language learner. Collocations that contain prepositions have been shown to pose particular difficulty (Hong, Rahim, Hua, & Salehuddin, 2011). Collocational errors are common, even among advanced learners (Laufer & Waldman, 2011). The purpose of this pilot study was three-fold: (1) to determine whether the use of a digital corpus by English language learners is effective in learning prepositional collocations, (2) to determine if proficiency level exerts any influence on effectiveness of using a digital corpus to learn prepositional collocations, and (3) to examine learner perception regarding the use of a digital corpus to learn prepositional collocations.

Forty-four international undergraduate students participated in this mixed-method study, and were randomly assigned to either a treatment or control group. Study materials were delivered via Canvas, a learning management system. All participants completed a pretest (gap-fill format) consisting of 15 target prepositional collocations to establish a baseline. Target collocations were presented to treatment group participants via an instructional module utilizing the Corpus of Contemporary American English (COCA), while control group participants used an instructional module without COCA. Following instruction, participants completed an immediate posttest and a delayed posttest two weeks later. Treatment group participants completed a survey to gauge their satisfaction with COCA and perception of its usefulness.

Immediate and delayed posttest gains were compared using statistical analysis, but results did not show a statistically significant difference, suggesting that the impact of COCA on
collocational learning is inconclusive. Utilizing factorial analysis of variance for pretest to immediate posttest gains, there was a statistically insignificant effect of group (treatment vs. control) after controlling for proficiency. For pretest to delayed posttest gains, a statistically significant effect of group was indicated, although the effect size was small. A statistically significant effect of proficiency on test score gains (for both pretest-immediate posttest and pretest-delayed posttest) was shown after controlling for group. There was no statistically significant interaction effect for either pretest-immediate posttest gains or pretest-delayed posttest gains. Results seem to indicate an impact of proficiency on gains, although higher baseline pretest scores may have played a role. Thematic analysis of feedback from the post-study survey revealed several areas that participants emphasized in their responses: user interaction/interface, usefulness, context/examples, functionality, and layout/design. Responses were positive overall, suggesting that participants viewed COCA favorably in terms of satisfaction and usefulness. There were mixed responses regarding user friendliness and ease of use, highlighting the importance of effective training on the use of COCA prior to instructional integration. The most frequently cited positive attribute of COCA was the use of authentic examples of collocations in context. Overall, despite some inconclusive quantitative results, qualitative findings suggest positive perceptions and benefits of using COCA for learning collocations, and the extension of this pilot study to a main study seems feasible and promising.
CHAPTER 1
INTRODUCTION

The acquisition of second language collocations—sequences of words that commonly occur together—can present challenges for language learners. Because these sets of words often appear together as the result of repeated usage and convention, and often have little to do with either correct grammatical construction or meaning of its constituent parts, collocations have been shown to pose difficulty for second language learners, especially since they have already acquired collocations in their native language (e.g., Bahardoust & Moini, 2012; Durrant, 2014; Granger & Bestgen, 2014). Recent corpus-based research has revealed much about the nature and use of collocations by both native and non-native speakers and writers, including the relationship between collocational acquisition and generalized L2 language proficiency (e.g., Durrant & Schmitt, 2009; Fan, 2009; Laufer & Waldman, 2011; Siyanova & Schmitt, 2008). The means by which learners are exposed to collocations, in terms of input conditions and enhancement, has been researched as well, yielding valuable findings with significant pedagogical implications. Technological innovation and application have been studied in the context of both explicit instruction and self-directed practice, solidifying the role of technology in successful learning of collocations, as well as language learning generally. Research based on various corpora (including the British National Corpus, the Corpus of Contemporary American English, and various corpora consisting of written samples from native and non-native speakers), investigating the impact of input conditions (e.g., Choi, 2016; Peters, 2009), exploration of pedagogical approaches (e.g., Gitsaki, 1999; Jiang, 2009; White, 2012), and technological
innovation (e.g., Chan & Liou, 2005; Geluso & Yamaguchi, 2014; Vyatkina, 2016)—these are the strands of academic inquiry that have dominated the field of L2 collocational acquisition over the past decade.

Statement of Problem

Because of their prevalence in English, collocations are important for the English language learner. Further, collocations are frequently present in both spoken and written language, as well as in academic text. Although English language learners can sometimes utilize a strategy of avoidance, choosing alternative wording to express themselves in spoken and written language, students are often asked to read and write extensively for academic purposes, and collocational comprehension and usage are therefore required.

Further, learning L2 collocations can pose a challenge due to their origins in repeated use and convention (which may be difficult for the L2 learner to predict without knowledge of those conventions), the existence of multiple collocations with the same root word (each with a different meaning), and the inability to rely on the meanings of individual component words to determine the meaning of the collocation as a whole. Vocabulary knowledge alone is insufficient to determine the meaning and appropriate use of a collocation.

Some types of collocations (categorized by part of speech of components) have been shown to pose greater difficulty than others. Specifically, collocations that contain a preposition, because they are grammatical rather than lexical collocations (see Definitions of Key Terms, below), are particularly difficult (Hong, Rahim, Hua, & Salehuddin, 2011). Errors and misuse are prevalent, even among advanced learners (Laufer & Waldman, 2011).
Purpose of Study

The purpose of this study was three-fold: (1) to determine whether the use of a digital corpus by English language learners is effective in learning prepositional collocations, (2) to determine what influence proficiency level exerts on effectiveness of using a digital corpus to learn prepositional collocations, and (3) to examine learner perception of the effectiveness and usefulness of a digital corpus in learning prepositional collocations. This study utilized online instructional delivery, via the Canvas learning management system, to provide instruction of prepositional collocations using the Corpus of Contemporary American English (COCA), as illustrated in Figure 1 below.

![Figure 1. Study conceptual overview](image)

Research Questions

The following research questions guided this study:

1. How does the use of a digital corpus facilitate the acquisition of prepositional collocations by undergraduate English language learners, as compared to a control group which does not utilize a digital corpus?
2. How does the effectiveness of use of a digital corpus in learning prepositional collocations vary among undergraduate English language learners of different proficiency levels?

3. What is the perception of the usefulness of a digital corpus for prepositional collocation learning by undergraduate English language learners?

**Significance of Study**

This study has the potential to impact research, pedagogy, and technological innovation in the following ways:

First, some of the gaps in current research in L2 collocation learning highlighted below were addressed. Specifically, a mixed-methods approach, missing from the majority of recent studies, was utilized. A qualitative component can add depth of understanding to the quantitative results. Additionally, focus on a particularly troublesome type of collocation (i.e., the prepositional collocation), as well as inclusion of a heterogeneous set of proficiency levels, provided data not present in much of the current research.

Second, there are practical pedagogical implications resulting from this study. Type of instruction, focus of instruction, and method of instruction may be impacted by the results of this research. While it may be agreed that technology has a significant role to play in the learning of L2 collocations, the extent to which technological tools are utilized, as well as the key attributes of those tools which are deemed to be most effective, may emerge from research results.

Third, while an emphasis on technology is timely with regard to offering technological solutions to educational issues, purposeful focus on the most efficacious aspects of specific technological tools have ramifications for future technological innovation.
**Justification for Pilot Study**

There are three primary justifications for an exploratory pilot study. First, it is necessary to determine the feasibility of the main study. Because there is little research in the literature which includes all three major elements of this study—specifically, focus on prepositional collocations, use of a digital corpus, and online delivery via a learning management system—it is desirable to preface further research in this niche with preliminary study and results. Second, it would be beneficial to get feedback based on the results to apply to the main study as adjustments in design, instrumentation, and instructional materials. Each of these would benefit from additional refinement and improvement that would result from the rich data derived from a pilot study. Third, it would be desirable to determine whether inclusion of additional variables in the main study could give a more complete picture of the use of digital corpora for learning of prepositional collocations. Such factors could emerge from the results, holding promise that those factors could be introduced in future research in the area.

**Theoretical Framework**

The definition of the root term on which this dissertation is based—collocation—is itself the subject of a long, extensive debate. Although the definitions of collocation used by various researchers are discussed at length in the next chapter (see What are Collocations in Chapter 2), it should be noted here that the approach to the definition of collocations can be either from a frequency-based or a phraseological perspective, each of which has unique theoretical ramifications. The study of second language collocation learning and the application of technology in that pursuit is likewise informed by multiple theoretical perspectives. The use of corpora by L2 learners involves both the inclusion of context (via concordance lines) and the
utilization of authentic materials, each of which have theoretical justification. In addition, because the use of technology in education is intertwined with the subject of motivation, it is imperative that motivational theory be included as well. Therefore, this discussion of theoretical framework will consist of the following: learning theory applicable to the unique nature of collocations, theory related to the use of corpora for L2 learning, and motivational theory associated with use of computer assisted language learning (CALL).

Collocations are groups of words rather than individual lexical units. As such, learning collocations may be quite different from learning single words for the following reason: because of non-compositionality, the collocational meaning cannot necessarily be derived from the meanings of the collocational components. Therefore, individual lexical component vocabulary knowledge cannot be relied upon to learn the collocations formed by such components. Ellis (2001) conceptualizes collocations as chunks of lexical information. Working memory limitations, insofar as vocabulary knowledge is concerned, can be overcome through learning chunks, rather than bits, of information; in other words, if one assumes that working memory can store approximately seven bits of information, seven collocations can be stored as easily as seven individual words (Nation, 2001). This chunking commonly takes place when the same components are often seen together, characteristic of the mutual association aspect of collocations. According to Ellis, learning collocations is a type of chunking—the long-term storage of associative connections. An alternative to chunking is rule based processing, in which the item is recreated each time it is used productively. As Nation (2001) points out, in comparing these two input processing mechanisms, there seems to be a tradeoff between processing time and storage capacity. Consequently, high-frequency items tend to follow the chunking procedure, whereas low-frequency items tend to follow the rule based processing mechanism (Nation,
The distinction between high- and low-frequency collocations has important ramifications for L2 collocation learning because low-frequency collocations that are strongly associated are prevalent in both written and spoken language.

According to Sinclair (1991), there are two principles which govern the ways in which words occur in a text: the open-choice principle (in which choice of words is constrained solely by grammaticality) and the idiom principle (in which there is much greater restriction on word choice. Although these two principles are discussed at greater length in the next chapter, it is important to note that collocations follow the idiom principle of word choice (Sinclair, 1991), and the consequent restriction on word choice, often arbitrary and conventionalized, could represent a cognitive burden to second language learners.

Corpora are collections of linguistic data (written and/or spoken) used as a basis for the descriptive analysis of language. Examples are the British National Corpus and the Corpus of Contemporary American English, which are compilations of written and spoken data from various sources, including books, newspapers, and speeches. Corpora are useful because they are descriptive, rather than prescriptive—that is, they represent language in use from authentic sources, such as those described above. There are two major areas in which the use of corpora impact L2 collocation learning from a theoretical perspective. First, corpora are a reflection of the frequency of collocations. As Ellis (2002) points out, “language processing is intimately tuned to input frequency, (and)…usage-based theories hold that the acquisition of language is exemplar based” (p. 143). Second, corpora represent authentic use of collocations presented in context (generally within concordance lines, which include the words preceding and subsequent to the word or phrase under investigation). This quality may enhance meaning (to complement
form) of target collocations, allow easier comprehension and learning than through isolated collocation exemplars, and provide motivation for the L2 learner (discussed below).

In their survey of second language learning theories, Mitchell and Myles (2004) discuss multiple theoretical perspectives which inform L2 learning, including cognitive, functional and pragmatic, input and interaction, sociocultural, and sociolinguistic perspectives on SLA. It seems clear that any one of these approaches alone is insufficient to describe the process of L2 collocation learning. Chapelle (2009), in her research on the relationship between second language acquisition theory and CALL, illustrates the applicability of multiple theoretical approaches (cognitive linguistic, psycholinguistic, general human learning, sociocultural, and others) to computer assisted language learning. Input processing and interactionist approaches have implications for CALL in general and L2 collocation learning in particular; the former provides a basis for suggesting that “the format of instructional materials (can) draw learners’ attention to target form-meaning mappings”, while the latter provides a basis for suggesting that “meaning-oriented activities (can) engage learners’ attention to form” (Chapelle, 2009, p. 744).

The repeated exposure of learners to L2 collocations, through multiple concordance lines in digital corpora, aligns well with Ellis’s (2006) Associative-Cognitive CREED, which …holds that SLA is Construction-based, Rational, Exemplar-driven, Emergent, and Dialectic, (and)… language learning involves the acquisition of constructions that map linguistic form and function. Competence and performance both emerge from the dynamic system that is the frequency-tuned conspiracy of memorized exemplars of use of these constructions, with competence being the integrated sum of prior usage and performance being its dynamic contextualized activation (p. 100).
The importance of motivation in learning cannot be overestimated. In Krashen’s (1982) Monitor Hypothesis, it is posited that, in order for L2 learning to occur, there must be both comprehensible input and a low (or weak) affective filter. Affective variables which impact this filter include motivation, self-confidence, and low anxiety. Gardner and MacIntyre (1993) point out that motivation can be viewed as having three components: the desire to achieve a goal, the willingness to expend effort, and satisfaction with the task at hand. Based on the overwhelmingly positive attitude toward the use of technology in L2 collocation learning by participants of multiple studies elucidated in the next chapter, even despite sometimes mixed performance results, it seems that motivation can be a strong influence supporting the use of digital corpora in this study.

*How* information is presented to learners can be as important as *what* information is presented. This is especially applicable to the use of technology to deliver instruction, as in this study, in which instruction was delivered through a multimedia approach. It is desirable to maximize learning and minimize cognitive load in instructional delivery. Mayer (2001) identified 12 principles of multimedia learning which are useful in identifying how people learn best. Examples include the Coherence Principle, the Signaling Principle, and the Segmenting Principle. The Coherence Principle states that people learn best when extraneous information (words, images, and sounds) are removed. The Signaling Principle posits that people learn best when cues highlighting the organization of essential material are provided. The Segmenting Principle maintains that people learn best when information is broken down into manageable segments. These principles (along with the other nine) can be helpful in guiding how instruction is delivered in this study and in the classroom.
In sum, L2 collocational learning is informed by multiple theories from multiple perspectives, and this theoretical framework can be applied to this study by virtue of the multiword and non-compositional nature of collocations, the use of authentic and contextual material through digital corpora, and the importance of motivation in learning L2 collocations. While the sources of SLA theory pertaining to digital corpora use in L2 collocational acquisition are varied, and the perspectives underlying this theory multi-faceted, the framework described here provides a solid structure on which this study may be conducted.

**Gaps in Current Research**

Based upon an extensive review of the literature (see Chapter 2), it becomes evident that there are certain gaps that exist in recent research in L2 collocational learning. Specifically, there are five areas in which further research is needed.

First, the overwhelming majority of research in the area of L2 collocational acquisition is quantitative, primarily either experimental or quasi-experimental. While these approaches are conventionally viewed as the *gold standard* of empirical study, there is a depth of understanding that could be gained through qualitative methodologies. There were a few mixed-methods studies found in the literature (e.g., Myers & Chang, 2009; Nassaji & Tian, 2010); the former had a *bona fide* qualitative arm, while the latter utilized some qualitative data in an otherwise quantitative analysis. Reynold’s (2015) study of the use of a web-based concordancer (WBC) by Taiwanese university students is classified as action research and was mostly quantitative in terms of data analysis, yet had a qualitative research question relating to WBC perception. Overall, however, serious qualitative inquiry seems to be lacking, for the most part.
Second, although prepositional collocations are the primary focus of the literature review which follows in the next chapter, it was difficult to find research specifically addressing this type. A few studies, however, approach prepositional collocations in a peripheral manner. Bahardoust and Moeini (2012) noted that EFL writers tend to use lexical collocations (i.e., collocations containing nouns, verbs, adjectives, and adverbs) more frequently than grammatical collocations (i.e., collocations containing words with a grammatical function, such as prepositions). Hong et al. (2011) observed that the most frequent type of collocation error was preposition-related. Mueller (2011) noted that collocational frequency affects L2 learners’ comprehension of prepositional meaning. Considering the relative difficulty of prepositional collocation learning implied by these studies, further investigation in this area is warranted.

Third, whether for sampling convenience or to control for L2 proficiency as a confounding variable, nearly all the research studies consist of participants who are homogeneous with respect to proficiency level. The notable exception is the corpus-based study of Israeli L2 English writers at three proficiency levels by Laufer and Waldman (2011), who found both similarities and differences in the L2 collocational knowledge at these levels. It may be useful to examine the impact of L2 proficiency more closely, as it may represent an important variable to be considered.

Fourth, most of the research relating to technological use focuses on the web-based concordancer. Although WBC is a significant tool, especially in the area of collocations, it is not the only one. A greater variety of technologies should be examined, particularly mobile applications, which are likely to become more prominent in language learning. Ashiyan and Salehi (2016) utilized WhatsApp in their research, which is the only study in this review which explored mobile assisted language learning (MALL) and its effect on L2 collocation acquisition.
Fifth, there is a dearth of studies which include informal learning environments. All of the studies in this literature review were conducted in formal learning contexts. Perhaps these types of studies are easier to conduct (since researchers are generally affiliated with educational institutions, formal learning contexts in themselves). However, as the importance of informal learning becomes more evident and its prevalence more widespread, it would be desirable to include informal contexts in the research. This lack represents a significant gap in what is currently available.

Assumptions and Caveat

In this study, three assumptions are made with regard to the participants. First, the participants have Internet access. Second, participants know how to access and use the Canvas learning management system. Third, participants know the meanings of the individual words that comprise the target collocations that are included in the instruments and instructional materials.

There is one caveat. The study utilizes a corpus of American English and participants are international students located in the United States. However, it is recognized that participants may have been exposed to non-US varieties of English (e.g., British, Indian, or Singaporean English), in which collocations may be considerably different. Therefore, there is a possibility that a particular collocation, acceptable to the standards of other Englishes, may not be judged as correct by the researcher within the context of this study.

Definition of Key Terms

The following terms, due to their pervasive nature in the research and central role in the presentation of this study, warrant definition prior to discussion of this, or other, specific studies.
Collocation. From a corpus linguistics perspective, collocations are sequences of words that appear together more frequently than would be dictated by pure chance. From a language use perspective, collocations are fixed (or semi-fixed) groups of words that have become accepted and established by virtue of their repeated usage in context. From a second language acquisition perspective, knowledge of collocations is vital to fluency and competence in the L2; even a grammatical sentence will sound awkward (to the native speaker) if collocations are misused. In layman’s terms, collocations are words which go together in authentic language use; L1 speakers usually know these intuitively, whereas L2 speakers must learn them.

A collocation may be categorized based on the part of speech of its constituent elements, as follows:

- Adverb – adjective collocations (e.g., fully aware, richly decorated, deeply concerned, highly probable, utterly ridiculous)
- Adjective – noun collocations (e.g., hard time, excruciating pain, inclement weather, heavy traffic, strong supporter)
- Noun – noun collocations (e.g., ceasefire agreement, absentee ballot, stock option, speech impediment, color blindness)
- Noun – preposition collocations (e.g., dissatisfaction with, example of, interest in, reason for, awareness of)
- Verb – noun collocations (e.g., do my homework, have lunch, make an effort, miss an opportunity, cross the street)
- Verb – prepositional phrase collocations (e.g., participate in, belong to, compatible with, depend on, contribute to)
- Verb – adverb collocations (e.g., drive carefully, wait patiently, agree completely, run quickly, sit quietly)

Words can be classified as content words or function words. Content words (nouns, verbs, adjectives, and most adverbs) carry meaning, whereas function words (such as prepositions and conjunctions) may have ambiguous meanings that require context. A function word fulfills a structural or grammatical relationship in a sentence, such as and joining two phrases or the acting as a determiner of a noun phrase. By themselves, these words have little meaning and require additional context. By contrast, content words such as dog or house have clear unambiguous meanings. The former category is said to have a lexical nature, while the latter has a grammatical/functional nature. As this concept relates to collocation categorization, collocations which contain a prepositional phrase are examples of the second (functional) type, such as run out of money or make up your mind (Bahardoust & Moeini, 2012; Sicherl, 2004).

Alternatively, collocations can be categorized based on whether their meanings are literal, figurative, or both (Macis & Schmitt, 2016a). Collocations can be strong or weak (depending on the strength of association between constituent parts), or congruent versus non-congruent (which refers to the degree of similarity between the L1 and the L2 regarding a particular collocation) (Zaferanieh & Behrooznia, 2011).

Collocations are sometimes referred to by other names in the literature, although the definitions of these other terms by researchers overlap the definition of collocation, as described here. Liu (2012) uses the term multi-word constructions, and Lindstromberg, Eyckmans, and Connabeer (2016) use the term formulaic sequences; both are closely related to collocations in the context of their research. Hoang and Boers (2016) refer to multiword expressions in their study, which is an all-encompassing term which includes collocations and phrasal verbs.
**Prepositional collocation.** For purposes of this study, the term *prepositional collocation* refers to any collocation with contains a preposition or a prepositional phrase. Utilizing the categorization of collocations above, this subset of collocations includes *noun—preposition collocations* and *verb—prepositional phrase collocations*. Additionally, it should be noted that phrasal verbs are included as well, specifically *prepositional phrasal verbs* and *prepositional—particle phrasal verbs* (described in the next section).

**Colligation.** The term *colligation* is closely related to the term *collocation*. Both terms were first used by Firth (1968) to describe the co-occurrence of lexical items (in the case of collocation) and grammatical categories (in the case of colligation). It is most frequently used today to refer to the syntagmatic attraction between a lexical item (e.g., a word) and a grammatical category (e.g., a part of speech) (Lehecka, 2015). In other words, whereas collocation generally refers to specific words that “go together,” colligation refers to word groups that tend to pair with particular classes of words, such as possessive adjectives, particular verb tenses, or modal verbs. For example, *true feelings* is a collocation, but because *true feelings* is usually preceded by a possessive adjective (e.g., *my, your, her*), the resultant word combination (*my true feelings, your true feelings, or her true feelings*) is a colligation. Sinclair (1998) mentions another example, the phrase *naked eye*, which is commonly preceded by the definite article *the*, as in *to the naked eye*.

**Phrasal verb.** Darwin and Gray (1999) note that the research literature lacks consistency and agreement regarding the definition of phrasal verbs. According to Yule (2009), a phrasal verb is formed when “a particle is regularly combined with a particular verb” (p. 156); non-compositional verbs followed by prepositions are sometimes called *prepositional verbs*, but, for purposes of this discussion, phrasal verbs will be assumed to include these.
Phrasal verbs, then, are created when a verb is followed by a particle, a preposition, or both, in a non-compositional manner. The first type is called a particle phrasal verb (e.g., dress up), the second type is called a prepositional phrasal verb (e.g., pick on), and the third type is called a prepositional-particle phrasal verb (e.g., put up with). Particles are differentiated from prepositions in that the former does not take a complement, whereas the latter does (creating a prepositional phrase). Phrasal verbs (e.g., to pick up, to drop off, to stand by) can be categorized by transitivity and by separability. Transitive phrasal verbs must have a direct object (e.g., to take off your shoes, to look for the keys, to set up the software), whereas intransitive phrasal verbs do not take a direct object (e.g., to break down, to get by, to eat out). Separable phrasal verbs may have a word between the main verb and the particle (e.g., to make something up, to turn me down, to write the phone number down), whereas inseparable phrasal verbs may not (e.g., to get off the bus, to run into a friend, to look after a sick parent).

**Mutual information (MI).** MI is a measurement of strength of association between components of a collocation. It is commonly used in collocation extraction from a corpus to find collocations which are low-frequency, yet strongly associated. For example, commit suicide, boost production, and take one’s blood pressure may not be very common, but the components are strongly associated. For more detailed information on mutual information as it relates to collocation extraction, including calculations and examples, see Bouma (2009).

**Input enhancement.** When collocations or phrasal verbs are presented to the L2 learner in the form of text (through extensive reading, for example), the nature of the input in terms of context is a pertinent factor. Sonbul and Schmitt (2013) distinguish among three types of input: enriched, enhanced, and decontextualized. With enriched input, the text is seeded with the target collocational structure so that the reader is exposed to high frequencies, over a period of time. By
contrast, *enhanced* input contains the target feature that has been emphasized; this can be done by highlighting or bold-facing, for example. Decontextualized input has neither the enrichment nor the enhancement described and is devoid of any contextual cues.

**Concordance.** A concordance is a listing of occurrences of a word in its immediate context. This is done in large corpora, such as the British National Corpus (BNC) or the Corpus of Contemporary American English (COCA), and facilitates identification of collocations, among other uses. Digital *concordancers* are software tools that construct concordances, allowing the comparison of different usage, determining frequencies, and identifying collocations. [*Note: The term digital corpus is used throughout this dissertation to describe the large corpora mentioned above (e.g., BNC and COCA). The term web-based concordancer (WBC) is often used synonymously by certain researchers. When referring to the work of these researchers, WBC is used. However, the term digital corpus is the default term for purposes of this dissertation.*]

**Congruent and non-congruent collocations.** Congruent collocations are those in which there is a direct, word-for-word equivalent in the L1. For example, the English collocations *drive recklessly* and *waste time* are congruent with the Spanish collocations *manejar imprudentemente* and *perder el tiempo*, respectively. By contrast, non-congruent collocations do not have a direct equivalent in the L1. For example, *break the law* and *make money* cannot be literally translated into Spanish, as the result would be meaningless. (One would say *violar la ley* and *ganar dinero,* not *romper la ley* and *hacer dinero.*) Of course, the congruence of a collocation depends on the L1 of the learner.

**Explicit and implicit learning.** Explicit learning refers to *intentional* learning; the learner is aware of what he or she is learning. It may or may not occur within a classroom—that
is the distinction between formal and informal learning environments. In implicit learning, the learning is *incidental*. In the case of language acquisition, for example, the learning of new words through extensive reading would be considered implicit learning of vocabulary. The distinction, however, is not always clear-cut. For example, if an L2 reader who encounters an unfamiliar word looks it up in a dictionary, a case could be made that this learning is explicit because it becomes intentional on the part of the learner.

**ESL, EFL, and L2.** The focus of this study is on English as a second language (ESL) because the participants are located in the United States. More generally, ESL refers to an educational context in which English is the primary language: Australia, Canada, New Zealand, the United Kingdom, and the United States. Conversely, EFL refers to an educational context in which English is not the primary language. L2 refers to the additional language (English in the case of this dissertation) being learned.

**Organization of Dissertation**

Following this introduction chapter, a review of the literature on collocational acquisition by second language learners is presented in Chapter 2. Chapter 3 contains the design of the mixed-methods pilot study on the use of digital corpora to learn L2 prepositional collocations, including specific design, procedure, data collection, and data analysis for the quantitative and qualitative portions, as well as for the study overall. Chapter 4 presents the results from the data analysis, interpretation of results, and discussion of results. Chapter 5 concludes the presentation of the study with limitations, pedagogical implications, and recommendations for future research. Appendices follow the reference section.
Summary

In this introductory chapter, a statement of the problem of L2 prepositional collocation learning has been presented, and the purpose of the study has been put forward. Following the three research questions, the significance of the present study has been elucidated. A theoretical framework relating to L2 collocation learning in a CALL environment has been presented, with emphasis on various cognitive and affective elements associated with this endeavor. Following some assumptions and a caveat, key terms used throughout this dissertation have been defined, and the organizational structure of the dissertation has been given. In the next chapter, following a detailed discussion on the definition of collocations, recent research in the area of L2 collocational learning is presented.
CHAPTER 2
REVIEW OF LITERATURE

Introduction

The volume of research on collocations, particularly with regard to second language learners, is quite large and spans at least three decades. Included in this literature is research on the definition and nature of collocations (e.g., Schmitt, 2012; Shin & Nation, 2008; Sinclair, 1991), use of L2 collocations by language learners (e.g., Durrant & Schmitt, 2009; Mueller, 2011; Nesselhauf, 2003), pedagogical approaches to L2 collocation instruction (e.g., Mueller, 2010; Nation, 2001; Szudarski, 2012), and use of digital corpora in L2 collocation learning (e.g., Çelik, 2011; Daskalovska, 2015; Vyatkina, 2016). In addition to scholarly inquiry into the prevalence of collocations in the English language (underscoring the importance of collocational knowledge for English language learners), there is considerable research on how students learn and use collocations in both oral and written expression, pedagogical approaches to development of collocational competence, strategies utilized by instructors, use and effectiveness of an assortment of technological tools, and student attitudes toward the use of technology.

Geographically, the research is truly global in scale, representing 21 countries. The most common locations are Iran (10), Taiwan (6), the United States (6), and Turkey (5). Participants range in age from adolescence to middle age, although university undergraduates (26) are disproportionately represented. In order to approach the task of this literature review in a systematic manner, a meaningful organization of the material is paramount.
Since the term *collocation* was first used many decades ago, its meaning has evolved and expanded. Consequently, there is not universal agreement among academics regarding the definition of collocations, particularly with regard to inclusion and exclusion criteria. Because the term is central to this dissertation, a detailed discussion on definition is warranted. In addition to the inclusion of various perspectives and approaches used in defining collocations, discussion of other types of multiword sequences—specifically, idioms and phrasal verbs—is necessary, due primarily to confusion which often arises in distinguishing among these sequence types. Categorization issues logically follow definitional ones, so a discussion of types of collocations is presented next.

After discussion of definition and categorization, the prevalence of collocations in the English language, as well as the importance of teaching collocations to second language learners, is addressed. A brief discussion of the major lines of research in the area of collocations is presented, which includes corpus-based research, pedagogical approaches, input enhancement, and use of technology in collocation learning. Each of these major areas of research is then presented in greater detail. Corpus-based research of different types is discussed, along with challenges for L2 learners and a detailed discussion of collocational use by second language learners. Pedagogical approaches to teaching and learning collocations, the effect of enhancement of input on collocation learning, and the role of digital corpora (as well as other technologies) in L2 collocational acquisition, are each discussed in the context of research findings. The affective component of collocational learning through utilization of aforementioned tools, methods, and strategies is addressed in a section dealing with student/learner attitudes and perceptions. Finally, a summary is presented which allows for a
synthesis of the multiple strands of research in the area of second language collocational acquisition within the context of innovative technological educational practice.

A categorization of reviewed literature by major topic area is presented chronologically on the next page in Table 1. These topic areas consist of definition and use, L2 collocational processing, L2 collocational use, pedagogy, input conditions and enhancement, digital corpora use, other technologies used, and literature reviews and meta-analyses. Although many of these works deal with more than one area, they are grouped according to the purposes for which they are used in this dissertation.

What are Collocations?

Between the word level and the sentence level, language consists of groups of words that seem to go together. Within the literature, the nomenclature used to describe these groups of words is quite varied. In the context of EFL writing, Granger (1998) refers to prefabricated patterns, which consist of collocations and lexical phrases. Biber (2009) uses the term multiword pattern to describe the overarching concept which includes collocations. Henriksen (2013) points out that there is general agreement that collocations are a subset of formulaic sequences. Regardless of the terminology used, one is still faced with the task of defining the term collocation, a task which is not quite as straightforward as it may seem at first glance.

Although the large quantity of research in the area seems to indicate agreement on the importance of collocations for second language learners, there is far less agreement on the definition of collocations. The term collocations, coined by noted linguist J. R. Firth (1968), was originally conceptualized as the “habitual and recurrent juxtaposition of semantically related
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<td>L2 collocational processing</td>
<td>Liontas (2002a); Liontas (2007); Siyanova and Schmitt (2008); Durrant and Schmitt (2010); Yamashita and Jiang (2010); Phoocharoensil (2013); Sonbul and Schmitt (2013); Wolter and Gyllstad (2013); Szudarski and Conklin (2014); Gyllstad and Wolter (2016); Hoang and Boers (2016); Peters (2016)</td>
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<td>L2 collocational use</td>
<td>Schachter (1974); Granger (1998); Howarth (1998b); Nesselhauf (2003); Barfield and Gyllstad (2009); Durrant and Schmitt (2009); Fan (2009); Jaén (2009); Hong, Rahim, Hua, and Salehuddin (2011); Mueller (2011); Laufer and Waldman (2011); Bahardoust and Moeini (2012); Levitzky-Aviad and Laufer (2013); Durrant (2014); Granger and Bestgen (2014); González Fernández and Schmitt (2015); Siyanova-Chanturia (2015)</td>
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<td>Literature reviews and meta- analyses</td>
<td>Henriksen (2013); Ramos and Dario (2015)</td>
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words” (Bartsch & Evert, 2014, p. 48). In an effort to combine the original Firthian notion of collocation with the technological tools available in the form of digital corpora of ever-increasing size, Bartsch and Evert (2014) refer to statistical identification of collocations and offer quantitative insights to their categorization. Over the last several decades, the definition has been expanded to include grammatical as well as lexical elements. For example, the online *English Oxford Living Dictionaries* ([https://en.oxforddictionaries.com/definition/collocation](https://en.oxforddictionaries.com/definition/collocation)) define *collocation* as “the habitual juxtaposition of a particular word with another word or words with a frequency greater than chance.” A more general notion of collocation is offered by Gitsaki (1999), who defines a collocation as “any well-formed combination of words” (p. 27). Nation (2008) puts it more colloquially, stating that collocations consist of “the company words keep” (p. 167). Adopting a definition that is more functionally oriented, Howarth (1998a) posits that collocations are “combinations of words with a syntactic function as constituents of sentences (such as noun or prepositional phrases or verb and object constructions)” (p. 24).

Unfortunately, the generality inherent in the aforementioned definitions render them less than useful for several reasons, three of which are discussed here. First, the element of chance/probability suggests a continuum. Although reflective of the descriptive, rather than prescriptive, nature of collocations by virtue of frequency of use, this aspect of definition causes one to question where one must draw the line between what is, and what is not, to be considered a collocation. Second, there are other types of multiword expressions, such as idioms, that could qualify as collocations, given a definition based on frequency and convention alone. Clearly, other characteristics of collocations—those which would distinguish them from other word sequences—need to be considered. Third, a frequency-based definition, in addition to including non-collocations, may serve to exclude expressions that are collocations. Collocations that are
infrequently used (perhaps due to association with a specialized field) should nonetheless qualify under a comprehensive definition. Other measures, such as mutual information, which gauge strength of association may be used in lieu of frequency.

In defining collocations, two primary approaches have traditionally been used: the frequency-based approach and the phraseological approach. In the *frequency-based approach*, as the name implies, collocations are generally extracted from large corpora based on frequency. Collocations, then, are co-occurring words within a certain limited distance of each other (not necessarily contiguous, but close to each other); a distinction is made between words that are frequently and infrequently occurring (Barfield & Gyllstad, 2009). The underlying assumption is that, because collocations have an element of repeated usage and conventionalization, thorough examination of large corpora, made possible and feasible by the technological innovation in digital databases over the last few decades, should allow one to uncover frequently-used exemplars. Unfortunately, sole reliance on a frequency-based approach may omit word pairs that, while not frequent in usage, are nonetheless strongly associated (i.e., when one of the lexical components is present, the other is likely to be present as well); due to this association, the word pair should be viewed as a collocation. Strength of association, however, can be related, albeit indirectly, to frequency. Sinclair (1991) noted that the relative frequency of a collocation’s *node* (i.e., the word in a collocation whose lexical behavior is under investigation) and its *collocate* (i.e., the word in a collocation which occurs in close proximity to the node) can affect the strength of the relationship between them, categorizing collocations as either *downward* collocations (in which the node is more frequent than the collocate) or *upward* collocations (in which the reverse is true). For example, if the word under investigation is *back*, upward collocations include *get back*, *back down*, and *back up*, and downward collocations include *come*
back, back again, and looking back; the components of downward collocations tend to have a stronger mutual relationship than those of upward collocations (Sinclair, 1991). In the phraseological approach, rather than focusing on frequency of occurrence, semantic specialization and restriction are the determining factors (Durrant, 2014). The collocation is viewed from the perspective of a word combination, which possesses certain structural and functional characteristics, such as the fixedness of the combination, and there is greater emphasis on the decontextualized categorization of collocations (Barfield & Gyllstad, 2009). Utilizing a phraseological approach, Howarth (1998a) developed the Continuum Model, in which collocations can be viewed on a continuum between free combinations and idioms. In addition to the frequency-based and phraseological approaches, Durrant (2014) mentions a third alternative, the psycholinguistic approach, in which collocations are defined as “combinations of words which have psychological reality in that they are stored holistically or there is an associative link between their elements” (p. 447). This approach would capture the less frequent, yet strongly associated, collocations mentioned earlier as a limitation to the frequency-based approach.

In reality, a combination of these approaches is generally used in defining what a collocation is (and is not). Nation (2001), in listing a set of criteria for determining categorization as a collocation, includes elements of frequency, phraseology, and psycholinguistics: frequency of occurrence; adjacency; grammatical connectedness, structure, uniqueness, and fossilization; collocational specialization; lexical fossilization; semantic opaqueness; and uniqueness of meaning. Although the criteria used by Shin and Nation (2008) are primarily related to frequency, they nevertheless address the issue of distance between constituent elements (i.e., these elements may not cross the immediate constituent boundary), clearly a phraseological concept relating to how far collocational components are from each other in a sentence. For
example, one may consider the collocation *play a role*. It is possible to insert an adjective (e.g., *play an important role*) while maintaining the collocation. How far apart can collocational components be within a sentence, then? The term *constituent boundary* refers to the limit past which the words no longer form a collocation. In the last example, the word *important* is within the constituent boundaries, so the collocation remains valid. In all three approaches to definition, collocations are viewed as entities that must be viewed as partially independent units whose behavior cannot be explained from its components (Durrant, 2014).

Language, at the sentence level, involves choices, both lexical and phraseological. In the view of Sinclair (1991), these choices are governed by two competing (yet complementary) principles: the open-choice principle and the idiom principle. From the perspective of the open-choice principle, the formation of a text results from a large number of complex choices, in which slots are filled with words to satisfy local constraints (e.g., the need for a particular part of speech in a certain location). Grammar, as an example, generally follows this principle. By contrast, the idiom principle restricts the choices that would otherwise be available, and allows the existence of semi-preconstructed phrases, and the preference of certain words over others. Collocations are an example of the idiom principle (Sinclair, 1991).

In defining collocations, it is necessary to distinguish them from other multiword expressions. One could begin with a set of characteristics common to collocations, such as semantic opaqueness, non-compositionality, and conventionalized usage. However, idioms possess these same characteristics (McPherron & Randolph, 2014). How does one distinguish between the two? Three approaches to the distinction between collocations and idioms are presented here. *First*, one could start with a distinguishing property of collocations: fixedness—that is, the restriction on substitutability of one word for a synonym. According to Howarth
(1998a), one can envision degrees of fixedness; indeed, there is a continuum (Howarth’s Continuum Model) of this characteristic ranging from free combinations to idioms, and collocations, as a category, fall somewhere in between, further complicating the issue. On the one end of the spectrum are word combinations that have no restriction whatsoever (i.e., any group of words in which components can be substituted, such as drive a car); on the other end of the spectrum are word combinations that are completely restricted (i.e., idioms, such as raining cats and dogs or beat around the bush). In the latter examples, one may not replace any of the words without changing the meaning. Nesselhauf (2003), utilizing a phraseological approach, defines collocations as word combinations in which there is an arbitrary restriction on substitutability. In the case of a verb-noun word combination, if both components are unrestricted, they represent a free combination (e.g., eat lunch; eat dinner and have lunch are both possible). If both components are restricted, they represent an idiom (e.g., kick the bucket; neither kick nor bucket can be changed without altering the meaning). If one is restricted while the other is not, they represent a collocation (e.g., commit suicide; commit a crime is possible, but commit is restricted) (Nesselhauf, 2003). Collocations themselves can be categorized as either restricted or unrestricted; an example of the former is pitch black (in which no substitution is permitted), while an example of the latter is run a business (in which other words, such as department or show can be substituted for business) (Liontas, 2002b). Second, one could consider whether the meaning of a given word combination is literal or figurative. Idioms are known for having both literal and figurative meanings, although the generally-accepted preference is for the figurative. For example, when one says kick the bucket, it is possible that one could mean that literally, but it would be assumed that the phrase is being used to mean die. Can collocations have both literal and figurative meanings? According to Macis and Schmitt
(2016a), they can and do. In their search for collocations in the Corpus of Contemporary American English (COCA), 78% of collocations were classified as literal (combinations where the literal meanings of the words are just added together); the remaining were either figurative collocations (i.e., have figurative meanings not derivable from constituent parts) or duplex collocations (i.e., polysemous) (Macis & Schmitt, 2016b). One could reasonably argue that this last category would be more properly classified as idioms. Idioms are characterized by having both literal and figurative (idiomatic) meanings, and the latter has little or nothing to do with the former (Liontas, 2002b). In addition, it is necessary to distinguish between figurative meaning of the word sequence as a whole (as in our example kick the bucket) and figurative meaning of a constituent part (as in the phrase reach a conclusion, in which the word reach is used figuratively). The former would be considered an idiom, whereas the latter would be considered a collocation. Third, one could approach the dilemma from a more functional perspective. From the perspective of an English language learner, this perspective is especially relevant. Jaén (2009) noted that, compared to idioms, collocations are very difficult to paraphrase; whereas one could easily use the word die in lieu of the idiom kick the bucket, the language learner may be hard-pressed to find a substitute for a given collocation, such as commit suicide or pay your respects. Because non-native speakers may use a strategy of avoidance to circumvent unknown word groups, the learner would face a challenge. It is likely that the second language learner would select a synonym for one of the constituents of the collocation, the result of which would sound non-nativelike.

Another related type of word combination which appears frequently in the literature is the phrasal verb, a single verb combined with an adverb or preposition, used as a verb phrase (e.g., turn down, look after, put up with). More specifically, Gardner and Davies (2007) use a
frequency-based approach, including “all two-part verbs in the [British National Corpus] BNC consisting of a lexical verb…followed by an adverbial particle…that is either contiguous (adjacent) to that verb or noncontiguous….” (p. 341) (e.g., sit down, sit yourself down). Bolinger (1971) outlines nine tests to determine whether a verb-particle combination is a phrasal verb: replacement, formation of passives, formation of action nominals, object movement, pronoun placement, adverbial insertion, stress definite noun phrases, and listing. Without going into unnecessary specifics, suffice it to state that, in addition to being extremely cumbersome and complex, these tests are also riddled with exceptions. As a solution, Darwin and Gray (1999) propose that, rather than requiring phrasal verb candidates to be positively identified as phrasal verbs, it would be wiser to consider all verb-particle combinations to be phrasal verbs until shown otherwise. A possible source of confusion is that an adverbial particle may look like a preposition (e.g., put your hat on; although on looks like a preposition, it is tied to the verb rather than to a noun or pronoun, so is considered a particle). Indeed, prepositions can have an adverbial function when used as particles (Yule, 2009). Prepositions are generally means of expressing locations—in space, in time, and in metaphor (Yule, 2009). Because phrasal verbs possess many of the criteria which would characterize a word sequence as a collocation, phrasal verbs are often viewed as a subset of collocations. To further complicate the issue, phrasal verbs may be distinguished from prepositional verbs; in the former (as in switch on), contiguity is unnecessary, but in the latter (as in jump on), the elements must be adjacent (Yule, 2009). For purposes of this dissertation, only the so-called prepositional verbs are includable as collocations—specifically, prepositional collocations (i.e., phrasal verbs are excluded). For example, rely on, subject to, and dispose of are included, but put off, stop by, and pick up are excluded.
It is worth noting that, while effort has been made to distinguish collocations from other word sequences, such as idioms and phrasal verbs, there is some commonality from the perspective of teaching and learning for second language learners. Due to their unpredictability, non-compositionality, and (often) non-congruence, these multiword sequences cannot be approached from a purely lexical standpoint. Vocabulary knowledge alone will not help. Therefore, research which examines the teaching and learning of idioms and phrasal verbs does have some applicability to the teaching and learning of L2 collocations, and is includable in this dissertation. In such cases, the difference of object of analysis is specifically noted.

From the previous extensive discussion, it is reasonable that a workable definition of collocations should meet three criteria. First, the definition should be specific enough to be useful. In other words, the definition should be free of ambiguity, in terms of structure, function, and meaning. Second, it should be clear, from the definition, which word groups are meaningfully included and excluded from the category called *collocations*. There should be no confusion as to whether a particular word sequence is to be considered a collocation. Third, both the frequency-based and phraseological approaches should be addressed. It is important to recognize that certain collocations are more frequent than others, and, while frequency of use is a good indicator of conventionalization of use, there are other less commonly used collocations that are nevertheless comprised of constituent parts that are strongly associated with each other (i.e., we rarely see the node without the collocate). Collocations should not be confused with colligations (see *Colligation* in *Definition of Key Terms*, above).

For purposes of this dissertation, based on the preceding discussion, collocations are defined to include multiword sequences two or three words in length which satisfy the following conditions:
• *Contiguity is not required*, although no collocational component may cross the immediate constituent boundary. In other words, the components of a collocation may be separated by a word or phrase (e.g., *blame [someone] for [something]*, *trace [something] to*, and *discuss [something] with [someone]*).

• *Collocational components must either be strongly associated* (as measured by an index of mutual association, such as the MI) *or frequently used* (as reflected by occurrence in a major corpus, such as the BNC or COCA), in recognition of the cogency of both the frequency-based and phraseological approaches to collocations (as described above).

• Collocations are *non-compositional and conventionalized*.

• *There is some arbitrary restriction on substitutability*. For example, *commit a crime* and *commit suicide* are both valid collocations, but *perform a crime* is not.

• *Constituent parts of a collocation may have a figurative meaning, but the collocation as a whole may not*. For example, in *reach your potential*, the meaning of *reach* is not literal. Word sequences with figurative meanings may be treated as idioms rather than as collocations.

• To avoid overlapping nomenclature, *phrasal verbs are excluded from this definition*. Although collocations and phrasal verbs share characteristics—specifically, non-compositionality and non-substitutability—the latter can be considered a single unit rather than a collocation of two (or more) items. Nevertheless, much of the research discussed in this chapter which concerns phrasal verbs can be applied to collocations as a whole.
Types of Collocations

Most frequently in the literature, collocations are categorized based on the parts of speech of its constituent parts, as highlighted earlier in Definition of Key Terms. Due to clarity of meaning, this manner of classification is useful for a review of the literature. These categories can be grouped into lexical and grammatical collocations, depending upon whether the collocate has a lexical or grammatical function. Generally, grammatical collocations include verb-preposition and noun-preposition types, and all other types are included in the lexical collocation category.

This literature review includes research which utilizes instruments designed to measure collocational knowledge. The collocations which are present in the testing items include most of the types described above, although the research emphasis has been on lexical collocations. In addition, many research findings presented in this chapter address the learning of English phrasal verbs specifically, although the conclusions may often be generalized to collocations, the justification for which was discussed earlier.

Why Learn Collocations?

Although there is disagreement among researchers regarding the way in which collocations are defined, and how they are differentiated from other types of word sequences, it is generally agreed that it is important for the second language learner to learn collocations to attain L2 fluency (Nation, 2001). Rationale for learning L2 collocations includes the prevalence of collocations in written and spoken English, the non-compositionality and semantic opacity of collocations, the ultimate goal of attaining fluency in the L2, the difficulty in avoiding the use of
collocations in written and spoken English, and the reduction of cognitive load that results from learning formulaic sequences such as collocations.

Collocations are extremely prevalent in both written and spoken English. Shin and Nation (2008) noted that, based on examination of large corpora of both spoken and written language, English is filled with a very large number of high-frequency, grammatically well-formed collocations. They are pervasive in both spoken and written language, span all language registers, and are present in academic writing.

Due to their non-compositionality, collocations may be viewed as chunks that must be learned as individual units of language. In other words, the second language learner cannot rely on lexical-level vocabulary knowledge alone to understand and produce target collocations in a nativelike manner. Moreover, by learning collocations, learners are introduced to the concept of using language units that are larger than individual words, and one can use words of similar meaning that behave differently in larger context (Nation, 2008).

Presumably, the goal of the second language learner is to attain some degree of fluency. Although the term fluency may be defined in many ways, an issue that is beyond the scope of this discussion, it can be agreed that it is desirable for the language learner to produce the language in a way that is authentic and well-understood by the native interlocutor. Although the L2 user may be understood when using a collocation incorrectly, the language production will seem awkward and unusual to the native speaker.

Collocations are difficult to avoid. Schachter (1974) has observed that one of the strategies utilized by second language learners, particularly at the beginner and intermediate levels, is avoidance, in which the language learner will avoid using difficult words or structures in favor of simpler ones. Unfortunately, in the case of collocations, this is often not possible. As
mentioned earlier, unlike idioms, collocations are difficult to paraphrase, and it can be difficult to find a synonymous expression (Jaén, 2009).

From a cognitive perspective, learning collocations (or any type of formulaic language, for that matter) allows the L2 learner to reduce cognitive load normally attributable to certain well-used word sequences, thereby allowing the learner to expend that cognitive effort on more creative aspects of language production (Henriksen, 2013). As formulaic sequences are learned (and to some extent automatized), the L2 speaker or writer can devote more cognitive energy to expand the richness of his or her spoken or written language.

For all these reasons, the L2 learner should strive to acquire collocational competence. As Wray (2000) stated, “Gaining full command of a new language requires the learner to become sensitive to the native speakers’ preferences for certain sequences of words over others that might appear just as possible” (p. 463). Full mastery of a language, after all, involves more than mere comprehension and expression of basic ideas; it requires an understanding of nuances of meaning as well.

**General Instructional Considerations**

Although not an exhaustive list, the following are considerations for both teachers and teacher educators, in both formal and informal educational contexts, and in the United States and abroad.

**Context of educational setting.** The location of the learner needs to be considered. In an EFL context, the learner may have limited opportunity to use the L2 outside the classroom, particularly with regard to spoken input. Authenticity of input may be affected by the lack of availability of native speakers of the L2. In the ESL context, target language input is more
readily available, and the diversity of L1s within the classroom usually precludes the use of the L1 by students in the instructional setting.

On the theme of educational setting context, the issue of formal versus informal learning must be considered as well. A growing proportion of L2 learners may benefit from a non-traditional setting in terms of access; adult immigrants and learners in certain locations (i.e., far from educational institutions) are clear beneficiaries of informal learning and distance learning.

**Access to technological tools.** Technology can play a powerful role in L2 collocational acquisition. One must bear in mind, however, that technology may not always be accessible to the learner. Availability of software and hardware, as well as access to the Internet, which can vary widely by geographical location, should be considered. Access to technology can vary considerably within developed countries like the United States as well, in which underserved communities (of which many L2 learners are a part) often lack the financial resources for fully technologically-integrated schools. This inconsistency of access will impact the ability to use technology in instruction, the knowledge and skills (by both teacher and student) relating to technology use, and access outside the classroom for assignments, projects, and so on.

**Learner characteristics.** There are several characteristics of the learner that need to be taken into consideration, such as L2 proficiency level, overall goals of the learner, the linguistic background (L1), and cultural background of the learner. Although prepositional collocations can and should be taught to learners of all proficiency levels, instructional variables such as strategy selection, method, and prior knowledge can be affected by the proficiency level. The goals of the learner will determine the chosen pathway to language learning; one must inquire into the purpose of L2 acquisition for a particular student before embarking on a course of instruction. The learner’s L1 may affect prepositional collocational acquisition; a Germanic
linguistic background, for example, may make the process of learning phrasal verbs less challenging conceptually (due to the presence of phrasal verbs in those languages). Cultural background should also be considered, since roles and expectations of instructors and students vary across cultures.

**Flexibility and latitude of language instructor.** Due to restrictions imposed by the educational institution, time and resource constraints of the instructional syllabus, and autonomy granted to the language instructor, some approaches and methods may not be feasible. Therefore, specific characteristics of the institution (including culture and teacher’s role *vis-à-vis* the administration), as well as the course syllabus (which may not allow for change) must be included in instructional considerations.

**Philosophical approach.** Much more difficult to quantify, the philosophies internalized by the instructor, the learner, and the educational context must nonetheless be taken into consideration. Often invisible, this important element affects assumptions and beliefs, and ultimately impacts instruction both inside and outside the classroom.

**Major Lines of Research on Collocations**

Although many strands of research were identified from the various research reviewed, there were four in particular that were prominent: corpus-based research, input enhancement, pedagogical approaches, and use of technology.

A major line of research in the area of collocations and phrasal verbs can be broadly characterized as **corpus-based research.** Most of these studies utilize some form of content analysis to answer research questions relating to use of collocations and phrasal verbs, either of a specific type or in general. Researchers have used large existing native L1 corpora to identify
collocations and phrasal verbs, obtain data relating to frequency and type, and detect patterns. The most frequently used corpora for this task are the British National Corpus (BNC) and the Corpus of Contemporary American English (COCA), most likely due to their size and availability. Representing a large sample of both British and American English, they provide a descriptive sample of English collocational usage. Shin and Nation (2008) used these corpora to measure frequency of collocation and detect common patterns. Macis and Schmitt (2016b) used the large sample to determine the relative proportions of literal and figurative collocations. The most frequently-used collocations for academic written English were found by Liu (2012) using these large corpora. Phrasal verbs of different types were examined by Gardner and Davies (2007), who studied actual occurrence using the BNC. In addition to utilizing large corpora such as the BNC and the COCA, researchers have also used corpora that were obtained either from secondary sources or by research participants themselves in order to draw conclusions regarding collocational usage. Learner corpora, collected from non-native L2 language, extracted from essays and other written materials composed by L2 learners, fall into this category. A prominent corpus of this type is the International Corpus of Learner English (ICLE), which contains argumentative essays written by English learners from a variety of L1 backgrounds. An advantage to using this corpus is the ability to use subcorpora of writing from a particular L1. The most common approach used in the reviewed research was to examine and compare corpora developed from the written language of both native and non-native speakers (Durrant & Schmitt, 2009; Fan, 2009; Laufer & Waldman, 2011; Siyanova & Schmitt, 2008). Hong et al. (2011) and Levitzsky-Aviad and Laufer (2013) utilized corpora obtained from Malaysian and Israeli English language learners, respectively. Zarifi and Mukundan (2012) used corpus data obtained from
Malaysian EFL textbooks. Irrespective of their source corpora represent a wealth of data on collocational usage and can be used to make valuable inferences in the area of L2 collocations.

Many of the studies focused on the **instructional approach** itself, including strategy use, scaffolding, collaboration, explicit versus implicit instruction, and the importance of repetition. Utilization of multiple strategies was researched by Myers and Chang (2009), while use of different types of scaffolding was the focus of Rezaee, Marefat, and Saedakhtar (2015). Szudarski (2012) compared meaning-focused instruction (MFI) and focus on form (FonF). Tsai (2018) compared the outcomes of form-focused instruction to that of concept-based instruction and a traditional instructional approach. Explicit and implicit instruction and incidental learning were studied by several researchers (Mueller, 2010; Pellicer-Sánchez, 2015; Ramos & Dario, 2015; Webb, Newton, & Chang, 2013; Zaferanieh & Behrooznia, 2011). The effect of repetition was examined by Durrant and Schmitt (2010) and González Fernández and Schmitt (2015). Nguyen and Webb (2017) examined the effect of various characteristics of collocations (e.g., node word frequency, congruency, etc.) on receptive knowledge of L2 collocations. Factors such as motivation and metacognitive awareness of collocations were the focus of a qualitative case study by Yang (2015). Rather than focusing on large samples of written text or qualities of input, these studies are most closely aligned with classroom instructional methodology.

The effect of various types of **input enhancement** on collocational learning was studied by several researchers. Lexical input elaboration was compared with typographical input enhancement by Birjandi, Alavi, and Najafi Karimi (2015). Sonbul and Schmitt (2013) compared three input conditions: enriched, enhanced, and decontextualized. Other approaches included the use of eye-tracking software to measure attention to textual enhancement (Choi, 2016), and the use of different types of dictogloss (spoken enhancement of written text) (Lindstromberg et al.,
2016). These studies are rooted in Schmidt’s Noticing Hypothesis, which asserts that L2 learners must notice the linguistic feature in question in order to acquire it.

Much of the research in collocations and phrasal verbs centers on technological use. The most frequently researched technological tool was the online concordance, both in terms of collocational learning and participant perceptions (Basal, 2019; Çelik, 2011; Daskalovska, 2015; Girgin (2019); Kartal & Yangineksi (2018); Reynolds, 2015; Sun & Wang, 2003; Zaferanieh & Behrooznia, 2011). Ashiyan and Salehi (2016) studied the effect of mobile-assisted language learning (specifically the use of WhatsApp), while Chang, Chang, Chen, and Liou (2008) and Mirzaei, Domakani, and Rahimi (2016) focused on other lexis-based software in the classroom. Son (2008) incorporated web-based language learning activities in the classroom for his research. There is some overlap between this strand of research and the pedagogical approaches strand; some of the research here can be characterized as technology-enhanced instruction, and could be viewed as a subset of the previous research line.

**Corpus-based Research**

Corpora are used extensively in research on collocations and collocation learning, and are used in three ways. First, large corpora (such as COCA or BNC) are used to identify frequent collocations and collocational patterns in English. Researchers use large existing corpora to identify collocations and phrasal verbs, obtain data relating to frequency and type, and detect patterns. The most frequently used corpora for this task are the British National Corpus (BNC) and the Corpus of Contemporary American English (COCA), most likely due to their size and availability. Representing a large sample of both British and American English, they provide a descriptive sample of English collocational usage. Shin and Nation (2008) used these corpora to
measure frequency of collocation and detect common patterns, as well as the criteria needed to distinguish collocations from other word groups. Macis and Schmitt (2016b) used the large sample in COCA to determine the relative proportions of literal and figurative collocations. The most frequently-used collocations for academic written English were found by Liu (2012) using these large corpora. Phrasal verbs of different types were examined by Gardner and Davies (2007), who studied actual occurrence using the BNC.

Second, learner corpora, or subcorpora specific to learners’ L1s, are used to describe learner use of L2 collocations. This is primarily applicable to studies which attempt to describe learner patterns of collocational use in a descriptive way, as well as common errors in collocational use. The most common approach used in the reviewed research was to examine and compare corpora developed from the written language of both native and non-native speakers (Durrant & Schmitt, 2009; Fan, 2009; Laufer & Waldman, 2011; Siyanova & Schmitt, 2008). Hong et al. (2011) and Levitzsky-Aviad and Laufer (2013) utilized corpora obtained from Malaysian and Israeli English language learners, respectively. Zarifi and Mukundan (2012) used corpus data obtained from Malaysian EFL textbooks. Irrespective of their source corpora represent a wealth of data on collocational usage and can be used to make valuable inferences in the area of L2 collocations.

Third, corpora are used in conjunction with learning activities, in which students can find examples of collocations in authentic language. The value of corpora in the learning of collocations is expressed by McEnery and Xiao (2011) thusly: “Collocational knowledge indicates which lexical items co-occur frequently with others and how they combine within a sentence…. Corpora are useful in this respect, not only because collocations can only reliably be measured quantitatively, but also because the key word in context (KWIC) view of corpus data
exposes learners to a great deal of authentic data in a structured way” (p. 368). To lend further support to the potential offered by corpora in L2 collocation learning, one may note the similarity between strategies used in L2 collocation comprehension and L2 idiom comprehension (since both lie on the same phraseological continuum according to Howarth, 1998a). L2 learners make use of context to make sense of idioms in their second language (Liontas, 2007); likewise, it is reasonable to assume that the same strategies apply to L2 collocations, and corpora can provide that context in authentic language. Since findings from corpus-based research often reflect the challenges faced by second language learners in L2 collocational acquisition, as well as L2 collocational use, it is helpful to elaborate on these areas.

**Challenges for L2 learners.** In examining the challenges L2 learners face in learning collocations, it is necessary to delve into the particular aspects of second language collocations that cause so much difficulty. To what extent to said challenges relate to the nature of collocations themselves, and to what extent is the difficulty related to the differences between the learner’s first and second languages? Peters (2016) addresses this issue by distinguishing between interlexical and intralexical factors. Intralexical factors are intrinsic to the collocation itself, and include such elements as word length and collocate-node relationship. By contrast, interlexical factors deal with differences between the L1 and the L2, congruency, and L1 influence and/or interference. Peters (2016) found that incongruent collocations (i.e., collocations that are dissimilar in the L1 and the L2) caused more difficulty for the L2 learner than did congruent collocations in form recall tests, but not in the form recognition test. Intralexical factors were found to play a role as well, including type of collocation (adjective-noun collocations such as *heavy coat* were better recognized and recalled than verb-noun collocations
such as *take notes*), vocabulary size of the learner, and word length of collocational components (Peters, 2016).

It seems evident that knowledge of L2 vocabulary and grammar is a necessary precondition to L2 collocational acquisition. In his study of English learners in Hong Kong, Fan (2009) reported that collocational use was adversely affected by deficiencies in both English grammar and lexis. However, it should be noted that knowledge in these areas does not guarantee problem-free learning of L2 collocations. Collocations vary from one language to another, and combining words which are semantically compatible does not necessarily produce an acceptable L2 collocation; there is an absence of a standard set of rules to determine acceptability (Gitsaki, 1999). As a result, the L2 learner must develop strategies unrelated to reliance on L2 vocabulary or grammar alone. The learner’s native language often comes into play. Nearly two decades ago, Nesselhauf (2003) remarked that the L1 has an influence that greatly surpasses what prior research had predicted; subsequent research has borne this out. Phoocharoensil (2013) found that the L1 plays a significant role in the learning of L2 collocations, due primarily to reliance on a learning strategy that depends heavily on L1 transfer, even among advanced, high-proficiency learners, resulting in non-nativelike word choices and misuse or omission of prepositions. In their study of English native speakers, Japanese ESL learners, and Japanese EFL learners, Yamashita and Jiang (2010) compared measures of phrase acceptability judgment between congruent and incongruent collocations; results suggested that both L1 congruency and L2 exposure impact L2 collocation learning, and that incongruent collocations continue to pose difficulty for learners with a high level of L2 exposure. Although the ESL learners performed better than the EFL learners in terms of accuracy and reaction time, incongruent collocations were still a problem area. In their closer examination of L1 interference,
Chang et al. (2008) introduced two concepts: split category and direct translation impossibilities. In the former, two (or more) words in one language may correspond to only one word in another language; in the latter, a word in one language may not have a direct translation in another language.

When one considers that collocations fall within a phraseological spectrum between free combinations and idioms, it becomes evident that there are nuances of language which the L2 learner must navigate. Such characteristics as non-compositionality and fixedness/restriction often pose difficulty. Howarth (1998b) noted that, “from the evidence of NNS collocational deviation…, it would seem that many learners fail to understand the existence of the central idea of the phraseological spectrum between free combinations and idioms. It is in handling restricted collocations that errors of both a lexical and grammatical nature constantly occur” (p.186). It is reasonable, therefore, to look to idioms, which share the characteristics of non-compositionality and fixedness, to see similar challenges for the L2 learner. When confronted with an unfamiliar idiom, the learner will often implement the strategy of noticing the gap between L1 and L2 idioms, utilizing their L1 knowledge, to derive the meaning (Liontas, 2002a). For example, an English learner with a Spanish L1 may notice the difference between the English idiom to pull someone’s leg and the Spanish idiom tomarle el pelo a alguien (to pull someone’s hair) and reason that they have the same meaning. In a similar manner, the L2 learner may attempt to use L1 knowledge to make sense of an unfamiliar collocation, thereby supporting the notion of L1 influence as an important factor.

In addition to L1 influence, frequency of L2 collocations seems to have a profound effect on collocational acquisition. Wolter and Gyllstad (2013), in their study of native Swedish speakers who were learning English collocations, noted significant frequency effects on the
processing of both congruent and non-congruent collocations in line with usage-based models of collocational processing. They observed that “usage-based models predict that higher frequency should lead to more rapid processing, and the fact that the single biggest predictor for RTs in the current study appeared to be the frequency at which the collocations appeared in the English corpus (for both the NSSs and the NSs) supports this view” (p. 471). The more advanced English learners were especially sensitive to frequency effects (for both congruent and non-congruent collocations), possibly because lower-proficiency learners relied more on word-by-word analysis of collocations than did the higher-proficiency learners (p. 472). This result is not surprising when one considers the increased exposure of advanced L2 learners to English collocations, which allows the more frequent ones to be differentiated from the less frequent ones.

Although one can measure and describe, with reasonable accuracy, aspects of L1 influence relating to transparency and congruency, and although collocational frequency can be easily determined through the use of large corpora, there are certain elements of L2 learning that are more difficult to quantify. These relate to the intuition that one has in one’s native language and the confidence with which one judges acceptable and appropriate word combinations. To some extent (perhaps less so for the more advanced L2 speaker), these characteristics are lacking for the L2 learner. As a result, non-native speakers tend to be less intuitive and less confident of their judgments regarding L2 collocations than native speakers, as found by Siyanova and Schmitt’s (2008) study of advanced English learners’ (L1=Russian) and native English speakers’ judgment of frequent and infrequent English collocations. They found that even advanced NNSs lacked collocational intuition, and that “the NNSs tended to judge uncommon collocations as more common and plausible than they actually were and, conversely, did not adequately perceive
the higher frequency of common collocations” (p. 453). These results suggest a persistent challenge in collocational acquisition by non-native speakers, irrespective of proficiency level.

Collocational use by L2 learners. It is not surprising that the various challenges in collocational acquisition faced by L2 learners are reflected in their use of L2 collocations. Generally, L2 collocational use is characterized by: (1) reliance on high-frequency collocations, (2) preference for, and higher competence in, lexical (as opposed to grammatical) collocations, and (3) persistence of collocational errors at higher levels of L2 proficiency. (High-frequency collocations are those which are used most often, and consequently to which English language learners are most likely to be exposed. The Academic Collocation List, for example, lists over 2400 frequent collocations used in academic English. There are collocations that are strongly associated despite being less frequent. For example, to take one’s blood pressure is rarely used outside the medical context, but take is nearly always associated with blood pressure.) Each of these characteristics, along with relevant research, is discussed in turn.

In their study of native Russian speakers who were advanced English learners, Siyanova and Schmitt (2008) noted that L2 writing relied heavily on relatively frequent, strongly associated collocations. Jiang (2009) found that Chinese learners of English in their writing, tended to overuse the most frequent collocations. A plausible explanation, according to Jiang, is that Chinese learners often rely on familiar collocations, overlooking other choices. Similarly, other studies have shown that non-native writers tend to use fewer collocations than their native counterparts, and their range is restricted to those which are most commonly used. For example, Durrant and Schmitt (2009) found, utilizing corpus-based content analysis of the writing of native and non-native English speakers, that the non-native writers relied on high-frequency collocations to the exclusion of strongly-associated, yet low-frequency, collocations that were
commonly used by the native writers. Similarly, analyzing a corpus of British and Hong Kong high school students’ writing, Fan (2009) noted that the non-native writers used fewer collocations and a more restricted range of collocations than their British counterparts; She attributed this result to both a deficiency in English lexical knowledge and L1 influence. Schmitt (2012), in his literature review on the use of formulaic sequences in L2 writing, remarked that non-natives used more of the “safe bets,” perhaps due to a higher level of confidence in their use; certain multiword verbs (including phrasal verbs) were particularly underused. He cited several examples from the literature, including Durrant and Schmitt (2009), Granger (1998), and Howarth (1998b).

Prepositional use seems to be a problem area for L2 learners, perhaps due to their grammatical (rather than lexical) nature. In their study of Malaysian writers of English, Hong et al. (2011) noticed that the most frequent type of error was preposition-related—superfluous prepositions (e.g., *go for fishing* instead of *go fishing*), missing prepositions (e.g., *sat the river bank* instead of *sat on the river bank*), and incorrect prepositions (e.g., *fall in the river* instead of *fall into the river*). Mueller (2011) observed that L2 students display better knowledge of prepositional use when the preposition is embedded in a frequently-occurring collocation than when it is not. This may be partly due to a preference for high-frequency collocations over low-frequency collocations (as noted earlier in this review), and partly due to the necessity of additional context for a problematic part of speech. Either way, there seems to be a preference for lexical collocations (such as noun-verb and verb-noun collocations) over grammatical collocations (e.g., collocations with prepositions). Gitsaki (1999) remarked that students overused a small number of lexical collocations (using a node such as *get*, rather than alternatives such as *receive, acquire, or gain*) in their writing, and collocations containing a
preposition (such as verb-preposition and noun-preposition collocations) were more difficult than collocations containing an infinitive (possibly because prepositions seemed to be more likely to cause L1 interference). In an Iranian university, second-year English students used lexical collocations (specifically, adjective+noun, verb+noun, verb+adverb, be+adjective, and noun+verb collocations) much more often than grammatical collocations (i.e., verb+preposition collocations) in L2 writing (Bahardoust & Moeini, 2012).

As the L2 learner becomes more proficient and advanced in the second language, one might expect collocational use and competence to improve. Indeed, Gonzáles Fernández and Schmitt (2015) found a strong correlation between L2 English collocational knowledge and English proficiency level (albeit self-reported). Additionally, a relationship between L2 proficiency and phraseological competence has been shown by Granger and Bestgen (2014), who found that, in a comparison of collocational use between intermediate and advanced L2 learners, the former group tended to overuse high-frequency collocations and underuse low-frequency (yet strongly associated) collocations in comparison to the latter group, which agrees with the results from other studies (e.g., Durrant & Schmitt, 2009; Jiang, 2009; Siyanova & Schmitt, 2008). In Siyanova-Chanturía’s (2015) longitudinal study of Chinese beginner learners of Italian, it was found that, over the course of a five-month intensive program, over which participants wrote three compositions, use of both high-frequency and strongly-associated collocations increased significantly, suggesting that a “beginner learner collocational knowledge can improve over a relatively short period of time” (p. 158). However, much research indicates that, although collocational knowledge may well increase as language proficiency increases, it does not do so commensurately or linearly. In actuality, collocational errors (such as using the wrong verb in a verb-noun collocation) persist through the advanced proficiency level, and
collocational use continues to lag behind that of native speakers. Laufer and Waldman (2011) studied Israeli English language learners at three proficiency levels (beginner, intermediate, and advanced), and noted that all learners produced fewer collocations in their writing than native English speakers did, and that the number of collocations used began to increase only at the advanced level; further, collocational errors (especially due to L1 interference) continued, even at the advanced level (specifically, although the number of collocations used in writing was higher at the advanced level, the error rate was still over 30%, only slightly less than at the intermediate and basic levels). In a six-year longitudinal study (which included the first year of university) with the same demographic, Levitsky-Aviad and Laufer (2013) found a lack of significant progress in collocational use despite advancement in general English proficiency level.

**Pedagogical Approaches**

Much of the research in L2 collocational learning focused on the instructional approach itself. Rather than focusing on large samples of written text or qualities of input, these studies are most closely aligned with classroom instructional methodology. Included in this section are findings relating to the use and importance of repetition, the implementation of various strategies, the value of collaboration and scaffolding, and the relative effectiveness of implicit and explicit instruction.

In Durrant and Schmitt’s (2010) study of adult English learners of various L1s studying at a university in the UK, a collocation naming task was performed on three groups assigned different treatment conditions: no repetition (i.e., control group), verbatim repetition of a single linguistic context, and repeated use of the target collocation in different sentence contexts.
Although both repetition groups outperformed the control group, the verbatim repetition group fared best, suggesting that fluency-oriented repetition of individual sentence contexts had the greatest effect on collocation learning, particularly at the earlier stages of L2 development. Webb, Newton, and Chang (2013) studied the effect of repetition on the incidental learning of collocations by first and second year undergraduates in Taiwan, from which they found that multiple encounters—specifically, at least five—were necessary for incidental learning to occur. In a study of intermediate English language learners, however, Pellicer-Sánchez (2015) found no significant difference in incidental learning of collocations from reading between treatment conditions differing in number of repetitions (four vs. eight), although the collocations used consisted of pseudoword components.

Nguyen and Webb (2017), in their study of 100 undergraduate English majors in Vietnam, examined characteristics of collocations as possible predictors of success in learning verb-noun and adjective-noun collocations. They found that of five factors (node word frequency, collocation frequency, MI score, congruency, and part of speech), the node word frequency (rather than the collocation frequency) was the strongest predictor. There are two explanations given for this result: (1) there may not be sufficient input for collocational frequency to impact learning, and (2) high frequency node words “may enable L2 learners to develop schemata that help them to recognize words that are likely to cooccur in sequence” (p. 315).

Utilization of multiple strategies was researched by Myers and Chang (2009), who found that the use of a variety of strategies—such as concept wheels, word maps, pantomiming, and other verbal-visual word strategies—was beneficial to the acquisition of L2 collocations by students in Taiwan. It is important to note, however, that the participants consisted of high school
students rather than college undergraduates. White (2012), in his study of ESL students in an EAP (English for Academic Purposes) course at an American university, explored a conceptual approach to the learning of English phrasal verbs, consisting of student orientation toward phrasal verbs, student collection of phrasal verbs, discussion of meaning, and student drawing/sharing of that meaning. Although the posttest results were inconclusive and gains were modest, the feedback from students was overwhelmingly positive.

In their study of low intermediate adult ESL students at a Canadian university, Nassaji and Tian (2010) examined the effects of certain output tasks (specifically, cloze and editing) on learning English phrasal verbs, as well as the impact of collaboration on both success in completing the tasks and gains in vocabulary knowledge; while completion of output tasks were enhanced by collaboration, gains in L2 phrasal verb knowledge were not statistically significant. Rezaee et al. (2015) studied the effects of different types of scaffolding (symmetric vs. asymmetric) on the learning of English collocations, in the context of concordancing, by Iranian college students. Symmetric differs from asymmetric scaffolding in that the former is peer-to-peer, while the latter is instructor to student. Although no significant differences in performance of receptive and productive tasks were reported among the groups with different scaffolding treatments (i.e., symmetric, asymmetric, and no scaffolding), all three treatment groups outperformed the control group, which did not have access to concordancing, suggesting the value of concordancing context on L2 collocational learning.

The debate between inductive and deductive learning approaches persists in the area of L2 collocational acquisition. Inductive learning is most closely associated with implicit instruction, while deductive learning is aligned with an explicit instructional approach. In incidental learning, the learner obtains knowledge outside of deliberate instruction (in either
formal or informal instructional contexts). An example of incidental learning would be the acquisition of L2 collocations through reading of an L2 text without intentional instruction. It is important to note that incidental learning does not equate to implicit instruction, in which instruction may be indirect but nonetheless intentional. Sun and Wang (2003) studied the effect of inductive and deductive instruction of English collocations to high school students in Taiwan, in which concordancing was used for both treatment groups. The mixed results suggest that, while easier patterns of collocations are suitable for the discovery learning opportunities that are fostered by the inductive approach, more difficult collocational structures require the more structured environment of deductive instruction. Mueller (2010), in his study of international students at an American university, found that explicit instruction acted as a trigger for incidental noticing of certain metaphorical word sequences during a subsequent reading task. In a study of Iranian English language learners, Zaferanieh and Behrooznia (2011) discovered that participants with explicit instruction outperformed those with implicit instruction on a post-treatment test of both congruent and non-congruent English collocations. Webb, Newton, and Chang (2013) found that learning of collocations could occur incidentally, but repetition is necessary (a minimum of five times). Pellicer-Sánchez (2015) found that reading can lead to increased knowledge of collocations incidentally, but that this “knowledge” is more receptive than productive; students could recognize L2 collocations, but were not necessarily able to produce them. Ramos and Dario (2015), in their literature review, found support that L2 learners develop much of their vocabulary through incidental means (such as reading), but that these encounters are enhanced by multi-modal tools (such as glosses). Based on the aforementioned research, it seems clear that, while implicit instruction has considerable value for the learner of L2 collocations, it is more amenable to less cognitively demanding material. Explicit instruction
seems to have an advantage both in terms of presentation of more difficult collocational structures and preparation for incidental noticing of L2 collocations (e.g., through a subsequent reading task).

Other pedagogical methods, such as FonF (focus on form), MFI (meaning-focused instruction), and rote rehearsal have been researched. In his study of EFL students in Poland, Szudarski (2012) examined the relative effectiveness of MFI plus FonF as compared to MFI only, finding that the combination of MFI followed by FonF led to greater receptive and productive collocational knowledge than the use of MFI alone. In a three-group quasi-experimental study in Taiwan, Tsai (2018) compared the acquisition of English verb-noun collocations by participants who were exposed to form-focused, concept-based, and traditional instruction; learners in the concept-based group outperformed those in the other two groups in both an immediate and delayed posttest. Szudarski and Conklin (2014) studied the effects of rote rehearsal on the collocational knowledge of advanced English learners (L1=Polish) living in the UK, finding that any positive effects were short-lived; results of a delayed (six weeks) posttest showed a decline in collocational knowledge. Moreover, frequency and congruency effects were present in the results (Szudarski & Conklin, 2014). In a qualitative study of 20 English language learners (L1=Mandarin) over the course of a five-week special English program in Singapore, Yang (2015) examined factors accounting for differences between strong and weak learners of collocations; it was found that motivation, knowledge about collocations, metacognitive awareness, and adoption of learning strategies all played a role, and that differences could be explained based on these core categories.

Although not considered a pedagogical method per se, the choice of textual material can impact L2 collocational acquisition—namely, the authenticity of such material. Unfortunately, in
the EFL context in many locations, the available materials are often lacking in terms of both authenticity and natural use of language, as found by Zarifi and Mukundan’s (2012) examination of phrasal verbs in Malaysian textbooks, suggesting the need for more effective recycling and representation of language used in instructional settings.

**Input Conditions and Enhancement**

As mentioned in the previous section, the learning of L2 collocations is predicated on the ability to notice them. This task is made somewhat easier in the case of explicit instruction, in which the target collocations are generally presented by the instructor. In the case of implicit instruction, and especially in the case of incidental learning, it is incumbent on the learner to notice and recognize the target collocation within a text, a task which can be aided through the use of input enhancement. For example, Ramos and Dario (2015) noted that incidental exposure of L2 collocations is enhanced through multi-modal glosses, an input enhancement in which the learner can hover over a target collocation to obtain more information about it. In its simplest form, input enhancement can consist of using bold font or underlining to draw the reader’s attention to a particular collocation. More advanced forms of enhancement can allow the learner to obtain textual information (either as an L2 explanation or definition, or as an L1 translation), graphical/pictorial information, or a combination of these by technological means. The effect of various types of input enhancement on collocational learning was studied by several researchers, rooted in Schmidt’s Noticing Hypothesis, which asserts that L2 learners must notice the linguistic feature in question in order to acquire it. Lexical input elaboration was compared with typographical input enhancement by Birjandi et al. (2005), who compared the relative effects of typographical input enhancement (the traditional technique drawing the learner’s attention
through use of bold font and marginal gloss), lexical input elaboration (in which additional information, such as synonyms and definition, is provided), and unenhanced input on the learning of English phrasal verbs. Results indicated that elaborated enhancement was more effective than mere typographical enhancement, although both types led to improved learning over unenhanced input. Sonbul and Schmitt (2013), focusing on lexical collocation learning by non-native postgraduate students at a British university, compared three input conditions: enriched, enhanced, and decontextualized, roughly corresponding to the three treatment conditions described in the Birjandi et al. (2005) study. It was found that both enriched and enhanced conditions led to “significant long-term gains” in both recognition and recall of collocations (Sonbul & Schmitt, 2013, p. 121).

Other approaches included the use of eye-tracking software to measure attention to textual enhancement (Choi, 2016), and the use of different types of dictogloss (spoken enhancement of written text, such as an audio explanation or definition when one hovers over the text with a mouse) (Lindstromberg et al., 2016). In the Choi (2016) study of undergraduate English learners in South Korea, it was noted that, although participants provided with typographically-enhanced input performed better on a posttest of collocations, they spent longer processing, and recalled significantly fewer unenhanced collocations than the control group, suggesting that “the trade-off between collocation learning and recall of unenhanced text is due to additional cognitive resources being allocated to enhanced collocations that are new to the reader” (p. 1). Gyllstad and Wolter (2016) had investigated the issue of cognitive processing of collocations, testing Howarth’s (1998a) Continuum Model by measuring reaction times and error rates for free combinations and collocations, finding that there was a processing cost for collocations, possibly due to differing degrees of semantic transparency and phrasal frequency.
Lindstromberg et al. (2016), in their study of advanced Dutch-speaking English learners, found that participants provided with a modified dictogloss (in the form of a supplemental outline highlighting the targeted formulaic sequences) used significantly more target academic formulaic sequences in a subsequent writing task, than did the participants provided with a standard dictogloss.

Not all research in the area of input enhancement has yielded positive results, in terms of improved performance on a posttest. In her exploratory study of advanced Dutch EFL students, Peters (2009) did not find significant positive evidence that an attention drawing technique (underlining and marginal gloss) increased recall of target collocations. Although various methodological explanations are given in the study, the contrary results highlight the complexity of assessing the influence of input enhancement as well as the importance of conducting further research.

**Use of Technology to Teach Collocations**

In his discussion of lexical awareness, Nation (2008) notes that “looking at collocation introduces learners to the ideas that in language production we often operate with units larger than words, and that words that seem to be similar in meaning can behave in quite different ways. An effective way of introducing learners to these ideas is to get them using concordancing programs…” (pp. 173-174). Much of the research in collocations centers on technological use. The most frequently researched technological tool was the online concordancer, both in terms of collocational learning and participant perceptions. The BNC and COCA online corpora are used extensively due to their size and availability. Mansour (2017) offers specific and practical guidance in directing students to an effective use of COCA to foster English collocation learning,
including use of search mechanisms and search strings, with success in assisting students translating academic texts from Arabic to English. Other web-based retrieval tools have been developed and tested by researchers, such as WebCollocate, based on a large portion of the Gutenberg corpus, and which has been helpful finding English collocations for translation tasks (Chen, 2011). Other technologies were studied as well, including mobile-assisted language learning (MALL) and classroom-based software, which will be mentioned at the end of this section. Research focusing on the use of technology tended to incorporate research questions of two types. The first type concerns the effect of a specific technology on L2 collocational learning outcomes, and the second type examines participants’ attitudes toward use of technology.

Several studies at Turkish universities focused on the use of online tools, including digital corpora, in collocational learning (Basal, 2019; Çelik, 2011; Girgin, 2019; Kartal & Yangineksi, 2018). In a quasi-experimental study of first-year undergraduates with upper-intermediate English proficiency, Basal (2019) examined the effects of four online tools (COCA digital corpus, Oxford online dictionary, Internet searches, and Google Docs) on collocational achievement. The online group significantly outperformed the control group in both the immediate and delayed posttests. In a study at a medical school, Çelik (2011) examined the effect of web-based concordancing activities (the data-driven learning, or DDL, group) on the learning and retention of prepositional collocations, as compared to activities which utilized an online dictionary. It was found that, although the difference between the DDL group and the online dictionary group was not statistically significant at the time of the posttest, the higher performance of the DDL group on the delayed posttest was significant, suggesting that the concordance-based activities led learners to do more research, exposing them to authentic language (Çelik, 2011). Girgin (2019) studied the impact of corpus-based activities on learning
of phrasal-prepositional verbs by upper-intermediate English learners, noting significant gains in tests focusing on recognition/understanding of forms, and correct use of those forms in a paraphrasing exercise. Utilizing both the COCA and BNC digital corpora, Kartal and Yangineksi (2018) studied the acquisition of English verb-noun collocations over a four-week period. Gains in knowledge and performance were found for the experimental group, as compared to the control group which did not use the corpora. Additionally, a qualitative component for Kartal and Yanineksi’s (2018) showed positive opinions of participants, nearly all of which found use of the digital corpora to be helpful.

Zaferanieh and Behrooznia (2011), in their study of Iranian EFL learners, noted that collocation instruction utilizing a web-based concordancer was more effective than a so-called “traditional method” of instruction, but only for non-congruent collocations. Daskalovska (2015), in her study of undergraduate English majors at a university in the Republic of Macedonia, compared the effects of an online corpus-based approach to more traditional methods on learning English collocations. In both the posttest and the delayed posttest, the students who used the concordancer performed significantly better than the students in the control group. Uçar and Yükselir (2015) obtained similar results, using corpus-based online materials from COCA, noting a significant increase in performance in a verb-noun collocation recognition test.

In the EFL context in Chinese-speaking locations, the use of an online parallel bilingual Chinese-English concordancer has been studied. In a study of first-year university students in Taiwan, Chan and Liou (2005) investigated the effect of using a web-based Chinese-English bilingual concordancer on collocation learning. Although the participants made significant progress in collocational knowledge, as reflected in the posttest, the gains decreased later, as
reflected in a delayed posttest two and one-half months later. Gao (2011) performed a pilot study to examine the use and effect of a parallel concordancer on a Chinese-English translation task. Reynolds (2015) explored the use of a parallel concordancer for English collocational use in the writing of medical students in Taiwan.

There were some researchers who did not find web-based concordancing activities to have a statistically significant effect on L2 collocation learning. Nour Mohammadi and Tashakori (2015), in investigating the effect of web-based concordancing activities on high and low proficiency English learners in Iran, did not find a significant difference between the WBC and control groups, although the difference in improvement between the high and low proficiency groups was significant. In their study of advanced EFL learners in Turkey, Akinci and Yildiz (2017) compared three groups: explicit instruction, DDL, and combined explicit instruction and DDL, in their learning of English verb-noun collocations. (The DDL group utilized WBC.) The DDL group fared the worst, although the result may be due to the absence of explicit instruction rather than efficacy of a more traditional method of instruction. Vyatkina (2016) compared two types of DDL—computer-based and paper-based, finding both to be equally effective in the learning of German verb-preposition collocations by intermediate North American English speaking undergraduates.

Although the vast majority of research on the use of technology in L2 collocation learning focuses on the online concordancer, there are other technologies which are used for language learning in general, and collocation learning in particular. With the ubiquity of mobile devices (e.g., smartphones), the importance of MALL in language learning cannot be overestimated. In the Iranian EFL context, Ashiyan and Salehi (2016) studied the effect of mobile-assisted language learning (specifically the use of WhatsApp) on English collocation
learning and retention, finding that the WhatsApp group outperformed the control group on tests of collocation, while simultaneously allowing for increased communication among peers to share information, a positive social atmosphere, and increased accessibility to learning. Chang et al. (2008) performed an evaluation of an online collocation aid for EFL writers in Taiwan, the goal of which is to detect and correct collocation errors attributable to L1 interference. Although not an empirical study per se, Chang et al.’s work is valuable for the light it sheds on difficulties with technologically-based translation, particularly between such linguistically distant languages as Chinese and English. Mirzaei et al. (2016) focused on other lexis-based software in the classroom—specifically, LexisBOARD, which provides learners with authentic concordances of spoken and written language. Although this study measured L2 vocabulary achievement (rather than collocations specifically), the improved performance of the LexisBOARD group over the (traditional) control group has wide-ranging implications. Son (2008) incorporated web-based language learning (WBLL) activities in the classroom for his research, which looks at ways in which WBLL can be used as a supplementary resource for teaching ESL

Attitudes and Perceptions toward Technology Use

Attitudes toward technology use, and specifically digital corpora use, for L2 collocation learning by students tended to be positive. Geluso and Yamaguchi (2014) study participants viewed web-based DDL as useful and effective, but difficulties included encountering unfamiliar vocabulary in the concordance lines, seemingly arbitrary cut-off in the concordance lines (in which contextual clues are assumed to lie outside those boundaries), and lack of sufficient time in the classroom to explore further. Iranian students in the Kheirzadeh and Marandi (2014) study expressed overall satisfaction with the use of concordancers in learning verb-noun collocations,
which were searched for most frequently, and reported paying closer attention to word combinations in reading and writing, as well as developing increased interest in using collocations in academic texts, going beyond their use in “idioms and metaphorical expressions” (p. 947). The medical students in Reynold’s (2015) study had a negative perception of the use of the concordancer to self-edit—not due to any deficiency in the technology, but rather because it was felt that the EFL writing instructor should do the editing. Despite quantitative results to the contrary, Akinci and Yildiz (2017) note that participants in the combined (explicit instruction and DDL) group expressed a positive attitude due primarily to increased learner autonomy.

Fuchs and Akbar (2013), who focused on perceptions of technology use by ESOL teachers, noted several benefits and drawbacks. On the positive side, technology affords instructors with more tool variation (especially useful for more experienced teachers), provides authentic materials, and engages students. On the negative side, IEP learners may have low e-literacy skills, novice teachers may need to devote more time and effort to lesson planning, and technology cannot be a substitute for face-to-face communication (Fuchs & Akbar, 2013).

Overall, the research seems to suggest that use of technology—digital corpora/concordancers in particular—is perceived in a positive light, provided that both instructors and students are trained properly, software technical issues are dealt with effectively, and additional support (and context) is provided as needed.

**Summary**

From the vast amount of literature on collocations, several insights can be gleaned. Collocations are difficult to define, and there is substantial disagreement regarding distinctions between collocations and other types of word groups. One may define collocations using either a
frequency-based approach (in which one looks at how often words appear together in language) or a phraseological approach (in which one looks at the characteristics and structure of collocations). In the latter approach, one may view collocations as part of a continuum. In actuality, it may be helpful to use both of these approaches in tandem. Despite difficulties in defining collocations, learning collocations is important to attain linguistic competence. Collocations, after all, are ubiquitous in both spoken and written language, hence difficult to avoid. Moreover, the often non-compositional, restricted, and conventionalized nature of collocations requires the learner to view them as “chunks” of vocabulary because knowledge of individual words will not be sufficient. Furthermore, target-like fluency demands that the L2 learner use collocations accurately and appropriately.

Instructional factors that must be considered when teaching L2 collocations include learner factors (such as linguistic background and prior experiences), instructor factors (such as level of expertise and level of autonomy within the educational setting), and external factors (such as access to technology and opportunities for practice in the community). Attitudes of both the teacher and the learner enter into the equation as well.

Researching collocations covers many areas, with significant overlap. These include corpus-based research, pedagogical approaches, input enhancement, and use of technology. Corpora may be used for extraction and identification of collocations, descriptive data for collocational use by L2 learners, and instructional activities in the classroom. Often research will span two or more of these general topical areas.

Collocations pose unique challenges for L2 learners, and these challenges are reflected in collocation use. Common problems with L2 collocational learning include L1 influence and interference, deficiency in L2 vocabulary or grammar knowledge, lack of intuition about L2
collocations, and a lack of confidence in judging and using collocations. Consequently, L2 learners often overuse high-frequency “safe bets”, avoiding low-frequency yet strongly associated collocations.

Choices in pedagogical approach can have a profound effect on how L2 learners acquire collocations. The effects of repetition, multimodal strategies, explicit and implicit instruction, collaboration, and scaffolding have been well documented in the literature. Although there is not a single, “one size fits all” answer, all of the aforementioned should be taken into consideration.

Collocational learning can be improved through various types of textual enhancement. These can be as simple as using bold font or underlining target collocations to draw the learner’s attention, but the research seems to suggest that, the more information provided (e.g., glossing with textual and/or visual information), the more effective the learning.

Technological tools, such as digital corpora, can aid in L2 collocational learning. There are several corpora available online that provides authentic language in context, and can be integrated with classroom instruction on collocations. It is important to consider, however, that there is a learning curve associated with the educational use of any technological tool, and the digital corpus is no exception. Adequate training of both instructor and learner is essential in order to maximize instructional effectiveness and learner satisfaction.

In sum, collocational learning is a significant challenge for L2 learners, but it is a task that is necessary for the ultimate goal of L2 mastery. The literature contains considerable data on L2 collocations, and may provide guidance for the language instructor on ways to assist the language learner in this challenging task. Further, technological innovation provides a way to present L2 collocations in authentic context. Although technology provides useful tools, they are
tools designed to be a supplement to, not a substitute for, sound educational research and practice.
CHAPTER 3
METHODOLOGY

Overview of Study

Pilot testing of instruments and course modules preceded conduct of the study proper, in which three pilot participants were tested using the quantitative instruments described below to get feedback and make adjustments where appropriate. In addition, these pilot participants were asked to take course modules on Canvas and give feedback regarding ease of use, perceived effectiveness, and suggestions for modification. Once pilot testing was completed, instruments and course modules were revised as necessary, and the study commenced.

All study materials (instruments and instructional modules) were delivered to participants via the Canvas learning management system, allowing for flexibility in terms of time and scheduling. Participants were offered compensation of $25 as an incentive to participate. Following signature of appropriate online consent forms, delivered as a Qualtrics survey, participants were alternately assigned to either the treatment or control group in the order of consent. This ensured that assignment was randomized, and that group sizes were comparable. Participants were then invited to one of two Canvas courses, depending on the group to which they were assigned. Following acceptance of the course invitation, participants then completed a preliminary pre-study questionnaire containing biographical and demographic information, including age, gender, country of origin, first language, and other information to be used in describing participant profile (see Appendix A). Participants then took a pretest of prepositional
collocation knowledge, consisting of gap-fill questions containing the target prepositional collocations (see Appendix B). Depending upon the group to which they were assigned, participants took an instructional module specific to that group. The treatment group module (described below) consisted of COCA instruction, as well as a task that required participants to search for each of 15 target collocations using COCA. The control group module (described below) consisted of the same 15 target collocations presented with two example sentences for each. Both treatment and control modules included a self-test at the end, allowing participants to select the appropriate preposition for each of the target collocations. At the conclusion of instruction modules, all participants took an immediate posttest consisting of the same items as the pretest, but in a different order. (The immediate posttest is hereafter referred to as simply *posttest.*) Following completion of the posttest, participants in the treatment group completed a survey of their experience with using COCA in the study, including open-ended questions relating to their impressions of COCA and its perceived usefulness in learning prepositional collocations. The qualitative data for this study consisted of the responses to these questions. Two weeks after they completed the posttest and the survey, participants received a separate Canvas course invitation consisting of a delayed posttest and a survey specifying how participants would like to receive their compensation. The delayed posttest consisted of the same questions as the pretest and the posttest, but in a different order.

Statistical quantitative data analysis was performed on the raw data from participants’ pretest, posttest, and delayed posttest results. Qualitative data analysis (thematic analysis) consisted of compilation of posttest survey data and thematic analysis thereof. Results were written up and discussed, and are presented in Chapters 4 and 5, respectively.
Overall Mixed-Methods Design

Rationale. The use of a mixed methods approach in the TESOL (Teaching English to Speakers of Other Languages) field is gaining momentum; despite constituting a small proportion of TESOL-related studies, it has wide applicability, including action, corpus, statistical, discourse analysis, program evaluation, survey, and testing research (Brown, 2014). Nevertheless, after an extensive review of the literature relating specifically to L2 collocation acquisition and the use of technology (a total of 44 studies), the vast majority of studies found were quantitative, with only a small scattering of mixed methods research (a total of four). In an effort to bring together notions of achievement and perceptions within a single study, the use of a mixed methods approach seemed ideal.

Mixed-methods research holds several advantages over either qualitative or quantitative research, including the ability to offset weaknesses inherent in qualitative and quantitative research, to provide more comprehensive evidence for studying a particular research problem, and to answer research questions that are not amenable to qualitative or qualitative approaches alone (Creswell & Plano Clark, 2007; Teddlie & Tashakkori, 2003). This study has both a quasi-experimental component and a qualitative component, each of which, alone, could constitute a quantitative or qualitative study; however, when viewed as a unified whole, the research problem could only be adequately addressed utilizing elements from both quantitative and qualitative approaches.

The use of a mixed-methods research approach is justified when a need exists for both quantitative and qualitative approaches, a need exists to enhance the study with a second source of data, and a need exists to explain quantitative results (Creswell & Plano Clark, 2007). Achievement data without perception data gives an incomplete picture, particularly when one
considers the close relationship between the two. Establishing that digital corpus technology is beneficial to L2 collocational acquisition may be extremely useful in terms of pedagogical practice, but something is missing; marrying the affective and the cognitive domains, the *emic* and the *etic* perspectives, the narrative to the numbers, adds depth to the research, and could take into account additional factors, such as motivation, that would otherwise not be considered.

**Paradigm.** The overarching worldview from which this research emanates is pragmatism, which has the flexibility to incorporate both qualitative and quantitative elements. Practical considerations—*what works*—dictates the relationship between the researcher and the research problem. Multiple perspectives, including the perceptions of the participants, are necessary to gain understanding about the impact of technology on knowledge and achievement. Neither a purely deductive nor purely inductive approach will suffice methodologically; the inclusion of learner perceptions precludes the former, and the quasi-experimental treatment and control conditions preclude the latter. A combining of both qualitative and quantitative data is necessary, and there is a *problem-solving* orientation, geared toward ultimate pedagogical practice. Indeed, it has been suggested that pragmatism is typically associated with mixed methods research (Creswell & Plano Clark, 2007).

**Overall design.** According to Creswell and Plano Clark (2007), the three major decisions that must be made to determine the design type relate to timing (concurrent or sequential), weighting (equal or unequal), and mixing of data. Quantitative and qualitative data were collected sequentially; following the posttest after the treatment, participants completed a post-study survey to provide qualitative perception data. According to Morse (as cited in Creswell & Plano Clark, 2007), the weighting is often determined by the paradigm; in the case of pragmatism, the weighting can be either equal or unequal, depending on the research question. In
the case of this study, most of the data is quantitative in nature, so the weighting is unequal, with primary weight given to the quantitative data. The first two research questions deal with quantitative data, while the third is qualitative in nature.

This study utilized the Explanatory Sequential Design, a two-phase design in which qualitative data builds upon the quantitative results. Because the focus of the qualitative phase will be on perceptions of the use of COCA in learning prepositional collocations, only specific participants (i.e., participants in the treatment group) were selected for that phase. Therefore, the participant selection model (a variant of the explanatory model) is appropriate for this study.

Strengths of this design include logistic manageability due to the two-phase structure (permitting a single researcher to conduct the research) and clear delineation in the write-up process (Creswell & Plano Clark, 2007).

**Quantitative design.** The quantitative arm of this research consisted of a randomized control trial (RCT) which examined the influence of using web-based concordance technology (specifically, an online corpus concordancer, COCA) on the learning of a particular type of collocations (prepositional) for undergraduate university student English language learners of various English proficiency levels. This quantitative phase addressed the first two of three research questions listed above, and attempted to draw inferences regarding the relative benefit of utilizing web-based concordance technology for students at different levels of L2 proficiency, as well as for undergraduate ELLs generally, as compared to more traditional pedagogical methods. The first research question compares learning of prepositional collocations for a treatment group which uses COCA to that of a control group which does not. The procedure vis-à-vis this research question can be characterized as a randomized control trial. Participants were randomly assigned to either a treatment group or a control group, and the gain in collocational
knowledge (learning) was measured. Three instruments were utilized for this purpose: the pretest, the posttest, and the delayed posttest. Two separate gains were calculated: the increase from pretest score to posttest score, and the increase from pretest score to delayed posttest score. The independent variable was the instructional treatment/intervention and had a Boolean value corresponding to treatment or control. Two independent variables consisted of the pretest-posttest gain and the pretest-delayed posttest gain.

The second research question introduced an additional independent variable: English language proficiency. This construct was operationalized by introducing another Boolean variable, with a value of either high or low proficiency. Because assignment of this variable to participants was predicated on study results, I discuss this further in Chapter 4. In other words, the design corresponding to the second research question can be viewed as a 2 x 2 matrix, where treatment/control and high/low language proficiency (independent variables) represent 2 dimensions. The gains (dependent variable; pretest-posttest and pretest-delayed posttest) were compiled for all participants in each of the four subgroups to be analyzed.

The treatment condition consisted of a Canvas-based instructional module, described above in *Instructional materials*. Participants were introduced to the web-based digital corpus, *Corpus of Contemporary American English* (COCA). This module explained how to search for prepositional collocations with COCA, and participants were exposed to 15 target prepositional collocations via a search activity using COCA. I chose COCA due to its size, its availability, and its use of American English. Developed by Brigham Young University, COCA contains over 520 million words, and is equally divided among spoken, fiction, popular magazines, newspapers, and academic texts. It is freely available online, and the emphasis on American
English (rather than British English) usage was deemed to be desirable considering the research setting at an American university.

The control condition consisted of another Canvas-based instructional module described above in Instructional materials. This module targeted the same 15 prepositional collocation items used in the treatment condition. Rather than searching for collocations in COCA, participants in the control group were provided with examples (two for each target collocation). The primary difference between the two groups’ instruction was the use of a COCA-based activity in the treatment group which did not take place in the control group.

**Qualitative design.** The way in which the quantitative and qualitative sections of this study are sequenced and utilized was discussed in the section dealing with overall mixed-methods design. With respect to the qualitative arm alone, design considerations emerge from purpose, which is to get in-depth information about participants’ attitudes, perceptions, and experiences using COCA for learning L2 prepositional collocations, as well as to relate these insights to prior quantitative results for these particular participants. Data is obtained by two methods: questionnaire and interview. Coding of interview data is done with the goal of performing a thematic analysis. The analysis of these considerations are in a way explanatory (i.e., making sense of prior quantitative results) and in a way exploratory (i.e., giving participants the opportunity to express beliefs, attitudes, and perceptions).

**Sequence of Events**

The sequence of events for this study consisted of several phases: development of course modules and instruments, pilot testing of modules and instruments, informed consent and assignment to either treatment or control group, completion of instruments and modules by
participants, statistical analysis (for quantitative data) and thematic analysis (for qualitative data), and write-up. After material and instrument development, pilot participants completed items on test of prepositional collocations, as well as course modules, and provided feedback. This feedback was then used to revise instruments and/or course modules. Following informed consent and assignment to either the treatment or the control group (process described above), participants received and accepted the appropriate course invitation. At that point, each participant followed the sequence corresponding to the appropriate group, as shown in Figure 2. Details for each group’s sequence are provided below.

**Figure 2. Sequence of events**

**Treatment group sequence.** The sequence for the treatment group consisted of seven steps, as described below. To insure that participants proceeded in order and completed all steps, Canvas parameters specified that each step had, as prerequisites, all the previous steps, and that each step had to be completed before proceeding to the next step.

**Step 1: Pre-study survey.** This survey consisted of demographic and background information, including age, gender, country of origin, first language, language medium of high school instruction, year in university, major, self-reported English proficiency, and prior experience with COCA (see Appendix A). This survey verified eligibility to participate in the
study (i.e., meeting of inclusion criteria) and provided language background information that could be used in interpreting data results.

**Step 2: Pre-study quiz.** This is the study pretest, consisting of 15 gap-fill questions, each pertaining to one of the 15 target prepositional collocations (see Appendix B). The results of this quiz were used to establish a baseline of collocational knowledge prior to study intervention.

**Step 3: Instructional module (Part 1).** This part of the instructional module consisted of a brief introduction to prepositions, collocations, and COCA, instructions on the use of COCA to search for prepositional collocations (a five-minute instructional video, accompanied by a COCA Quick Guide (a synopsis of steps involved in a COCA search with corresponding screenshots) to which participants were able to refer during the study. Following COCA search instruction, participants were required to search COCA for each of the 15 target collocations and enter the results of that search (sentence containing each collocation) as a response to a short-answer “quiz” included in the module to provide accountability and ensure that the task was completed.

**Step 4: Instructional module (Part 2).** This portion of the instructional module consisted of a review of the 15 target collocations, allowing participants to check for understanding and provide reinforcement for what was learned. Part 2 was separated from Part 1 to ensure that participants did not go back to look at their search results while reviewing the collocations (due to prerequisite requirements).

**Step 5: Post-study quiz.** Participants completed this posttest, consisting of the same questions as the pretest, but in a different order.

**Step 6: COCA feedback survey.** Participants answered several questions relating to their experience using COCA in this study (see Appendix C). These questions included general impressions of COCA, what was liked most and least about COCA, perceptions regarding
helpfulness of COCA in learning collocations, and recommendations for learners with respect to using COCA.

**Step 7: Delayed post-study quiz and compensation survey.** Two weeks after completion of Step 6, participants were invited to a separate Canvas course, which consisted of the delayed posttest (same questions as the pretest and posttest, but in a different order) and a brief survey in which participants specified how they would like to receive compensation for their participation in the study.

Following completion of all the above steps, I sent participants an email verifying study completion and compensation choice, I provided compensation, and participation came to a conclusion.

**Control group sequence.** The sequence for the control group consisted of five steps, as described below. As was the case with the treatment group, participants were required to complete all steps in order.

**Step 1: Pre-study survey.** This survey consisted of demographic and background information, including age, gender, country of origin, first language, language medium of high school instruction, year in university, major, self-reported English proficiency, and prior experience with COCA (see Appendix A). This survey verified eligibility to participate in the study (i.e., meeting of inclusion criteria) and provided language background information that could be used in interpreting data results.

**Step 2: Pre-study quiz.** This is the study pretest, consisting of 15 gap-fill questions, each pertaining to one of the 15 target prepositional collocations (see Appendix B). The results of this quiz were used to establish a baseline of collocational knowledge prior to study intervention.
**Step 3: Instructional module.** Following a brief introduction to prepositions and collocations, the module presented 15 target collocations, one per slide, each accompanied by two example sentences containing the collocation. Participants were required to view each slide sequentially, followed by a review of the target collocations, allowing participants to check for understanding and provide reinforcement for what was learned.

**Step 4: Post-study quiz.** Participants completed this posttest, consisting of the same questions as the pretest, but in a different order.

**Step 5: Delayed post-study quiz and compensation survey.** Two weeks after completion of Step 6, participants were invited to a separate Canvas course, which consisted of the delayed posttest (same questions as the pretest and posttest, but in a different order) and a brief survey in which participants specified how they would like to receive compensation for their participation in the study.

I then compiled the quantitative data, consisting of test scores for each participant’s pretest, posttest, and delayed posttest, as well as demographic information from the pre-study survey, and ran statistical analysis on SAS to provide descriptive and inferential statistics, as described in the relevant section, below. Using information from the COCA feedback survey, I analyzed the qualitative data using thematic analysis. Finally, I presented the results of the study, along with interpretation, explanation, and discussion thereof.

**Participants**

Participants were selected from undergraduate international students enrolled at a state university in the southeastern United States. There are two categories of international students at the university; there are those who are admitted by the same criteria used for domestic students
(including English proficiency), and there are those who are admitted provisionally through a program which allows them to take coursework while improving their English proficiency skills to meet standard university requirements. For purposes of this dissertation, these students are referred to as regular and provisional students, respectively. I used two approaches to recruit participants targeting these two populations of students. First, I posted flyers in conspicuous locations around the university, including basic information about the study and a contact email for those interested; this strategy was aimed at regular international students. Second, I enlisted the assistance of several instructors in the aforementioned program, who made information about the study available to their students, who fall into the provisional category described above. As an incentive to participate in the study, I offered compensation in the amount of $25 to participants.

Calculation of required sample size is dependent on confidence interval, margin of error, and population standard deviation. Unfortunately, population standard deviation is unknown, so using the formula is not possible. Therefore, a power analysis was done. Assuming a desired $\alpha$ of 0.05 and a power of 0.80, the required sample size was determined from a table provided by Cohen (1992); for a large effect size, the desired sample size per group was determined to be 26. Review of group sizes in four studies with similar purposes (determining the effect of technology on L2 collocation acquisition) and design (experimental and control groups, pretest and posttest) is summarized below in Table 2.

Based on Cohen’s (1992) power analysis and sample size selection by similar research studies, a total sample size of 50 (25 for the treatment group and 25 for the control group) seemed reasonable. To allow for possible withdraw of participants from the study, I continued recruitment until 60 participants had responded, and sent the online informed consent link to
those people. To be considered for participation in the study, students had to meet three criteria: they had to (1) be at least 18 years of age, (2) be undergraduate students at the university, and (3) have a first language (L1) other than English. Because the participants were able to access study materials online via the Canvas learning management system (for which all students have access), physical presence in the same location and at the same time as the researcher was not necessary.

Table 2
Sample Sizes of Comparable Research Studies

<table>
<thead>
<tr>
<th>Research study</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashiyan and Salehi (2016)</td>
<td>30</td>
</tr>
<tr>
<td>Basal (2019)</td>
<td>28/25 (unequal group sizes)</td>
</tr>
<tr>
<td>Çelik (2011)</td>
<td>32/34 (unequal group sizes)</td>
</tr>
<tr>
<td>Daskalovska (2015)</td>
<td>21/25 (unequal group sizes)</td>
</tr>
<tr>
<td>Kartal and Yangineksi (2018)</td>
<td>30</td>
</tr>
<tr>
<td>Mirzaei, Domakani, and Rahimi (2016)</td>
<td>25</td>
</tr>
<tr>
<td>Tsai (2018)</td>
<td>23/29/21 (unequal group sizes, three groups)</td>
</tr>
</tbody>
</table>

Determinant of proficiency. Because English proficiency level was a variable for the second research question, determination of proficiency was an important component for the conduct of this study. Proficiency, however, is a challenging construct to determine and quantify. To identify proficiency level, I employed the following strategies.

First, by virtue of my recruitment procedures and approaches, I expected participants to fall into two categories: students who were enrolled provisionally to the university through a program for international students with limited English language proficiency (i.e., provisional students), and international students who were admitted to the university under the same criteria used for admission of domestic students (i.e., regular students). Participants in the former category were primarily recruited through the assistance of English language instructors, while
participants in the latter category would be primarily recruited through exposure to the recruitment flyers which I posted throughout the campus. On the pre-study survey, there were questions relating to the aforementioned program, so participants could readily be categorized as either regular or provisional students. In this way, it was anticipated that participants could be divided into high and low proficiency on the basis of these categories.

*Second*, the data obtained from the study pretest could offer a clue as to language proficiency. There were limitations to this approach, however. English language proficiency does not necessarily correlate to collocational knowledge. Although it was expected that participants who scored well on the baseline test of collocations could probably be considered higher proficiency English language learners, there are other explanations that could account for performance on the study pretest, such as inclusion or exclusion of collocational instruction in participants’ prior English language curriculum or exposure (or lack of exposure) to collocational usage by native speakers by participants with either high or low generalized proficiency level. Nonetheless, baseline score provided a useful indicator of knowledge of English collocations despite the small number of target items, especially if the range of scores is large.

*Third*, the pre-study survey included a question about proficiency level, giving participants a choice of beginner, intermediate, or advanced. Admittedly, self-report of proficiency level is subjective and could be a reflection of a participant’s confidence, as well as proficiency, in English. Nevertheless, the survey item provided additional information that could be considered in proficiency determination.

In brief, it was hoped that a combination of the above three approaches could provide a means by which participants could be divided into categories of high and low English
proficiency. Chapter 4 provides the results of these strategies, and Chapter 5 discusses the implications of their use.

**Instruments**

**Tests.** The quantitative portion of this study, specifically the first two research questions, utilized a preliminary questionnaire and three versions of a test of prepositional collocations. Following informed consent, participants completed a *preliminary questionnaire* containing biographic and demographic information. This data was primarily used to determine and verify suitability for participation in the present study based on the inclusion criteria. In addition to providing demographic information about the participants (e.g., age, gender, year, etc.), included a question relating to proficiency level, in which participants were asked to select beginner, intermediate, or advanced level. This data was used with extreme caution due to the subjectivity of self-reporting. This issue was discussed above, and is revisited in a later section on data analysis pertaining to the second research question.

The *pretest* was designed to test knowledge of 15 target prepositional collocations, and consisted of 15 gap-fill questions in which the participants were required to fill in the missing preposition for each target collocation. As a researcher-developed test, this instrument’s validity and reliability had not previously been determined. This was a limitation of the study, and is discussed further in Chapter 5. To proactively address issues relating to validity and reliability, the test was subject to pilot testing prior to the research study.

*Selection of target prepositional collocations.* A critical element in designing the instruments for this study was the selection of the 15 target prepositional collocations to be used in the pretest, posttest, and delayed posttest. I used three criteria in the selection process:
1. Targeted collocations had to be in common usage in the United States. It would have been unreasonable to expect participants to comprehend uncommon or obscure collocations, even though mutual association of collocational components may be strong. Moreover, the COCA search results for such collocations could yield sentences that are equally incomprehensible to the English language learner, reducing the likelihood that they would learn the meaning in context. Fortunately, COCA provided frequency information, which was able to be used to determine common exemplars in US English.

2. The targeted collocations could not be ambiguous with respect to the prepositional component. If there were two (or more) prepositions that provided legitimate collocations with a given word, validity of the test of collocational knowledge would be called into question (more than one correct answer), and would result in confusion for the participants. Therefore, I searched for each candidate collocation to ascertain that the COCA results would yield clear and unambiguous frequency data.

3. The range of difficulty had to be sufficient to provide a baseline that could (1) assist in assessing English proficiency level and (2) provide gain potential from pretest to posttest and delayed posttest. Although it was impossible to determine, in advance, which collocations would be known to participants, pilot testing of tests of collocations by international graduate students provided some measure of difficulty level.

To begin the process, I searched for as many prepositional collocations as I could find. Several online sources provided an amalgamation of examples:


• ESL Buzz (2017) – Common preposition collocations in English, retrieved from https://www.eslbuzz.com/common-preposition-collocations-in-english-2/, and


From this large pool of prepositional collocations, I performed the following procedure to reduce this large selection to the 15 target collocations that would ultimately be used for this study.

1. I entered approximately 800 candidate collocations from the above sources alphabetically on an Excel spreadsheet. I excluded duplicates, as well as those which did not align with the definition of prepositional collocation as presented earlier, resulting in a list of over 700 prepositional collocations.

2. Using a random number function, I sorted the list of collocations. The resulting sorted list contained all candidate collocations in random order.

3. I started at the top of the list, removing collocations that (1) commonly collocate with more than one preposition, (2) have duplicate word forms, (3) are neither high-frequency nor strongly associated, or (4) are common to UK (as opposed to US) usage. I stopped after reaching 50 collocations which satisfied all the criteria for use in this study.

4. I searched COCA for each of the collocations in the prior step (minus the preposition), selecting the examples that provided the clearest difference between the two highest-
frequency collocations (i.e., I removed candidates for which there were two prepositions of nearly equal frequency). This step would insure that participants would not be confronted with an ambiguous result when searching for the collocation in COCA.

5. I presented these candidate collocations to the pilot testers, and selected 15 which represented a wide range of perceived difficulty. I chose items that were frequently mis-collocated by non-native speakers of English, the pilot testers in particular. In addition, I chose items so that different types of prepositional collocations (e.g., verb-preposition collocations) would be represented.

A summary of the target collocations is presented below in Table 3, including node word, preposition (collocate), frequency in COCA of collocate, and frequency of second most frequent preposition that collocates with the node word. Note that the difference between these two frequencies indicates a clear distinction for the participant performing the search.

Table 3

*Target Collocation Frequency in COCA*

<table>
<thead>
<tr>
<th>Node word</th>
<th>Collocate preposition</th>
<th>Freq. of target collocation</th>
<th>Freq. of second most frequent preposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>vulnerable</td>
<td>to</td>
<td>4282</td>
<td>350</td>
</tr>
<tr>
<td>detrimental</td>
<td>to</td>
<td>840</td>
<td>31</td>
</tr>
<tr>
<td>dispose</td>
<td>of</td>
<td>1321</td>
<td>1</td>
</tr>
<tr>
<td>arrived</td>
<td>at</td>
<td>7706</td>
<td>7423</td>
</tr>
<tr>
<td>controversy</td>
<td>over</td>
<td>1462</td>
<td>500</td>
</tr>
<tr>
<td>indulge</td>
<td>in</td>
<td>845</td>
<td>10</td>
</tr>
<tr>
<td>subsist</td>
<td>on</td>
<td>89</td>
<td>20</td>
</tr>
<tr>
<td>unique</td>
<td>to</td>
<td>1996</td>
<td>1014</td>
</tr>
<tr>
<td>pride</td>
<td>in</td>
<td>3148</td>
<td>1102</td>
</tr>
<tr>
<td>prohibited</td>
<td>from</td>
<td>735</td>
<td>400</td>
</tr>
<tr>
<td>role</td>
<td>in</td>
<td>29379</td>
<td>22939</td>
</tr>
<tr>
<td>adept</td>
<td>at</td>
<td>1306</td>
<td>81</td>
</tr>
<tr>
<td>specialize</td>
<td>in</td>
<td>1346</td>
<td>6</td>
</tr>
<tr>
<td>restriction</td>
<td>on</td>
<td>417</td>
<td>314</td>
</tr>
<tr>
<td>immune</td>
<td>to</td>
<td>1382</td>
<td>580</td>
</tr>
</tbody>
</table>
The *posttest* and the *delayed posttest* consisted of the same items as the pretest; however, the order of the items was changed. The posttest was administered in the Canvas course immediately after the instructional module for both the treatment and control groups. I compiled a list of participants and the date each had completed the posttest, and scheduled the delayed posttest two weeks (14 days) later (along with an email reminder), at which time I sent a course invitation for this last step. Participants from both the treatment and control groups were invited to the same course, since it contained only the delayed posttest common to both groups.

**Scoring of tests.** When designing the instruments on Canvas, I was required to include the correct answers for each of the 15 items as part of the setup. As participants completed the pretest, posttest, and delayed posttest, their scores were automatically calculated. In my role as “Instructor” for the Canvas courses, I was able to access each participant’s score, as well as their responses to each question.

**Surveys.** The post-study survey was the instrument from which the qualitative data was derived. A questionnaire was administered to participants in the treatment group to obtain information about participants’ attitudes and perceptions. Included in this questionnaire were open-ended questions on the following topics.

- General impressions about using COCA
- Aspects of COCA viewed most favorably in terms of general impressions
- Aspects of COCA viewed least favorably in terms of general impressions
- Perceived helpfulness of COCA in learning English collocations
- Aspects of COCA viewed most favorably in terms of helpfulness in learning collocations
- Aspects of COCA viewed least favorably in terms of helpfulness in learning collocations
Recommendation on using COCA for other learners

Advice for other learners using COCA

In addition to providing answers to questions on the preceding topics, participants were asked to give specific examples.

**Instructional Materials**

Instructional material consisted of two course modules accessible via Canvas: the instruction module incorporating COCA to be used by the treatment group and the instruction module which does not incorporate COCA to be used by the control group. The content of each module is described in detail below, and a discussion of design consideration follows.

**Instructional module for treatment group.** The treatment instructional module was divided into two parts. In the first part of this module, participants were introduced to the concepts of collocations and prepositions, as well as some general information about COCA, via PowerPoint slides. I recorded a five-minute instructional video using *Screencast-O-Matic* which explained how to log onto COCA and how to search for prepositional collocations through use of an example, and included the video in the module slide sequence following the aforementioned introduction. I also created a *COCA Quick Guide* as a linked document (see Appendix D), delineating the steps described in the video, along with corresponding screenshots. This guide was available to participants at all points in this part of the module by clicking on a button provided on all slides. I then provided participants the opportunity to try an example, followed by a slide giving the results of the COCA search so that participants could check their progress and understanding of the search process. When participants were ready to begin, they navigated through a sequence of 15 slides, each with a collocation to search for. The first word of the
collocation appeared on the slide, and participants were prompted to search for the preposition to follow that word on COCA. Participants then found an example sentence on COCA and entered it on an input form, shown as a “quiz” on Canvas, a text box provided for each of the 15 target collocations. Because Canvas does not allow the participant to go back after completing the input of COCA sentences, the remainder of the instructional content had to shift to a second module, labeled as Part 2 on the Canvas course sequence.

In the second part of the module, participants had the opportunity to review what they had learned. A series of 15 slides, each with a target collocation, prompted participants to select the appropriate preposition in a given collocation in a multiple-choice format by clicking on a button. The correct answer then appeared, allowing participants to review and check their knowledge of the target collocations. Once this part was completed, the participants moved to the posttest, at which time they were unable to go back to the module.

**Instructional module for control group.** In the instructional module for the control group, participants were first introduced to the concepts of collocations and prepositions via PowerPoint slides. The 15 target collocations were then presented, one to a slide, with two examples of their use in sentences. Participants were permitted to go back to view previous slides before they moved on to a review, which consisted of the same interactive multiple-choice format slides that were used in the treatment group’s instructional module. This allowed participants to review and check their knowledge of the target collocations. Once this part was completed, the participants moved to the posttest, at which time they were unable to go back to the module.

**Design considerations.** The design of the instructional modules was subject to the constraints under which the study took place. There were three specific constraints which guided
the design of these modules. First, all study procedures were delivered online via the Canvas learning management system. This approach was necessary to accommodate a large group of participants with varying schedules and obligations at the university. As a result, the participants were not under my direct control and supervision during the study. Second, because recruitment continued after the study was underway, there were multiple start and stop dates for different participants. It would have been implausible to delay study procedures until all participants had been recruited (a situation that may have resulted in early participants dropping out). Third, because COCA is an extensive database with a wide variety of search options, instruction in the use of COCA is a complex procedure. Additionally, I could not assume any prior exposure to the corpus on the part of the participants. The first two constraints applied to both the treatment and control groups, while the third constraint applied solely to the treatment group.

For the treatment to be effective, I determined that the following had to be considered in designing the instructional modules:

- Logistical considerations.
- Clarity and simplicity of instructions. Participants had to understand the instructions, and how the study would proceed.
- Accountability for completion of all study procedures.
- Reduction of cognitive load.
- User-friendliness.

For each instructional module, it was necessary to ensure that instructions were simple and clear for participants who were English language learners, that the modules were easy to use and navigate, and that the sequencing of course content was logical. To assist in this regard, I piloted the modules on three international graduate students, who agreed to work through the
modules and provide me with feedback. Based on that feedback, I made several modifications, the results of which are described below.

Because the participants were English language learners with a range of language proficiency, it was essential that the instructions for the modules were simple and clear. This was especially applicable to the treatment group instructional module, which required participants to use an unfamiliar digital corpus website with its own complexities and navigational challenges. In general, I avoided compound instructions; each step was short, clear, and in simple language, and I avoided overly complex terms wherever possible. I numbered steps in sequence (i.e., Step 1, Step 2, etc.) to reduce the cognitive load of voluminous text. I delineated sections of module slides to make sequencing clear for participants (e.g., welcome slides, transitional slides between instruction and review, and completion slides to prompt participants to move to the next part of the study). Regarding COCA instruction, I included a video showing, in a stepwise fashion and with a video view of the computer screen, how to set up an account and search for a collocation on the COCA website. I provided an accompanying job aid (the COCA Quick Guide) which participants could access, at any time during the instructional module, in case they forgot how to search. This guide also provided screenshots of each step so that participants could follow along in a visual way. COCA is a vast database, and its online interface has many capabilities (most of which were unnecessary for participation in this study), so I restricted the COCA instruction to what was necessary.

Ease of use and navigation was an important component to design of instructional modules. Because the study materials are delivered via Canvas, it was critical to keep the course as user-friendly as possible. Confusion on the part of the participants with technology, navigation, and so forth could possibly have led to attrition, an undesired outcome.
Consequently, I avoided use of multiple interfaces, aside from treatment group navigation of the COCA website (which was necessary for the study). All links within the modules led to pages within Canvas, and interactive buttons on the slides were placed consistently where one would expect to find them. Different functionality (e.g., previous and next slide, go to COCA Quick Guide, etc.) was color-coded to maintain clarity and avoid confusion. All menu items on the Canvas home page (except for Home) were removed from participant view so that they were required to go through the sequence properly via the links provided.

Progress through the study, from start to finish, was clearly sequenced on the welcome page for the course with links to each step. I programmed each step on Canvas as a prerequisite for the next step to prevent participants from getting lost (or skipping a step), especially if they were to go through the steps in more than one session and forget where they were in the sequence.

In addition, as much as possible, I tried to make the instruction comparable, varying only in the use of COCA. Target collocations were presented in the same order in the treatment and control modules. The welcome slide and the introductory slides relating to collocations and prepositions were the same for both, and the general instructions differed only as they related to COCA (present in the treatment module, absent in the control module). Treatment and control groups were both able to review what they have learned with the same set of interactive multiple-choice format slides described above and in Appendices E and F. The graduate students who pilot tested the two groups’ instructional modules spent approximately the same amount of time on each. The combination of all of these characteristics gave me some degree of confidence that the differences between the treatment and control groups were primarily due to the use (or non-use) of COCA to learn the target prepositional collocations.
Specific design decisions for treatment module. I made several decisions pertaining to the design of the treatment group instructional module, as described below.

- To insure that participants completed the search for collocations in COCA, I included an input form (as a “quiz” on Canvas) on which sentences found in COCA could be entered. Because participants submitted their responses to the quiz at the end of the slides pertaining to target collocations, it was necessary to split the treatment module into two parts. The first part embedded the instructional slides (up to and including target collocations) within the quiz (the input form) to allow participants to enter COCA sentences as they progressed through target collocations slides without having to skip back and forth. The second part included the review slides, and was reached after submission of the quiz (input form).

- I included a welcome slide describing the study in simple language, a general instruction slide containing seven concise steps for participants to follow, slides defining collocations and prepositions in easy-to-understand language, and a slide introducing COCA. The purpose of these slides at the beginning of the module was to familiarize participants with basic concepts, and prime them for their participation in the study.

- I embedded an instructional video on a slide following the introductory slides to minimize the number of pages participants would need to encounter. Five minutes in length, the video included a narration of specific instructions for searching for a prepositional collocation on COCA using part-of-speech tags. The video showed what participants would see as they navigated the COCA website and performed a search. I also provided a COCA quick guide job aid (with screenshots of each step) that participants could access at any point in the instructional phase of the study. I utilized this
multimedia approach to reduce cognitive load in accordance with Mayer’s (2001) multimedia principles.

- Following the initial set of slides and prior to the slides containing target items, I included a practice search to familiarize participants with using COCA and reduce anxiety.
- I devoted one slide to each target collocation (15 in total), including directions to search for the given item in COCA and input the sentence obtained from the search. Restricting each slide to one target item was designed to allow participants to focus on one item at a time and reduce cognitive load and anxiety.
- To maintain ease of navigation, I included interactive color-coded buttons on slides to allow participants to go to the previous or next slide, to go to the COCA website, and to access the Quick Guide. I placed these buttons consistently on each slide where one would expect to find them (Back and Next on the bottom, Quick Guide on the upper right where a Help button is usually located).
- I included a review of all 15 target collocations in a multiple-choice interactive button format, one target item per slide, to reinforce what was learned. I provided a sentence which included the collocation, and participants selected the missing preposition from four choices. A click on one of the buttons revealed the correct answer. In addition to the review and reinforcement function, these slides were designed to scaffold participants with a recognition task before requiring a recall task in the form of the posttest.

The feedback obtained from pilot participants regarding both instructional modules and instruments (i.e., pretest, posttest, and delayed posttest) resulted in several modification prior to the beginning of the study. The resulting changes gave me a measure of confidence that the
design of the study (and of the instructional modules in particular) was sound, given the constraints (described in the previous section) under which I operated.

**Procedures and Data Collection**

Three willing graduate students agreed to pilot test both the instrument and the instructional modules of instruments, and to provide feedback, resulting in several modifications and improvements. Examples of these improvements included simplifying instructions to make them more comprehensible to English language learners, providing screenshots in the COCA instructions, and modifying instructions for the pretest, posttest, and delayed posttest to reduce stress and assure participants that instructional methods would be evaluated, not the participants’ performance.

After obtaining IRB approval, international undergraduate students were recruited to participate in the research study through flyers and contact with instructors, who assured their students that participation was completely voluntary and would not affect the standing in their classes. I then briefed prospective participants by email on the research study, including purpose, general procedures, and assurances of privacy. I similarly assured them that they were permitted to withdraw from the study at any point. This same information was presented to them in the online informed consent, which was delivered through *Qualtrics*. Each participant digitally signed that informed consent form.

Participants for the study were selected based on a voluntary decision to participate in the research study through a convenience sampling strategy, in which participants were drawn from a pool of international students who responded to recruitment efforts by sending me an email
expressing interest, to which I responded by sending an email detailing information about the study and including a link to the informed consent form.

Once a participant consented, I sent a Canvas course invitation for either the treatment group course or the control group course. I assigned participants to a course alternately based on order I received notification of consent (i.e., treatment group consisted of 1st, 3rd, 5th, etc., and control group consisted of 2nd, 4th, 6th, etc.) Because all study materials were available on Canvas and all tasks done online, participants could begin and proceed at their own pace. The research setting was at the discretion of each participant. Due to the online research environment, participants were free to select a location that was comfortable for them. I believed that a quiet and familiar setting would put participants at ease, preventing anxiety that could affect the results. The prerequisite settings on Canvas insured that all participants proceeded in proper sequence. See Sequence of events, above, for the study course procedure. Once participants had finished the posttest, I sent an email to notify them that they would be receiving a separate course invitation in two weeks (14 days). The new course invitation, entitled Collocations study final step, was sent on the designated date, at which time participants completed the delayed posttest and chose their method of compensation. At the conclusion of testing (after the delayed posttest), I transferred all test data to an Excel spreadsheet, specifying participant identification and type of test (pretest, posttest, or delayed posttest). To preserve privacy, all tests information was digitally stored in a secured location with restricted access.

Data Analysis

The procedure for data analysis is presented in the order of research question addressed. Data analysis for the first two research questions was quantitative in nature, and involved choice
of appropriate statistical tests and analysis of the results of those tests. The third research question is qualitative in nature, and data analysis, based on post-study survey responses, followed a coding and thematic analysis protocol.

**RQ #1:** How does the use of a digital corpus facilitate the acquisition of prepositional collocations by undergraduate English language learners, as compared to a control group which does not utilize a digital corpus? In deciding on an appropriate statistical approach for the first research question, I decided to use gain score analysis, comparing the gains for the treatment group and the control group. I compared two sets of gains: pretest-to-posttest gains and pretest-to-delayed posttest gains, then compiled the pretest, posttest, and delayed posttest scores from Canvas on an Excel spreadsheet for each group of participants and calculated the gains: pretest to posttest, and pretest to delayed posttest. I recognized that there has been a longstanding debate on the appropriateness of gain score analysis, particularly as compared with analysis of covariance (ANCOVA). Fitzmaurice, Laird, and Ware (2004) point out that the choice of gain score analysis or ANCOVA depends on the research question; the former should be used if the inquiry focuses on the difference, on average, of different groups’ gains, whereas the latter should be used if the research question focuses on how groups differ on posttest, given the same pretest starting point. Although the pretest means were similar for both treatment and control groups, the focus of my research question was the improvement of participants in the two groups (i.e., the gain from pretest to posttest, and from pretest to delayed posttest). In examining related studies with a similar design, I found that several utilized gain score analysis (e.g., Daskalovska, 2015; Girgin, 2019; Nour Mohammadi & Tashakori, 2015). In each of these studies, the research questions emphasized the effectiveness of corpus-based activities or the difference in performance due to a concordance-based approach.
My hypotheses for the first research question was that the mean increase in test scores would be greater for the treatment group than for the control group, for both pretest-posttest gains and pretest-delayed posttest gains. I chose the independent-means $t$-test as the appropriate statistical test for this purpose. Assumptions for use of the independent-means $t$-test---homogeneity of variance, independence of observations, and normality of population distribution—were deemed to have been satisfied, and are addressed further in Chapter 4. Using SAS Version 9.4, I performed two $t$-tests: the first comparing the pretest-posttest gains for the treatment and control groups, and the second comparing the pretest-delayed posttest gains for the treatment and control groups.

**RQ #2: How does the effectiveness of use of a digital corpus in learning prepositional collocations vary among undergraduate English language learners of different proficiency levels?** Data analysis for the second research question involved the use of two independent variables: the presence/absence of COCA (i.e., treatment or control) and the proficiency level (i.e., high or low). The purpose of this analysis was to explore the effect of proficiency level on the hypothesized gain advantage of the treatment group over the control group.

From the compiled data of pretest, posttest, and delayed posttest scores, I sorted each group (treatment and control) by pretest score and separated each group into high- and low-proficiency subgroups, as per earlier discussion of proficiency determination. For each subgroup (treatment/high proficiency, treatment/low proficiency, control/high proficiency, and control/low proficiency), I compiled the pretest scores, posttest scores, delayed posttest scores, gains from pretest to posttest, and gains from pretest to delayed posttest.

I chose two-way factorial analysis of variance (ANOVA) as the appropriate statistical test for the second research question. Two-way factorial ANOVA was desirable because analysis
included two independent variables studied in combination. Results would provide information
about the effect of each independent variable while controlling for the other independent
variable, as well as the interaction (joint) effect of the two independent variables working
together. The assumptions of normality, homogeneity of variance, and independence applied to
ANOVA as well. Because group sizes were unequal, the unbalanced factorial ANOVA was used.
I performed the factorial ANOVA twice: once for pretest-posttest gains and once for pretest-
delayed posttest gains, the results of which are displayed in Chapter 4.

In addition, descriptive statistics were generated including mean and percentage scores
for pretest, posttest, and delayed posttest for the experimental and control groups (by proficiency
level and overall). Means and percentage scores for pretest-posttest and pretest-delayed posttest
gains were likewise collected for the experimental and control groups (by proficiency and
overall). All statistical analyses were accomplished using the SAS Version 9.4 statistical
software, and the same security protocols used in other parts of the research procedures were
followed in order to protect the privacy of participants.

RQ #3: What is the perception of the usefulness of a digital corpus for prepositional
collocation learning by undergraduate English language learners? The data analysis of the
qualitative phase consisted of coding and thematic analysis. I compiled the survey responses by
survey question and copied the responses from each of the 21 treatment group participants to a
Microsoft Word document for analysis. Response data was de-identified to reduce the likelihood
of bias in reading and coding the responses. In the initial open coding process, I analyzed the
response data from the post-study survey questionnaire. After compiling a preliminary code list,
I refined those codes into several themes which permeated the data. In addition to providing
results and analysis by survey question, I discussed each of the themes that emerged from the data in Chapter 4.

**Summary**

Following an overview of the study, the mixed method design, rationale, and paradigm were presented. Design of the quantitative and qualitative components of the study was detailed, and the sequence of events was given. This chapter discussed participant selection, including sample size considerations and determination of language proficiency. A detailed description of tests, surveys, and instructional modules used in the study followed, as well as a discussion of the method by which target collocations were selected. Finally, the procedures for data collection and analysis were delineated, the results of which are presented in the next chapter.
CHAPTER 4

FINDINGS

Introduction

This chapter includes demographic information about the study participants, instrument item analysis, study findings and interpretation, and discussion of results. Participant demographic data includes age, gender, national origin, first/native language, and college, as well as a discussion of proficiency determination. Item analysis is based on the pretest, and provides data relating to each test item and percentage of participants who answered that item correctly. Organized by research question, results from data analysis are presented and interpreted. Finally, a discussion section synthesizes the findings and interpretations in the overall context of the study.

Participants

Of the 60 participants who were recruited for the study, 57 completed the informed consent form. These people were alternately assigned to the treatment group and the control group. Eleven of these students did not complete all required tasks, and two were subsequently removed from the dataset because it was subsequently discovered that they did not meet the inclusion criteria for the study. Ultimately, the treatment group consisted of 21 participants and the control group consisted of 23 participants.
Demographic information. The mean age of the treatment group was 20.2381 (with a range from 18 to 24 years of age), and the mean age of the control group was 20.3913 (with a range from 18 to 25 years of age). In the treatment group, 11 participants identified as male, and 10 participants identified as female. In the control group, six participants identified as male, and 17 participants identified as female.

The nationalities of the participants were quite varied, and are summarized in Table 4. The first languages of the participants was varied as well, and is summarized in Table 5. In the treatment group, eight participants were freshmen (1st year), four were sophomores (2nd year), seven were juniors (3rd year), and two were seniors (4th year). In the control group, nine were freshmen, two were sophomores, four were juniors, and eight were seniors. Participants were queried as to their academic majors, and represented the colleges listed in Table 6.

Table 4
Participant Demographics: Country of Origin

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>Treatment group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Brazil</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>China</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Colombia</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Ecuador</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>El Salvador</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Germany</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Honduras</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>India</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Malaysia</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Myanmar</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Nepal</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Niger</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Nigeria</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Paraguay</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Peru</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>South Korea</td>
<td>1</td>
<td>0</td>
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<tr>
<td>Turkey</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 4, continued

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>Treatment group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venezuela</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Vietnam</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>21</strong></td>
<td><strong>23</strong></td>
</tr>
</tbody>
</table>

Table 5

*Participant Demographics: First Language*

<table>
<thead>
<tr>
<th>First language</th>
<th>Treatment group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bengali</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Burmese</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Chinese (Mandarin)</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>French</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>German</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Hindi</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Igbo</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Korean</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Malay</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Marathi</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Nepali</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Portuguese</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Spanish</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Turkish</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Vietnamese</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Yoruba</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>21</strong></td>
<td><strong>23</strong></td>
</tr>
</tbody>
</table>

Table 6

*Participant Demographics: College of Enrollment*

<table>
<thead>
<tr>
<th>College</th>
<th>Treatment group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts and Sciences</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Business</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Engineering</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Nursing</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Public Health</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Undeclared</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>21</strong></td>
<td><strong>23</strong></td>
</tr>
</tbody>
</table>
Proficiency determination. As discussed in Chapter 3, Determination of Proficiency, I expected to use three strategies to divide participants by proficiency. The first strategy involved categorizing participants as either provisional or regular students, the former enrolled in a program which provisionally allowed international students with limited English proficiency to be admitted. The second strategy categorized students by pretest performance. The third strategy used participants’ self-reported proficiency level to determine their membership in the high or low proficiency subgroup. Utilizing the first strategy, of the 44 participants for this study (21 in the treatment group and 23 in the control group), only five were provisional students (two in the treatment group and three in the control group). Therefore, this criterion could not be used to divide participants by proficiency level. The third strategy was not helpful either because of the 44 total participants, only eight identified as intermediate level (three in the treatment group and five in the control group); the remainder identified as advanced level. Therefore, utilizing the second strategy (use of pretest score), although not ideal as an indicator of proficiency level, seemed the most feasible option. There is some controversy over dichotomizing quantitative variables; MacCallum, Zhang, Preacher, and Rucker (2002) point out that it may give rise to misleading results. However, I chose this approach to aid in simplification, recognizing that for future studies, another means of proficiency determination should be used, eliminating the need for dichotomization of pretest scores. Selecting three or more categories of proficiency based on a percentile approach for delineation was not practical due to resulting group sizes being too small and widely unbalanced.

The participants were subdivided into high and low proficiency groups based on their pretest scores. In an effort to keep these groups as equal as possible in size, I determined the pretest raw score cutoff to be between seven and eight out of 15. This cutoff closely corresponds
to median pretest scores (seven and eight for the treatment and control groups, respectively). High proficiency participants were defined as those with pretest scores eight and higher, and low proficiency participants were defined as those with pretest scores seven and lower. As a result, the treatment group consisted of nine high-proficiency participants and 12 low-proficiency participants. The control group consisted of 12 high-proficiency participants and 11 low-proficiency participants. The analysis for Research Question #2 was performed using this delineation.

**Pretest Item Analysis**

The 15 items on the pretest (each corresponding to a target prepositional collocation) were of widely varying difficulty. I calculated the percentage of total participants who answered each question correctly, and a summary of the results are presented in Table 7.

<table>
<thead>
<tr>
<th>Question</th>
<th>Percent of correct responses</th>
<th>Question</th>
<th>Percent of correct responses</th>
<th>Question</th>
<th>Percent of correct responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>63.64%</td>
<td>6</td>
<td>52.27%</td>
<td>11</td>
<td>72.73%</td>
</tr>
<tr>
<td>2</td>
<td>63.64%</td>
<td>7</td>
<td>36.36%</td>
<td>12</td>
<td>25.00%</td>
</tr>
<tr>
<td>3</td>
<td>45.45%</td>
<td>8</td>
<td>45.45%</td>
<td>13</td>
<td>88.64%</td>
</tr>
<tr>
<td>4</td>
<td>61.36%</td>
<td>9</td>
<td>52.27%</td>
<td>14</td>
<td>45.45%</td>
</tr>
<tr>
<td>5</td>
<td>6.82%</td>
<td>10</td>
<td>43.18%</td>
<td>15</td>
<td>95.45%</td>
</tr>
</tbody>
</table>

**Research Question 1**

*How does the use of a digital corpus facilitate the acquisition of prepositional collocations by undergraduate English language learners, as compared to a control group which does not utilize a digital corpus?*
From Canvas, I compiled the pretest, posttest, and delayed posttest scores for participants in the treatment and control groups, and calculated two gains: from pretest to posttest, and from pretest to delayed posttest. This data is presented below in Table 8 for the treatment group and Table 9 for the control group.

Table 8  
Instrument Raw Scores and Gains: Treatment Group

<table>
<thead>
<tr>
<th>Participant</th>
<th>Pretest score</th>
<th>Posttest score</th>
<th>Delayed posttest score</th>
<th>Gain: pretest to posttest</th>
<th>Gain: pretest to delayed posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>7</td>
<td>15</td>
<td>12</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>T2</td>
<td>8</td>
<td>12</td>
<td>9</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>T3</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>T4</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>T5</td>
<td>7</td>
<td>11</td>
<td>12</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>T6</td>
<td>13</td>
<td>15</td>
<td>14</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>T7</td>
<td>5</td>
<td>9</td>
<td>10</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>T8</td>
<td>5</td>
<td>13</td>
<td>11</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>T9</td>
<td>7</td>
<td>12</td>
<td>13</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>T10</td>
<td>6</td>
<td>11</td>
<td>9</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>T11</td>
<td>6</td>
<td>12</td>
<td>10</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>T12</td>
<td>11</td>
<td>10</td>
<td>10</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>T13</td>
<td>14</td>
<td>15</td>
<td>13</td>
<td>1</td>
<td>-1</td>
</tr>
<tr>
<td>T14</td>
<td>6</td>
<td>11</td>
<td>12</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>T15</td>
<td>6</td>
<td>15</td>
<td>12</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>T16</td>
<td>7</td>
<td>9</td>
<td>9</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>T17</td>
<td>14</td>
<td>13</td>
<td>14</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>T18</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>T19</td>
<td>9</td>
<td>13</td>
<td>12</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>T20</td>
<td>9</td>
<td>15</td>
<td>11</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>T21</td>
<td>9</td>
<td>15</td>
<td>10</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>7.905</strong></td>
<td><strong>11.952</strong></td>
<td><strong>10.667</strong></td>
<td><strong>4.048</strong></td>
<td><strong>2.762</strong></td>
</tr>
</tbody>
</table>

I chose an independent means t-test to compare the gains from pretest to posttest for the treatment and control groups, based on assumptions of homogeneity of variance, normality, and independence of the two groups. The null hypothesis for the t-test was that the means of the pretest to posttest gains for the treatment group were equal to the control group. I checked for the
equal variance assumption using a folded $F$ test, and found that there is not significant evidence that the variances are different, $F(20,22) = 1.03, p = 0.938$. A test for normality (Shapiro-Wilk) yielded a $p$-value of 0.4696, which was greater than $\alpha = 0.05$ (skewness = -0.25, kurtosis = -0.41); therefore, normality was assumed. (See Figure 3, below, for a visual representation of the distribution of gain.) Therefore, I used a $t$-test assuming equal variances to test if the mean gain (pretest to posttest) for the treatment group was different from the control group. The results yielded a $p$-value greater than $\alpha = 0.05$, so I failed to reject the null hypotheses; $t(42) = 1.34, p = 0.187$. Descriptive statistics are shown in Table 10, and results of the $t$-test, in tabular form, are presented in Table 11. It is evident from these results that there was not a statistically significant difference between the two groups with respect to the gains from pretest to posttest. However, it is worthwhile to note that scores from both groups increased from pretest to posttest.

Table 9

Instrument Raw Scores and Gains: Control Group

<table>
<thead>
<tr>
<th>Participant</th>
<th>Pretest score</th>
<th>Posttest score</th>
<th>Delayed posttest score</th>
<th>Gain: pretest to posttest</th>
<th>Gain: pretest to delayed posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>6</td>
<td>10</td>
<td>7</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>C2</td>
<td>7</td>
<td>13</td>
<td>14</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>C3</td>
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<td>15</td>
<td>14</td>
<td>8</td>
<td>7</td>
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<tr>
<td>C4</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>C5</td>
<td>8</td>
<td>15</td>
<td>13</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>C6</td>
<td>10</td>
<td>13</td>
<td>9</td>
<td>3</td>
<td>-1</td>
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<tr>
<td>C7</td>
<td>11</td>
<td>15</td>
<td>14</td>
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<td>3</td>
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</tr>
<tr>
<td>C9</td>
<td>5</td>
<td>12</td>
<td>9</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>C10</td>
<td>6</td>
<td>14</td>
<td>9</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>C11</td>
<td>6</td>
<td>14</td>
<td>8</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>C12</td>
<td>5</td>
<td>10</td>
<td>9</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>C13</td>
<td>7</td>
<td>15</td>
<td>13</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>C14</td>
<td>9</td>
<td>12</td>
<td>12</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>C15</td>
<td>4</td>
<td>15</td>
<td>14</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>C16</td>
<td>9</td>
<td>15</td>
<td>14</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>C17</td>
<td>11</td>
<td>15</td>
<td>14</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>
Table 9, continued

<table>
<thead>
<tr>
<th>Participant</th>
<th>Pretest score</th>
<th>Posttest score</th>
<th>Delayed posttest score</th>
<th>Gain: pretest to posttest</th>
<th>Gain: pretest to delayed posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>C18</td>
<td>8</td>
<td>14</td>
<td>14</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>C19</td>
<td>12</td>
<td>12</td>
<td>13</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>C20</td>
<td>11</td>
<td>12</td>
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<td>1</td>
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</tr>
<tr>
<td>C21</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>C22</td>
<td>6</td>
<td>14</td>
<td>15</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>C23</td>
<td>12</td>
<td>15</td>
<td>14</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Average</td>
<td>8.043</td>
<td>13.217</td>
<td>11.957</td>
<td>5.174</td>
<td>3.913</td>
</tr>
</tbody>
</table>

Table 10
Descriptive Statistics: Mean Comparison of Pretest to Posttest Gains

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>21</td>
<td>4.05</td>
<td>2.80</td>
<td>0.61</td>
</tr>
<tr>
<td>Control</td>
<td>23</td>
<td>5.17</td>
<td>2.76</td>
<td>0.58</td>
</tr>
</tbody>
</table>

Table 11
T-test Results for Pretest to Posttest Gains

<table>
<thead>
<tr>
<th>Levene’s Test</th>
<th>t-test for Equality of Means</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>p</td>
</tr>
<tr>
<td>Equal variance assumed</td>
<td>1.03</td>
<td>0.938</td>
</tr>
<tr>
<td>Equal variance not assumed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.34 | 41.51 | 0.187 | 1.13 | 0.84 | -0.57 | 2.82 |
Figure 3. Distribution of gain: pretest to posttest. This SAS output shows the distribution of gain (in red), pretest to posttest, for the control (c) and treatment (t) groups as well as a box-and-whisker plot for each group. The normal curve is in blue.

Similarly, I chose an independent means t-test to compare the gains from pretest to delayed posttest for the treatment and control groups, based on the same assumptions previously described. The null hypothesis for the t-test was that the means of the pretest to delayed posttest gains for the treatment group were equal to the control group. I checked for the equal variance assumption using a folded F test, and found that there was not significant evidence that the variances were different, \( F(20,22) = 1.32, p = 0.531 \). A test for normality (Shapiro-Wilk) yielded a \( p \)-value of 0.076, which was greater than \( \alpha = 0.05 \) (skewness = 0.02, kurtosis = -1.29); therefore, normality was assumed. (See Figure 4, below, for a visual representation of the distribution of gain.) Therefore, I used a t-test assuming equal variances to test if the mean gain (pretest to delayed posttest) for the treatment group was different from the control group. The results yielded a \( p \)-value greater than \( \alpha = 0.05 \), so I failed to reject the null hypotheses; \( t(42) = 1.48, p = 0.147 \). Results of the t-test, in tabular form, are presented in Table 11. It is evident from
these results that there was not a statistically significant difference between the two groups with respect to the gains from pretest to delayed posttest. As in the analysis of pretest to posttest gains, scores from both groups reflected a net gain from pretest to delayed posttest.

The results from both t-tests indicate that the gains were greater for the control group than for the treatment group, for both pretest to posttest and pretest to delayed posttest, albeit not statistically significant. These surprising results seem, on the surface, to suggest that the treatment group instructional module was no more effective for learning prepositional collocations than was the control group module. It is possible that there were other factors, aside from instructional method, that affected the increase in scores. These potentially confounding variables are explored further in the Discussion section.

Table 12
Descriptive Statistics: Mean Comparison of Pretest to Delayed Posttest Gains

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>21</td>
<td>2.76</td>
<td>2.39</td>
<td>0.52</td>
</tr>
<tr>
<td>Control</td>
<td>23</td>
<td>3.91</td>
<td>2.75</td>
<td>0.57</td>
</tr>
</tbody>
</table>

Table 13
T-test Results for Pretest to Delayed Posttest Gains

<table>
<thead>
<tr>
<th>Levene’s Test</th>
<th>t-test for Equality of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
</tr>
<tr>
<td>Equal variance assumed</td>
<td>1.32</td>
</tr>
<tr>
<td>Equal variance not assumed</td>
<td>1.49</td>
</tr>
</tbody>
</table>
Figure 4. Distribution of gain: pretest to delayed posttest. This SAS output shows the distribution of gain (in red), pretest to delayed posttest, for the control (c) and treatment (t) groups as well as a box-and-whisker plot for each group. The normal curve is in blue.

Research Question 2

How does the effectiveness of use of a digital corpus in learning prepositional collocations vary among undergraduate English language learners of different proficiency levels?

The two factors present for this statistical analysis of pretest-posttest gain were group (treatment or control) and proficiency (high or low). I performed a two-way ANOVA to determine the effects of each factor (group and proficiency), as well as any interaction effects between group and proficiency. The three null hypotheses were:

1. The means of pretest-posttest gain were the same for treatment and control groups.
2. The means of pretest-posttest gain were the same for high and low proficiency.
3. There was no interaction effect between group and proficiency.

As before, assumptions included independence, homogeneity of variance, and normality.

In factorial ANOVA calculations, there are three approaches to the assignment of sums of squares to effects (in cases where the factors are competing for sum of squares): Type I (hierarchical approach), Type II (classical experimental design approach), and Type III (full regression approach). Because the observed cell frequencies are not intentional (i.e., they do not reflect population proportions), the full regression approach (Type III) is appropriate. Accordingly, all ANOVA results presented here reflect the aforementioned Type III approach.

As shown below in Table 14, the results showed that there was insignificant interaction effect between group and proficiency ($p = 0.537$, which is greater than $\alpha = 0.05$; fail to reject Null Hypothesis #3). The insignificance of interaction effect can be viewed graphically in Figure 5. The effect of group (treatment or control) on pretest-posttest gain was not statistically significant ($p = 0.087$), as all $p$-values were greater that $\alpha = 0.05$ (fail to reject Null Hypothesis #1). However, the results show a statistically significant effect of proficiency on pretest-posttest gain, with a $p$-value of 0.002 (reject Null Hypothesis #2).

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Sum of Squares (Type III)</th>
<th>Mean square</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>1</td>
<td>19.36</td>
<td>19.36</td>
<td>3.07</td>
<td>0.087</td>
</tr>
<tr>
<td>Proficiency</td>
<td>1</td>
<td>67.95</td>
<td>67.95</td>
<td>10.77</td>
<td>0.002</td>
</tr>
<tr>
<td>Group*Proficiency</td>
<td>1</td>
<td>2.45</td>
<td>2.45</td>
<td>0.39</td>
<td>0.537</td>
</tr>
</tbody>
</table>
The two factors present for this statistical analysis of pretest-delayed posttest gain were group (treatment or control) and proficiency (high or low). As before, I first performed a two-way ANOVA to determine if there were any interaction effects between group and proficiency. The three null hypotheses are:

1. The means of pretest-delayed posttest gain are the same for treatment and control groups.

2. The means of pretest-delayed posttest gain are the same for high and low proficiency.

3. There is no interaction effect between group and proficiency.

As shown below in Table 15, the results showed that there was insignificant interaction effect between group and proficiency ($p = 0.282$, which was greater than $\alpha = 0.05$; fail to reject
Null Hypothesis #3). The insignificance of interaction effect can be viewed graphically in Figure 6. The effect of group (treatment or control) on pretest-delayed posttest gain was statistically significant, with a $p$-value of 0.029. (As before, $\alpha = 0.05$.) Therefore, group (treatment or control) was considered to have a statistically significant effect on pretest-delayed posttest gain (reject Null Hypothesis #1). The results show a statistically significant effect of proficiency on pretest-delayed posttest gain ($p < 0.001$; reject Null Hypothesis #2).

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Sum of Squares (Type III)</th>
<th>Mean square</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>1</td>
<td>23.19</td>
<td>23.19</td>
<td>5.12</td>
<td>0.029</td>
</tr>
<tr>
<td>Proficiency</td>
<td>1</td>
<td>95.19</td>
<td>95.19</td>
<td>21.01</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Group*Proficiency</td>
<td>1</td>
<td>5.39</td>
<td>5.39</td>
<td>1.19</td>
<td>0.282</td>
</tr>
</tbody>
</table>

From the preceding two-factor analysis of gains in scores (pretest to posttest and pretest to delayed posttest), the statistical results show the following:

1. For pretest to posttest gains, there was a statistically insignificant effect of experimental group after controlling for proficiency. This result suggests that the treatment condition had no significant effect on collocational knowledge. It is possible, as mentioned earlier, that confounding variables played a role, and these are explored further in the Discussion section. For pretest to delayed posttest gains, a statistically significant effect of group was indicated, in seeming contradiction to the $t$-test results, after controlling for proficiency. It is possible that the interaction effect, though statistically insignificant, affected the results. It is also possible that, due to differences in the way statistics were calculated in SAS for $t$-tests and ANOVA, the conclusions could have been different. Irrespective of the reason for the difference, examination of the calculations for effect size of group
effect on pretest-delayed posttest gain revealed a range from 0.06 (semi-partial omega squared) to 0.11 (partial eta squared), so it can be surmised that the effect, while statistically significant given the sample size, is quite small.

Figure 6. Interaction plot: Pretest to delayed posttest gain. This SAS output shows the interaction between group (c = control; t = treatment) and proficiency (h = high; l = low). Parallel lines represent no interaction effect.

2. A statistically significant effect of proficiency on test score gains (for both pretest-posttest and pretest-delayed posttest) is shown from the ANOVA results, after controlling for group. This may be due to (1) the ceiling effect resulting from high pretest scores, (2) learning differences between high- and low-proficiency participants, or (3) extraneous
variables not considered in the analysis. These explanations are considered further in the
Discussion section.

3. There was no statistically significant interaction effect between the two factors (group and proficiency) for either pretest-posttest gains or pretest-delayed posttest gains.

Research Question 3

What is the perception of the usefulness of a digital corpus for prepositional collocation learning by undergraduate English language learners?

Data relating to this research question was obtained from the post-study survey (see Appendix C). Findings are organized by survey question, followed by a thematic analysis of the qualitative data.

What is your general impression about using COCA in this study? Interestingly, the most frequent responses for this question referred to ease of use, but with opposite opinions.

Several participants observed that using COCA was easy and straightforward.

I absolutely LOVED using COCA! It’s very simple, to the point, easy to use, and effective! If possible, I plan on continuing to use it after this study is over. (T10)

Others remarked that COCA was difficult to navigate and understand, and that the search process was too complex.

I feel that the idea is very good but the search engine might not be very easy unless you see the video and understand how it works. (T8)

A few participants felt that the design of the website was unattractive or unappealing.

It was a helpful method to learn collocation, however the design was very simple and less appealing than other websites additionally the search mechanism was a little bit difficult to understand in the beginning. (T9)

Other general impressions included compliments on COCA’s usefulness, effectiveness for learning collocations, and the extensiveness of the database.
What is your general feeling/impression of using COCA? Of the 21 participants included in this survey, eight responded very positive, nine responded somewhat positive, two responded neutral, and two responded somewhat negative. No one responded very negative.

What did you like the most about COCA? Please give specific examples. By far, the most frequent response was the number of examples and the context given from those examples.

I liked how you could click on the numbers and it showed me several great, credible articles. Reading a few paragraphs of those articles allowed me to understand the context in which the words are used and better comprehend their meaning. (T10)

Some participants also liked the frequency statistics provided in the COCA search results.

I liked how it showed the frequency of which a preposition is used with a word. That way, I can check if there are also any other prepositions used together with that word and how frequent they are used in colloquial language. (T21)

The size of the database, as well as the authentic nature of the examples, were also mentioned as favorite aspects of COCA.

I like the amount of data that you can extract from this. I feel like it is a database with many other useful information beyond prepositions. (T15)

I liked that the example sentences where from actual news shows and gave a real context to how the collocations are used. (T9)

What did you like the least about COCA? Please give specific examples. The most frequent complaint concerned the complicated account creation procedure, coupled with frequent prompts during searches to upgrade one’s account. The layout and design of the COCA website was criticized, and some observed speed issues during searches. Some participants were somewhat overwhelmed by the site’s complexity and remarked that the site was very complicated to use.

I did not like how it is very vague about the system and how to use it if we did not have instructions. I was confused about all the numbers and options in the pull-down panels. (T5)
Do you feel that COCA was helpful in learning English collocations? Why or why not?

*Please provide specific examples.* The majority of participants felt that COCA was helpful in learning English collocations, to varying degrees. The most frequent reason given for helpfulness was the context provided in COCA’s searches.

Yes!!! Very helpful! As I mentioned earlier, the best part about COCA were the articles and the sentences that it provided. Those examples allowed me to understand the use of those words in their context. (T10)

Others were not as enthusiastic. Recognizing the need for repetition for learning, one participant remarked:

I do believe that it is helpful, however, I must say that it is useful only to a certain extent. In my experience, English is best learned when it is in repeated use. COCA does present itself as a useful tool by providing users with useful contexts that help with the understanding of collocations. (T6)

Only one out of 21 participants stated that COCA was not helpful.

To be honest, examples was not that good. Some of them were very complicated. For instance, the words you assigned us to do, and the sentences related with it, I find it not that helpful. I would like to see easier and basic examples. (T18)

All in all, nearly all participants claimed that COCA was, to some extent, helpful for learning collocations.

*How helpful was COCA in helping you learn English collocations?* Out of 21 participants, eight responded *very helpful*, 10 responded *helpful*, two responded *slightly helpful*, and one responded *not helpful*.

*What part of using COCA do you think was most helpful for you? Why? Please provide specific examples.* The aspects of COCA deemed by participants to be the most helpful were context, frequency information, and variety of examples.

The frequency statistic presented to the user, as well as the multitude of contexts provided to the user helps a great amount. They put into perspective how often a specific word is used while also showing how the words are typically used. (T6)
The examples because they show the use of the words in different scenarios. (T8)

What part of using COCA do you think was least helpful for you? Why? Please provide specific examples. Least helpful aspects of COCA seemed to focus on difficulty of navigation and a feeling of being overwhelmed by the complexity of the site and quantity of information provided in the search.

COCA was least helpful when starting to use the site for the first time since it was difficult to navigate. (T19)

I thought it was a little too overwhelming to select the collocates (“prep.ALL, neg.ALL, det.ALL...”) at first. If these words were not abbreviated, it would have been a little easier to understand them and what they mean. (T10)

Other comments included complexity of example sentences and general complaints expressed in earlier survey questions.

Would you recommend using COCA for other students who are learning English? Why or why not? Most of the respondents stated that they would recommend COCA for other students learning English. The reasons given mirror the benefits mentioned in earlier survey responses, including availability of context, ease of use, and large amount of data.

I did not know about COCA when I was learning English. There were several times I would google for what prepositions would come after certain words, but there would be couple different collocations, and I would have a hard time finding which one to use. Whereas with COCA it is already listed based on the frequency of usage, which makes it easier to find one's answer. This is why I would recommend using COCA for other students. (T14)

A few participants would recommend COCA under specific circumstances, such as when a learner knows a word but is unsure how to use it (T16), when a learner is already somewhat fluent in English (T13), or when a learner is having specific difficulty with collocations (T6).

Would you recommend COCA to a friend who is learning English collocations? Out of a total of 21 participants, eight responded would strongly recommend, 11 responded would recommend, but not strongly, one responded no opinion on recommending, and one responded
would not recommend. Of the two participants who had a somewhat negative impression of COCA, both thought that COCA was helpful in learning English collocations, and one would nonetheless recommend COCA to a friend who is learning English collocations (although not strongly).

If you had a friend who was learning English and was going to use COCA, what 2 or 3 pieces of advice would you give? Be as specific as possible. The most frequent piece of advice offered by the participants is to look at several examples of a collocation, rather than just one, to understanding its meaning (T1, T7, T16, T19, T20). Other pieces of advice include reading the entire paragraph rather than just the sentence for context (T10), getting additional instruction/practice on COCA before using it (T5), creating an account so previous searches can be viewed (T13), and having fun exploring COCA (T2).

Anything else you would like to say (opinions, feelings) about your experience participating in this study? Most of these responses focused on participation in the study itself rather than on COCA specifically. There were some comments from participants that seem to indicate that the use of digital corpora holds promise for further research in the area of L2 collocational acquisition:

I feel it was not only easy but very helpful, as the use of prepositions is something I do struggle with occasionally. (T4)

In my opinion it was an interesting experiment, it involved more work than I anticipated, and it made me realize mistakes I make in collocations I would normally not notice. (T9)

I didn't have any idea about COCA before I participated in this program. Now, I feel like I have a resource in case I need help. (T19)

While responses to the post-study survey varied widely in terms of length, detail, and use of specific examples, participants were forthcoming and honest in their assessment of the study in general and the use of COCA in particular. There were some instances in which
respondents misinterpreted the meaning of a survey question, but responses were usually clear and easy to understand. There were some cases in which an interview follow-up would have been helpful, an issue I address in Chapter 5. Several themes emerged from the survey responses, which are explored in the next section.

**Themes.** Thematic analysis began with coding. Based on participant responses from each question in the post-study survey, I developed a list of 11 codes. Refining those codes, several themes emerged which warranted detailed examination. From careful scrutiny of participant responses and refinement of codes, five areas are presented for further discussion: user interaction/interface, usefulness, context/examples, functionality, and layout/design.

**User interaction/interface.** Including interactions between the user (learner) and the COCA website, issues relating to account setup, navigation, and perceived user-friendliness fall into this category. Ease of use was one of the most commented areas in the post-study survey, with participants nearly evenly split on this point. Several participants commented that the COCA website was easy and straightforward to use and navigate, while others complained that the site was quite difficult to navigate. The distinction seemed to be the understanding of instructions, suggesting the importance of clear directions for use of COCA. A few participants alluded to this distinction, remarking that searching for collocations became or would become easier if the user saw the instructional video and understood how the site works (T8), had the experience of a few initial searches (T9), or had “figured it out” (T6). Two of the most frequent complaints and least liked aspects of COCA were the registration process at the beginning (T3, T15, T16) and the frequent interruptions during searches to upgrade one’s account (T7, T18, T21). The speed of the website during searches and delay of page loading were criticized as well (T14, T17), although it is unclear if this was the result of the Internet connection, the
participants’ computers, or the website itself. Organization of the website was cited as the most liked aspect of COCA by one of the participants (T18).

**Usefulness.** This category includes perceived helpfulness of COCA in learning collocations, whether used as part of instruction, as a supplement to instruction, or as a resource to be consulted as needed. Nearly all the respondents found that use of COCA was useful and effective for learning collocations in this study. In many cases, however, specific details were not provided to account for the perceived usefulness. The most frequently mentioned reasons included the large number of examples (T1, T7, T8, T13, T16) and the provision of context (T3, T10). Some participants remarked that usefulness of COCA for learning collocations was conditional—that the study tasks were insufficiently challenging to require the use of COCA (T6), that repeated use is necessary to learn the collocations (T6), or that some of the examples may not be grammatically correct due to use of “everyday language” in the concordance lines (T21). Some of the examples were thought to be too complicated for use by beginner-level English language learners (T18), while another participant felt he was too advanced to find COCA useful (T17). It was noted that using COCA was “better and quicker than class teaching,” but students need an incentive, such as an assignment, to use the corpus (T18).

**Context/examples.** The context generated from a COCA search, including the context of the searched collocation within a concordance line or sentence, or within a paragraph, this theme includes such aspects as size of the COCA database and authenticity of examples from various sources (e.g., newspapers, magazines, etc.). The context provided by the corpus (T1, T3, T10), the size of the database (T7, T13, T15), and the diverse range of authentic material contained within (T8, T9, T17, T20) were mentioned by participants as the most liked aspects of COCA.
These responses suggest that the corpus’s strength lies in its size, its context, and its variety of authentic sources.

**Functionality.** This theme consists of the different functions COCA can perform, or the capabilities it can offer, such as frequency data and concordance lines resulting from a user search. Specific functions mentioned by participants in the post-study survey include frequency data (T15, T21), unspecified “statistics” (T11), and ability to select different parts of speech during a search (T2). Admittedly, the search functions utilized in this study were quite limited due to the scope of this research, focusing on the searches required for a very specific purpose. It is worth noting, however, that the potential uses of COCA increase with the extensive search capabilities that are available in the corpus.

**Layout/design.** This category includes the appearance of the website and the layout of its components, including the way tabs are arranged, how tables and data appear, and choice of color, font, and so on. The design of the website, in a general sense, was the least liked aspect of COCA by participants in this study. A few participants were more specific, remarking that the design was unattractive and unappealing (T4, T10), bland (T11), and simple (T9). A few compared COCA to other websites, which seems to suggest that the bar has been set high by a new generation of Internet users who have become accustomed to innovative website design with accompanying “bells and whistles.” COCA, by contrast, was designed for researchers, and thus geared more toward functionality than aesthetics.

Participants had a wide range of opinion relating to the user interactions with COCA. Comments suggest, however, that additional instruction and practice with the corpus is key to overcoming any negative impressions regarding ease of use and navigation. Account setup procedures, promotional interruptions, and site layout and design are beyond the control of
educators and researchers, but their negative impact can be somewhat mitigated through adequate notice in instruction. Participant responses also suggest that use of COCA is perceived as useful for learning collocations, primarily due to its strengths—context within sentences and paragraphs, authentic material, and database size.

Discussion of Findings

It is notable that the statistical analysis of pretest-posttest and pretest-delayed posttest gains yielded statistically insignificant differences between the treatment and control groups, which would seem to suggest that the treatment condition provided no advantage for the learning of prepositional collocations, as compared to the control condition. It is possible that the treatment condition itself was not as effective as originally anticipated due to the following:

- COCA search results consisted of sentences that may have been difficult for some participants to understand. In those cases, participants may have merely copied a pasted the sentence to the input form without regard for comprehension.
- Despite the effort to simplify COCA instruction through the video and the quick guide, the cognitive load of combining this instruction with the rest of the study procedures may have been too high, resulting in loss of motivation.
- The expectation of learning 15 target collocations may have been overly optimistic for the limited time of the study session.

Other studies on the impact of using digital corpora for learning collocations or phrasal verbs were conducted over longer periods of time, ranging from four hours (Ucar & Yükselir, 2015) to five weeks (Akinci & Yıldız, 2017; Basal, 2019; Celik, 2011). Studies which were conducted over a shorter period of time provided concordance lines to participants rather than
requiring a corpus search (Girgin, 2019; Ucar & Yükselir, 2015). Studies which took place over several weeks provided a separate instructional session during which participants familiarized themselves with the digital corpus (e.g., Akinci & Yildiz, 2017; Celik, 2011; Daskalovska, 2015; Kartal & Yangineksi, 2018).

Additionally, the number of target items tended to be fewer in relation to the contact time of the study. Multi-week studies ranged from six collocations per week (Akinci & Yildiz, 2017) to ten target items per week (Basal, 2019; Celik, 2011). Similar to the present study, Ucar and Yükselir (2015) focused on 15 target collocations over two 2-hour sessions, but provided concordance lines from COCA so participants did not need to search. Although this pilot study was limited in terms of contact time with participants, the aforementioned issues should be considered going forward, and are discussed in the next chapter.

Upon closer examination of the data, there are a couple additional possibilities which emerge as possible explanations for lack of statistically significant differences in the mean gain of test scores: insufficient time spent by participants on tasks, and possibly a low degree of investment in the study on the part of participants.

At the inception of the study, it was anticipated that both treatment and control group participants would spend between two and three hours on the study. The protocol for the study specified this time estimate, which was included in recruitment materials. Prospective participants were therefore aware of the time required to complete the study. Indeed, the time required was a major factor in determining appropriate compensation for participating in the study. Moreover, pilot testing of instruments and instructional modules reflected a two- to three-hour time commitment, from start to finish. However, after reviewing profile data on Canvas, it became evident that many participants spent much less than the estimated time, suggesting that
they may have rushed through the procedures. If this were true, there would certainly be an impact on the results. For learning to take place, exposure must occur over a period of time; if this did not occur, validity may be called into question. Moving from this pilot study to the main study, the element of time exposure to instruction would need to be addressed.

In recruiting participants for the present study, as an incentive to take part, I offered compensation in the amount of $25. I based this amount on time required, which I estimated to be between two and three hours. An unintended consequence of the compensation offer may have been to attract participants who wished to take part due to the compensation alone, rather than genuine interest in the study and its outcomes. Compounded with the online delivery of study materials and procedures, there may have been a temptation by some participants to race through the study procedures without being fully invested in the outcome. Indeed, the examination of data relating to time spent tended to confirm this. Compensation, according to IRB guidelines, may not be tied to any factors other than participation; that compensation had to be awarded irrespective of time or effort spent. For example, the treatment group participants were required to search for target collocations on COCA and input the search results to provide accountability. However, participants may have entered the search results without understanding them, resulting in a fidelity issue, and the study results may not accurately reflect learning of those target collocations. Perhaps in future study, tasks can be added to increase levels of accountability.

In addition, there may have been other extraneous factors which affected the results. Evidence for this includes delayed posttest scores that were less than the pretest scores and delayed posttest scores that were greater than posttest scores, both of which seem counterintuitive. Although these anomalies are minor (consisting of only a one-point difference
for five participants), one would expect scores to increase from pretest to posttest, then decay somewhat due to forgetting, suggesting that other factors may have played a role in performance during completion of one or more of the instruments.

The consideration of proficiency presented a challenge to the analysis of the results of this study. Specifically, the use of pretest scores as a measure of proficiency, due to limitations inherent in the instrument as well as the simplification of a very complex construct, yielded results that may not reflect the full impact of proficiency level on the effectiveness of instructional use of digital corpora. This is not an argument against pursuing the line of inquiry, however, and although the limitations of using the particular method of determining proficiency are detailed and discussed above in *Determination of proficiency* and below in *Limitations*, future modifications in instrumentation as well as use of more independent criteria for determining proficiency, moving from pilot study to main study, should provide results which are more indicative of actual effects of proficiency on the efficacy of a digital corpus-based instructional method.

As noted in the results of the factorial ANOVA analysis, proficiency level was found to have a statistically significant impact on test score gains. I propose that this result may have been due to a ceiling effect. The pretest determined the baseline for collocational acquisition in this study, and scores on this test varied widely among participants in both the treatment and control groups. Out of a maximum of 15, scores in the treatment group ranged from three to 14, and scores in the control group ranged from three to 12. For high-performing participants in either group, there was limited room for improvement. Because the gain in test score, from pretest to either posttest or delayed posttest, was a dependent variable used for statistical analysis, results from the $t$-test may have been distorted by this ceiling effect. For the results of statistical analysis
for the second research question, in which proficiency (as measured by the pretest score) was a factor, there would certainly have been an impact on the contribution of proficiency on the factorial ANOVA results.

It is worth noting that both the treatment and control groups experienced a net gain from pretest to both posttest and delayed posttest, suggesting that instructional intervention, generally, was effective in learning prepositional collocations. In addition, because I designed example sentences for the control group module that were simple and easily understood, comprehensibility may have outweighed authenticity for some participants.

Feedback from participants relating to use of COCA in this study suggest a role of digital corpora in learning collocations. Responses were generally positive in nature, indicating that learners enjoyed using the technology, but predicated on certain conditions. First, due to the researcher-oriented nature of a digital corpus such as COCA, it must be recognized that there are aspects which are not perceived by students as particularly user-friendly. Therefore, it is imperative that instruction on the use of the corpus be viewed as an educational element in itself. Comfort with the use of a new technology requires the opportunity for extensive exposure and practice. While the design of the treatment group instructional module included video, textual instruction, and practice in the use of COCA, more extensive and detailed direction in its use is warranted, both for the main study and for educational implementation. Second, the availability of authentic uses of collocations should be emphasized, but the complexity of some examples by virtue of their source (especially for lower-proficiency learners) should be recognized. It is likely that many learners will have some difficulty with comprehension of the contexts of the examples, and provision of additional resources (such as an online dictionary) may ameliorate this concern. Nevertheless, the importance of having examples in context from authentic sources
is a strength of COCA, as evidenced from participant responses. Third, use of COCA to learn prepositional collocations was viewed as a supplemental resource by many participants, and not as a standalone instructional method. While viewed as useful for learning collocations, the corpus sometimes provided examples that were difficult to understand, particularly for lower-proficiency English learners, suggesting the need for additional resources. Additionally, some aspects of spoken language, which is one of the sources from which the COCA database draws, reflect ungrammatical usage, which would indicate that some attention to grammar may be needed, yet not provided by the corpus itself. Positioning digital corpora as a tool to be used in language learning, in conjunction with other resources, would be beneficial for the process of building collocational knowledge and proficiency.

Summary

In this chapter, demographic data on participants was provided and research results—in the form of statistical analysis for quantitative data and thematic analysis for qualitative data—were presented. Following interpretation of the findings, the discussion section explored the issues relating to the study results. The discussion of research results leads to further exploration of study limitations, pedagogical implications, and recommendations for the main study and future research directions, which are presented in the next chapter.
CHAPTER 5

CONCLUSION

Introduction

This pilot study has examined the impact of using a digital corpus to learn prepositional collocations, explored the differing impact of proficiency levels on the effectiveness of utilizing a digital corpus-based approach, and revealed the perception of the usefulness of digital corpus use. The first chapter introduced the research problem, purpose and significance of this study, and theoretical framework. Additionally, the chapter defined key terms and delineated research gaps. The second chapter, which began with a detailed discussion of the meaning and importance of collocations, presented a review of the recent literature surrounding collocations, with particular focus on various lines of research and instructional considerations. The third chapter detailed the methodology, including design, instruments and instructional material used, and procedures for data collection and analysis. The fourth chapter presented, interpreted, and discussed the study findings. This fifth and final chapter highlights the limitations, discusses pedagogical implications, presents future research directions, and offers some final thoughts.

Summary of Findings

In summarizing the findings of this pilot study, it is helpful to revisit the original research questions. First, how does the use of a digital corpus facilitate the acquisition of prepositional collocations by undergraduate English language learners, as compared to a control group which
does not utilize a digital corpus? Although it was expected that digital corpus use would be shown to be more effective than a traditional method in learning prepositional collocations, statistical analysis revealed no significant difference in the mean gains (from the pretest to either the immediate or delayed posttests) of the treatment and control groups, which may be explained in the Limitations section below. Nevertheless, it would be worthwhile to further pursue this question with improved instrumentation and more extensive instruction, as expounded on below in Recommendations for Future Research.

Second, how does the effectiveness of use of a digital corpus in learning prepositional collocations vary among undergraduate English language learners of different proficiency levels? An analysis of variance showed that, while a link between group (treatment vs. control) and effectiveness was inconclusive, there was a marked difference in gains between high and low proficiency level participants. This may be due in part to the ceiling effect, as participants with higher pretest scores had less room for improvement. As discussed below, a change in the way proficiency is determined, as well as adjustments in future instrumentation, may yield more conclusive results.

Third, what is the perception of the usefulness of a digital corpus for prepositional collocation learning by undergraduate English language learners? An analysis of post-study survey results showed that COCA was deemed useful by participants. Although there were mixed perceptions regarding ease of use, the digital corpus was seen as a valuable resource for English language learners in learning prepositional collocations.

Overall, this pilot study has some inconclusive yet promising results. It demonstrates the feasibility of a more extensive main study with some modifications highlighted below in the Recommendations section.
Revisiting Theoretical Framework

Reflecting on the theoretical framework discussed in the introductory chapter, there are three areas of theory that stand out as especially applicable to this study in particular and to the learning of prepositional collocations in general: chunking versus rule-based processing, motivational theory, and multimedia learning theory.

Chunking refers to the learning of language through lexical “chunks” rather than word by word. As the name implies, rule-based processing requires the language learner to use prescriptive “rules” to determine individual lexical items. In the case of prepositional collocations, because the collocating preposition is determined by convention, rule-based processing is insufficient for the learner. It is desirable, therefore, to learn prepositional collocations in chunks consisting of the node word and the collocating preposition.

Because this study was conducted online through the Canvas learning management system, it was necessary to anticipate participant needs in terms of instruction via modules. Specifically, instruction in the use of COCA was challenging (as reflected in participant comments on the post-study survey). To maximize understanding and to minimize cognitive load, multimedia learning principles were essential. In particular, Mayer (2001) developed 12 principles that were invaluable in developing the instructional modules for this study. For example, I utilized the Pre-training Principle (by providing background information to participants on collocations, prepositions, and COCA in the instructional modules), the Segmenting Principle (by allowing participants to proceed through the study at their own pace and splitting up tasks in manageable segments), and the Multimedia Principle (by providing both text and screenshot images in the COCA Quick Guide). Likewise, in terms of collocational learning in the classroom (or online), the instructor should consider how information is delivered
as well as \textit{what} information is delivered. Therefore, this area of theory dealing with multimedia learning principles is beneficial.

Irrespective of method of instruction or intention of the teacher, the student should be motivated for learning to be effective. However, motivation can be difficult to quantify or predict in the case of individual learners; different people are motivated by different factors, just as different people learn differently. Therefore, it is helpful to discover some guiding principles related to motivation to assist in preparation for instruction as well as research. Focus on the learner’s desire to achieve a goal, willingness to make the effort, and satisfaction with the task at hand was identified by Gardner and MacIntyre (1993) as essential for motivation. In this study, I used various strategies to attend to these three areas. I provided justification for learning prepositional collocations in study materials to appeal to participants’ desire to learn, I offered compensation as incentive to expend the effort to participate, and I designed the modules to be user-friendly and enjoyable to enhance participant satisfaction with study tasks. In approaching instruction in either future research or pedagogy, it would be wise to consider these factors to maximize student motivation, and ultimately to facilitate learning.

\textbf{Limitations}

Eight limitations to this study are discussed here, some of which were mentioned above in the \textit{Discussion} section in the last chapter. Addressing these limitations are a priority in moving from this pilot study to the main study, and strategies to overcome these limitations are further explored below in the \textit{Recommendations} section. The limitations consist of (1) lack of direct supervision and control of participants, (2) complexity of COCA instruction, (3) motivation of participants, (4) time spent by participants on study procedures, (5) instrumentation validation,
(6) proficiency determination of participants, (7) qualitative procedures performed, and (8) sample size. These limitations varied in terms of what I could reasonably control. Although motivation and time spent were dependent on the participants’ interest and attitude, complexity of COCA instruction was a limitation over which I had the greatest control through treatment design.

**Lack of direct supervision and control.** Due to the online delivery of study materials via Canvas, participants performed required procedures independently (i.e., without my direct supervision and control). Furthermore, participants operated at their own pace and had multiple starting dates, as discussed in Methodology. Although I took reasonable steps through design (discussed in Methodology) to ensure that participants completed required procedures on their own, there was no guarantee that these design measures were foolproof. In particular, it is possible that participants communicated with each other or consulted outside sources during the course of the study.

**Complexity of COCA instruction.** Because COCA is an extensive database with myriad search options, the procedures required to perform searches can be quite complex, particularly for the uninitiated. Based on pre-study survey responses, it became clear after the study was underway that none of the participants had any prior exposure to COCA. To combat this issue, I (1) restricted instruction to include only search procedures necessary to complete the study, (2) provided multiple modes of instruction (video demonstrating a COCA search and a quick reference guide which included screenshots of all search steps), and (3) gave participants an opportunity to perform a practice search prior to searching for the target collocations to increase comfort level and familiarity. Despite these precautions, several participants noted (via post-
study survey responses) that the use of COCA was challenging and complex, underscoring the limitation inherent in COCA instruction.

**Motivation of participants.** In consideration of practical aspects of participant recruitment, it seemed reasonable to provide some external motivation. Therefore, I offered monetary compensation to incentivize participation, a strategy which was ultimately successful in obtaining the target sample size. While the details of participant motivation are unknown, it is possible that participants were motivated by compensation alone, rather than by interest in the study itself. The study was designed and implemented based on the assumption that participants would make their best effort on the pretest, posttest, and delayed posttest, take their time working through the instructional modules, and answer the post-study survey honestly and completely. Although it is not possible to guarantee prospective participants’ genuine interest in the research, future adjustments to the incentivization protocol may have a beneficial outcome in this regard. Possible adjustments include targeting prospective participants who have a particular interest in the study, surveying candidates to reveal their motivations for participation, and obtaining additional information from participants at the end in an interview.

**Use of a single instructional module for each group.** This study utilized a single instructional module per group over a time period projected to be a maximum of approximately two to three hours. The rationale for choosing this format was based on participant recruitment considerations, as a longer time requirement may have been a disincentive to participate. Additionally, it was anticipated that data from this pilot study would shed some light on which study materials and/or instruments could realistically be expanded for the main study. It is hoped that future study will include instructional intervention that incorporates a wider range of tasks
(including both recognition and recall tasks) and takes place over a longer time period (such as a longitudinal study).

**Instrument validation.** Because of lack of available pre-validated instruments for testing prepositional collocational knowledge, I devised my own test for that purpose. Although I took great effort to select appropriate target collocations and design a test which would elicit correct responses (as detailed in Chapter 3), it was not possible, considering the constraints on time and resources, to implement the lengthy and detailed procedures necessary for a comprehensive test of the validity of the instrument. For future study, it is anticipated that a pre-validated instrument to measure prepositional collocational knowledge can be found or developed.

**Determination of proficiency level of participants.** As discussed in the fourth chapter, there was difficulty associated with determining proficiency level of participants. Recruitment for the study centered on two approaches: instructor assistance targeting the *provisional* international student population and flyers targeting the *regular* international student population. It was anticipated that similar numbers of participants would be obtained from each population, allowing for a convenient delineation of high and low proficiency students. However, because so few of the participants were provisional students, it was not possible to use this categorization to determine proficiency level. Therefore, I used the baseline pretest scores as an indicator of proficiency. In recognition that this strategy has some shortcomings (e.g., the pretest instrument was researcher-developed, knowledge of a limited set of target collocations is not a measure of overall language ability), this method of proficiency determination is a limitation of this study—specifically, to the second research question. Nonetheless, the results may reasonably be used for future research trajectories, provided that a more objectively measurable determination of
English proficiency level can be made, perhaps through a pre-validated test of English proficiency or use of TOEFL (Test of English as a Foreign Language) scores.

**Qualitative data restricted to survey responses.** In designing the post-study survey, I chose many open-ended questions and requested specific examples to elicit detailed and complete qualitative data, and most of the respondents provided adequate detail as per survey instructions. However, some participants’ responses were short and lacking in specific detail. It would therefore have been desirable to have the option to interview participants for clarification and follow-up questioning. Future study should take this limitation into consideration in providing more detailed qualitative data, such as clarification and elaboration of survey responses. Furthermore, a follow-up interview would allow the researcher to delve more deeply into any issues that may emerge from participants.

**Sample size.** Although the total sample size was deemed adequate due to power analysis and comparisons with previous studies with a similar design (see Chapter 3), the second research question, which examines the effect of proficiency level, required a 2 x 2 factorial analysis of the data. In dividing the total sample to four cells over two dimensions, the subset of total participants allocable to these cells ranged from nine to twelve participants each. While a group of this size is appropriate for a pilot study, a larger sample would provide more robust data. It is anticipated that the main study, as well as any subsequent research, will address the aforementioned limitations inherent to this pilot study. This pilot study, despite these limitations, suggests that a main study which builds upon the results in Chapter 4 is both feasible and desirable.
Pedagogical Implications

The findings of this study, in concert with existing research presented in Chapter 2, have several implications that can inform professional language educators, specifically the focus on prepositional collocations, integration of digital corpora into instruction, training in use of digital corpora by both teachers and students, and the addition of digital corpora to the toolbox of resources for language instruction. Although any conclusions relating effectiveness of using digital corpora to proficiency level may be premature at this time, a case could be made for appropriate use of such technology across multiple proficiency levels, to which the following implications apply.

**Inclusion of prepositional collocations specifically.** The collection of research studies presented in Chapter 2 shows that (1) collocations are prevalent in English speech and writing (e.g., Shin & Nation, 2008) and (2) collocational acquisition is a challenge even for advanced English language learners (e.g., Levitsky-Aviad & Laufer, 2013). Acquisition of prepositional collocations in particular has been shown to be a challenge for English language learners (Hong et al., 2011). In the pretest for the present study, it is noted that the scores varied widely, even among participants who self-report as English advanced learners. This result seems to suggest that collocational knowledge cannot be assumed from generalized English proficiency level. Laufer and Waldman’s (2011) finding that collocational use, even among advanced learners, was prone to errors, seems to support this interpretation. It seems reasonable, therefore, to include collocations at all levels of language instruction. Owing to their particular difficulty, prepositional collocations should be specifically addressed in instruction.

**Integration of digital corpora into instruction.** Digital corpora, such as COCA, can be valuable tools for learning English collocations. Although the effect of using COCA for learning
prepositional collocations is inconclusive in this study (possibly due, in part, to the limitations discussed above), there are several research findings (e.g., Çelik, 2011; Daskalovska, 2015; Girgin, 2019) which suggest the benefit of using digital corpora for collocations generally. Furthermore, perceptions of participants have been positive in this study and others (e.g., Akinci & Yildiz, 2017; Geluso & Yamaguchi, 2014; Kheirzadeh & Marandi, 2014). Survey responses in the present study indicated that participants deemed COCA to be useful and effective by virtue of the context provided by concordance lines, the authentic nature of material in the corpus database, and as an added resource in the toolbox of language learning. A strong case is therefore made for including digital corpora into collocational instruction.

Training in COCA (or other digital corpus) for both instructors and students. To successfully implement digital corpus use in collocational instruction, proper training of students (and teachers) in use of the technology is critical. Despite conscientious effort to provide detailed instructions for using COCA, as evidenced by the majority of participants stating the digital corpus was easy to use, some respondents disagreed, responding that COCA was very complex and difficult to use. This seeming contradiction highlights an important point: proper training is essential to successful technology use (of any type), yet students often vary widely with respect to their technological experience and comfort level. Other research which focused on learner perceptions of digital corpora cite technical problems and a long learning curve when using the technology. Teachers, who are charged with explaining instructional technologies to their students, are also subject to the same variation in expertise and comfort level. Use of digital corpora is therefore predicated on proper instruction and training for both teachers and students.

Coordination of digital corpora with other resources. If COCA, or any other digital corpus, is to be effective as a language learning tool, it must be used in conjunction with other
resources. It is not a substitute for classroom (or online) instruction, and is not meant to be a standalone method. Use of other technological tools such as an online dictionary to aid in comprehension of contextualized concordance sentences and paragraphs and instructor feedback can be invaluable for learners.

The use of digital corpus technology, with proper training, in concert with other technological and non-technological resources, can assist English language learners in their acquisition of collocations, as suggested by the present study and other research in the recent literature.

Future Directions

As mentioned at the beginning of this chapter, the present study is but a first step in research using digital corpora for learning prepositional collocations via an online learning management system. Based on the experience and results of this study, several recommendations can be made. In many respects, these recommendations mirror the limitations previously discussed; addressing those limitations is considered in proposing trajectories for future research. These recommendations apply to both the conduct of a main study emanating from this pilot and related future research directions.

**Changes in treatment instructional module.** Based on study results and limitations discussed earlier, I would revise the treatment instructional module for the main study in three ways. *First*, the COCA training component of the treatment should be separated from the remainder of the instructional module. It was evident that the complexity of using the digital corpus was challenging for many participants, especially considering their lack of familiarity with using that type of tool. Therefore, it would be beneficial to devote an entire module to
training on the use and functionality of COCA as they pertain to study procedures. Cognitive load on the part of the participants would be reduced, as COCA instruction would be separated from collocational instruction. Second, the number of target collocations per unit of participant contact time should be reduced. Inclusion of 15 target items over a two-hour period (in addition to COCA instruction) may have been excessive, based on results and feedback. I would suggest reducing the number of target items to ten in a single module, which would be more comparable to similar studies as discussed earlier in Discussion of Findings. Third, the number of instructional modules should be increased and spread out over time. This modification would allow for a greater number of target collocations in total for the study as well as a reduction in cognitive load on the part of participants.

**Expansion of course modules over larger period of time.** The pilot nature of this study required some abbreviation of instructional content, due in part to determine which aspects of instruction need to be expanded or emphasized in the main study. However, some additional exposure to target collocations—perhaps by extending instruction over a longer time interval—may result in an enhanced learning outcome. Therefore, it may be desirable to extend instruction over several weeks to obtain more extensive data on the effect of using digital corpora on the learning of collocations, possibly as part of a longitudinal study. In the main study, it would be wise to incorporate several modules into the instructional phase of the research. Although the time commitment on the part of the participants would be increased, this modification may yield more robust data.

**More detailed and extensive instrumentation and validation.** It is logical to surmise that more detailed and extensive multi-part instruments would reveal more detailed information relating to increases in both receptive and productive collocational knowledge. Further, formal
validation of instruments utilizing formal procedures (or discovery of pre-validated instruments used by other researchers) would lend more credibility to experimental results. Research focusing on instrument validation and testing would be of immense benefit to other researchers whose investigations center on prepositional collocational acquisition.

**Specific attention to proficiency levels.** In recruiting participants for future study, it is recommended that an effort be made to include individuals from different proficiency levels. This may be accomplished, for example, by including students in two or more classes, each corresponding to a different proficiency level. In this way, the placement protocols for determining proficiency can be utilized, reducing the need for *post hoc* determination. Objectively verified instruments generally used for placement purposes could therefore be relied upon.

**More detailed qualitative data relating participants’ experience with COCA.** The qualitative component of the study was restricted by sole reliance on post-study survey responses. Although some participants provided comprehensive and detailed responses, it would have been helpful to follow up on survey answers, possibly through in-depth interviews. This additional qualitative source could clarify participant responses, as well as lead to additional questioning emerging from the survey and interview responses. It is possible that other variables with the potential to impact results could be uncovered. Exploration of these other variables affecting outcome may include language background of participants beyond first language (such as medium of high school instruction or bilingual upbringing) and experience with other technologies.

**Greater accountability and buy-in of participants.** Getting participants to conscientiously proceed through study procedures is of paramount importance. It is critical that
participants expend reasonable effort, or the study results may not accurately reflect learning. Essentially, there needs to be a way to ensure that participants are accountable for their effort, and that they are vested in the success of the research study. There are a few ways to accomplish this. First, there could be a pre-selection process by which the motivation for participating could be discovered. The disadvantages to this approach are difficulty in recruiting an adequate sample size, time and resources required for the pre-selection process, and the possibility that the sample of participants would not be representative of the population. Second, additional tasks could be added to the study procedures to increase accountability, as mentioned in the first point of this section. Involving participants over a longer period of time may increase their investment in the study (if additional tasks are engaging so as to prevent boredom). Third, the inclusion of a follow-up interview may serve to either discourage uninterested participants or increase accountability. Future research should utilize recruitment strategies (such as a pre-screening interview or survey) to select participants who have an active interest in the subject of the study, which may be accomplished using one or more of the above three approaches.

**Pedagogy.** Any discussion of future directions would be incomplete without consideration of pedagogy as it relates to the teaching and learning of prepositional collocations. This dissertation has made a case for teaching collocations (see *Why Learn Collocations?* in Chapter 2), and this study has shown that digital corpora have a role to play in the endeavor. The logical next step is to apply what we have learned in the classroom. The importance of comprehensible input, as originally posited by Krashen (1982), as well as the importance of providing authentic language in context, can be operationalized in instructional contexts through judicious and appropriate use of a digital corpus such as COCA as a supplement to (rather than in lieu of) teacher-student interactions. The results of this study show effectiveness of
instructional intervention for learning prepositional collocations (through improvement in collocational knowledge from pretest to posttest and delayed posttest), as well as positive perceptions of use of COCA (as reflected in participant post-study survey responses). It is therefore recommended that, in addition to further research described earlier in this section, explicit teaching of prepositional collocations and inclusion of digital corpora in instruction be implemented.

The aforementioned recommendations stem from the experience gained from this study and the limitations described above. It is hoped that future research will take these points into consideration.

Final Thought

Drawing on research that examined many aspects of collocations, including prevalence, usage, and instruction, the pilot study contained herein has attempted to explore the ways in which use of a digital corpus can facilitate the learning of prepositional collocations, determine the impact of language proficiency on the effectiveness of using digital corpora in instruction, and obtain feedback regarding perceptions about the usefulness of digital corpora for collocation learning. Through a mixed methods approach in which both quantitative and qualitative data were collected and analyzed, participants were exposed to collocation instruction, tested on their knowledge, and solicited for feedback on their perceptions of COCA. Quantitative data were analyzed statistically, while qualitative data were analyzed thematically. While results from the statistical analysis were inconclusive, the qualitative data, based on participant feedback, seems to indicate the feasibility of a main study stemming from this pilot study. Conclusions from this study align with those of other research in the area (e.g., Çelik, 2011; Daskalovska, 2015; Girgin,
2019) in that collocations are viewed an integral part of English language learning, and that digital corpus technology has an important role to play. Future focus on improved instrumentation, expansion of instructional modules, and enhancement of qualitative data collection holds promise for future research directions.
REFERENCES


APPENDIX A

PRE-STUDY SURVEY

Instructions: The purpose of this survey is to get some background information about you.

Please answer the following 14 questions. When you are finished the survey, click on Submit Quiz at the bottom of the page, then click on Next to move to Step 2: Pre-study quiz.

1. What is your age?
2. What is your gender?
3. What country are you from?
4. What is your first/native language?
5. In which country did you attend high school?
6. In high school, in what language were most of your classes taught?
7. What year of university are you (1st year, 2nd year, etc.)?
8. What is your major? If you don't know yet, type "undecided".
9. What is your English proficiency level? (Beginner, intermediate, or advanced)
10. Are you an INTO student?
11. If you are an INTO student, which program are you in? If you are not an INTO student, select "I am not an INTO student". (Standard Pathway, Accelerated Pathway, Academic English, or I am not an INTO student)
12. If you are in Academic English, which level are you? If you are not in Academic English, select "I am not in Academic English".
13. Have you ever used COCA (the Corpus of Contemporary American English)?

14. Is there any other information about your language background that you wish to share at this time? (For example, other languages, bilingual, etc.)
APPENDIX B

PRETEST

Please fill in the missing word for each sentence.

If you don’t know the answer, just type IDK (I don’t know) or a question mark (?). *This study's purpose is to explore the effectiveness of different instructional methods, not to evaluate student knowledge. Therefore, don’t worry about getting a question right or wrong. Just do the best you can, based on what you learn and remember.* There are no grades, and correct or incorrect answers will not affect your participation in the study or the compensation you get. So no stress :-) 

In order to assess different instruction methods, it is very important to get accurate data from participants. Therefore, please answer based only on what you remember, and do not look at any other resources or modules, or get any help from other people. Just do the best you can.

When you are finished the quiz, click on Submit Quiz on the bottom of the page. Then click on Next to move on to the next step, Step 3: Instructional content.

1. Newborn babies and senior citizens are especially vulnerable _________ the extremely cold weather.

2. Research has shown that smoking is detrimental _________ your health.

3. It is important to dispose _________ glass and plastic properly in the recycling bin.

4. I arrived _________ the party an hour late, so there wasn’t any food left.
5. There is much controversy _________ the new tax; some people say that the tax is necessary to pay for the new school, but other people say that taxes are already too high.

6. When I feel sad, I often indulge _________ comfort food, like chocolate ice cream, to make myself feel better.

7. They live in a rural area and none of them have any money. So they must subsist _________ whatever they can grow on their farm.

8. Palm trees are unique _________ tropical areas like the Caribbean and Hawaii.

9. She takes great pride _________ her work as a lawyer; she always does her best, and her clients are always satisfied with her results.

10. There are many families with small children living here, so residents are prohibited _________ making too much noise after 9:00 pm.

11. Through spending on social programs, the government plays an active role _________ the economy.

12. She is very adept _________ solving math problems. She got an 800 on the SAT!

13. Most doctors specialize _________ a particular field, such as psychiatry or internal medicine.

14. People with diabetes have a restriction _________ their diet; they need to avoid sugar.

15. Some people are immune _________ the virus, so they never get sick.
APPENDIX C

POST-STUDY SURVEY (TREATMENT GROUP)

Instructions: Please answer the following 12 questions about your experience using COCA.

There are no right or wrong answers. Just give your honest opinions. It is very important for this research that you give specific examples, so that I can make an accurate and honest interpretation of the results.

When you are finished the survey, click on Submit, and then you may sign out of Canvas. The last step (Step 7--Delayed post study quiz) will be available to you in about 2 weeks. That will be the last step in your participation in this study, after which you will receive your compensation. You will receive an email reminder when that quiz becomes available.

1. What is your general impression about using COCA in this study?
2. What is your general feeling/impression of using COCA? (Very positive, somewhat positive, neutral, somewhat negative, or very negative)
3. What did you like the most about COCA? Please give specific examples.
4. What did you like the least about COCA? Please give specific examples.
5. Do you feel that COCA was helpful in learning English collocations? Why or why not? Please provide specific examples.
6. How helpful was COCA in helping you learn English collocations? (Very helpful, helpful, slightly helpful, or not helpful)
7. What part of using COCA do you think was most helpful for you? Why? Please provide specific examples.

8. What part of using COCA do you think was least helpful for you? Why? Please provide specific examples.

9. Would you recommend using COCA for other students who are learning English? Why or why not?

10. Would you recommend COCA to a friend who is learning English collocations? (Strongly recommend, recommend by not strongly, slightly recommend, or not recommend)

11. If you had a friend who was learning English and was going to use COCA, what 2 or 3 pieces of advice would you give? Be as specific as possible.

12. Anything else you would like to say (opinions, feelings) about your experience participating in this study?
APPENDIX D

COCA QUICK GUIDE

How to use COCA for this study

This is a quick step-by-step guide for registering, logging on, and using COCA for this study.

To register:

You will need to do this the first time you use COCA.

1. Go to the COCA website (https://corpus.byu.edu/coca/).
2. Click on the yellow head icon in the upper right corner.
3. Click on REGISTER.
4. Fill out form with your name, email and country.
5. Choose Student (undergraduate) next to Category.
6. Agree to terms and conditions.
7. Click on SUBMIT.
8. Choose your university from the list.
9. Go to your email and click on the link to complete registration.
10. Go back to the login page, and enter your email and password to log in.

**Once you are logged in:**

11. Click on **SEARCH** on menu at the top of the webpage.

12. Click on **Collocates**.
13. Type the word you are searching for in the upper text box marked **Word/phrase**.
14. To the right of the lower text box marked *Collocates*, you will see *[POS]*. Click on it. (POS means Part of Speech.)

15. Click in the box that says *Insert PoS*, and you will see a drop-down menu.  
16. Select *Prep.ALL* (the 10th from the top), and you will see _i* in the lower text box.  
17. Below the text boxes, you will see + 4 3 2 1 0 0 1 2 3 4 +, which indicates number of words to left and right of the word you are searching for. Choose 0 to left and 1 to right.  
18. Click on *Find collocates*. 
    (Note: Occasionally, you may get a prompt to upgrade your account while you are searching. If you wait for a few seconds, a screen will appear that will allow you to click on a link to resume your search.)

19. You will see your search results under the *FREQUENCY* tab.
20. Click on the most frequent preposition (top of the list). Your search results will appear under the **CONTEXT** tab.

21. Find an example sentence that makes sense to you, and click on the number to the left of it. You will see the sentence you chose in a paragraph under the **CONTEXT +** tab.
22. You can enter the sentence (not the whole paragraph) on the input form.

23. To search for a new collocation, just click on **SEARCH** on the toolbar, click on **Reset**, and repeat the procedure from Step #12.

That’s it! You can log out by selecting **ACCOUNT** on the toolbar and clicking on **log out**.
APPENDIX E

LETTER OF IRB APPROVAL

11/13/2018

Matthew Siegel
Teaching and Learning
3600 East Fletcher Avenue #33
Tampa, FL 33613

RE: Expedited Approval for Initial Review
IRB#: Pro0036217
Title: Digital corpus use in learning L2 prepositional collocations: A mixed-methods study


Dear Mr. Siegel:

On 11/11/2018, the Institutional Review Board (IRB) reviewed and APPROVED the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
Protocol Version #1, 10.11.2018.docx

Consent/Assent Document(s)*:
Online consent form_V1.10.24.2018**

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved. **Online consent forms are un stamped

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110. The research proposed in this study is categorized under the following expedited review category:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural
beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your study qualifies for a waiver of the requirements for the documentation of informed consent as outlined in the federal regulations at 45CFR46.117(c) which states that an IRB may waive the requirement for the investigator to obtain a signed consent form for some or all subjects if it finds either: (1) That the only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject’s wishes will govern; or (2) That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context. This waiver of documentation of informed consent is granted to allow the study team to obtain online consent.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) business days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

[Signature]

Kristen Salomon, Ph.D., Chairperson
USF Institutional Review Board