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Corpus-Based Data-Driven Learning in Reading English for Academic Purposes

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By

IRA RASIKAWATI

A dissertation submitted in partial fulfillment

Of the requirements for the degree of

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Dedication

This work is dedicated to Daniel Suyatno, Kenzo Daniputera, and Kayla Daniputeri for their unconditional love, sacrifices, endless prayers and supports; to Oei Giok Hwa and Liem Wie Bing, my late mother and father, who taught me the love for learning, persistence, and hard work.

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Abstract

One of the second language (L2) instructional approaches perceived as promising is data-driven learning (DDL) – the use of computer-generated concordances for language teaching and learning. DDL provides students with the opportunity to analyze language forms across contexts found in the concordance output. Notwithstanding the growing research support, DDL has not been widely adopted in L2 classrooms. Studies examining the use of DDL have mostly been carried out in a case study context with a small sample size. To bridge the gap between research and instructional practices, more empirical studies are needed to corroborate the claim that exposing students to the authentic language samples in corpora can effectively promote the development of various language learning areas. This study was an exploration on the use of corpus-based DDL in Reading English for Academic Purposes (EAP) classrooms in an urban university in Indonesia. The study investigated whether different instructional methods result in a difference in vocabulary knowledge, syntax knowledge, listening comprehension, and reading comprehension in different levels of English proficiency. There were 153 freshmen from seven study programs who participated in the study. Randomly assigned to the experimental and control groups, students in the experimental group had corpus-based DDL, while those in the control group received regular vocabulary and grammar instruction. The study found mixed results suggesting the effects of instruction in different directions. While the effect of corpus-based DDL was statistically significantly different for the syntax knowledge measure, the statistically significant differences for vocabulary measures were in favor of the regular vocabulary and grammar instruction. The interaction between the instructional method and English proficiency showed a

statistically significant difference for the syntax knowledge measure in support of the higher proficiency level of the corpus-based DDL group. These findings illuminate the understanding of how corpus-based DDL instruction may work in EAP courses targeting undergraduate EFL students. The recommendations include the instructional implications of the study findings and directions for future research.

Keywords: EFL, EAP, DDL, corpus, vocabulary, syntax, reading comprehension.

Chapter One

Introduction

The vital role of vocabulary knowledge in language learning has long been recognized. Research findings in both first language (L1) and second language (L2) suggest that vocabulary knowledge predicts language proficiency, especially reading comprehension (Anderson & Freebody, 1981; Anderson & Nagy, 1992; Laufer & Ravenhorst-Kalovski, 2010; Nagy, 1988; Nation, 2006). Vocabulary instruction is necessary to improve learners' lexical knowledge, and overall language development as a limited vocabulary can impede comprehension and production of language. Despite the significance of vocabulary for promoting learning, vocabulary instruction has been unpopular (Stahl & Nagy, 2006). Even if the vocabulary instruction is evident, learning approaches continue to be traditional or what Nagy referred to as "involving some variety of a definitional approach" (Nagy, 1988, p. 4). Additionally, course materials and syllabi have not sufficiently addressed vocabulary learning strategies (Schmitt, 2008). More studies to investigate what vocabulary learning approaches may best facilitate language development, particularly reading comprehension in various higher education contexts, continue to be in high demand.

Background of the Study

Vocabulary acquisition can be especially challenging for English as a Foreign Language (EFL) learners whose learning contexts are non-English speaking countries. Unlike L2 learners who receive rich language exposure in school, EFL learners are often disadvantaged as they lack sufficient input in their learning environment (Kojic-Sabo & Lightbown, 1999). Vocabulary acquisition additionally has received little attention in

many EFL instructional texts and teacher education (Hunt & Beglar, 2005). The difficulty of acquiring EFL is more considerable as students enter higher education. Considering the status of English as the dominant language in various academic settings, increasing university students' ability to read academic texts independently in English becomes paramount. Learning English for study purposes is especially daunting for EFL students as it requires their ability to think about academic content and convey abstract ideas in the language they are still learning (Nagy & Townsend, 2012; Snow & Uccelli, 2009). Students need to develop not only the breadth but also the depth of their vocabulary knowledge. An immense amount of vocabulary is fundamental for them to read English texts independently. While Nation (2006) believes that understanding 98% of the running words in a text crucial for adequate comprehension, studies have found that 98% of word coverage may not suffice for easy understanding of a non-fiction text (Carver, 1994; Kurnia, 2003). Students need to have a vocabulary size of 8,000 to 9,000 word-families for written text comprehension and of 6,000 to 7,000 for spoken text comprehension (Nation, 2006). Moreover, mature readers need to increase the depth of their vocabulary knowledge, which necessitates the mastery of a wide range of vocabulary knowledge: polysemous meanings; collocations; word uses and forms (Schmitt, 2014). Knowing vocabulary, therefore, entails having a large vocabulary size and understanding of the nuances of words' meaning for both receptive and productive purposes. Taking into account the complexity of learning vocabulary knowledge, developing student vocabulary for academic purposes requires word learning strategies beyond the generic approaches. Technology-enhanced learning has been one of the promising methods to facilitate L2 acquisition in the classrooms.

Information and communication technology (ICT) is a common term to refer to digital technology use in language learning and teaching (Evans, 2009). ICT has incentivized EFL students to make learning more productive and self-regulated. Effective integration of technological tools in the classrooms has been purported to bring about development in various learning skills such as "reasoning and problem solving, learning how to learn and creativity"; broaden and deepen learning; and increase interest in learning activities (Eadie, 2001, p. 28). Technology-enhanced language learning has evolved from what is termed computer-based training (CBT) and computer-assisted language learning (CALL) (Farr & Murray, 2016) to the highly innovative corpus-based approach following the growth in corpus linguistics research (Warren, 2016). Research in L2 teaching and learning has paid greater attention to the corpus-based data-driven learning approach – the use of concordance lines stored in a corpus to investigate language patterns. This approach, rooted in the principles of discovery or inquiry learning, allows learners to discover language rules and patterns associated with lexical and grammatical features from the authentic data presented in corpora.

Purpose of the Study

A growing body of evidence from L2 studies indicates that corpus consultation can offer abundant opportunities that are potent for students' language development. Although perceived as a promising L2 learning approach, corpus-based DDL seems to encounter stagnancy on the classroom path. Despite the availability of free online corpora and classroom guides, corpus-based DDL has not been widely used in the classroom (Boulton, 2010a, 2017).

The primary purpose of this study was to explore whether corpus-based DDL strategies applied in the instruction of undergraduate students in a Reading English for Academic Purposes (EAP) program would improve their scores on measures of vocabulary and syntax knowledge as well as listening and reading comprehension. The study findings were expected to shed light on what instructional practices would be useful for improving students' lexical and grammatical knowledge and facilitating understanding of academic texts.

Specialized Terminology

Corpus

The term corpus (plural: corpora) refers to an extensive collection of naturally occurring written or spoken texts that are compiled systematically to exemplify a particular language (Cheng, 2012). Corpus linguistics – the compilation and analysis of corpora – is perceived as an approach of study whose assumptions consider language from its usage, the dynamic of language rules and patterns, and the interconnectedness of vocabulary and grammar domains (Liu & Lei, 2017). Electronic corpora are available in large quantities both for research and instructional purposes today, replacing the historically manual compilation of texts and analyses. The results of a corpus query are concordance lines, which contain examples of what words or phrases come before or after the searched word or phrases. The development of corpus research has resulted in a growing interest in instructional materials and corpus-aided teaching practice. Corpus of Contemporary American English (COCA) (Davies, 2008–) and BYU-BNC (Davies, 2004–) are examples of large corpora available online.

Data-Driven Learning (DDL)

Popularized for the first time by Tim Johns, DDL is a language learning approach that allows students to be "language detectives" or researchers to explore authentic language data that is stored in corpora (Johns, 1991). DDL allows students to participate in inquiry-based learning activities of analyzing common collocations of a word and other strings of words presented in concordance lines – a list of words within the contexts of each word's occurrences. Johns initially used DDL for his postgraduate students to improve their writing. Students could benefit more from this inductive approach than the traditional grammar-based approach as they have the opportunity to examine the linguistic patterns and generalize the rules from the language examples (Johns, 1991).

English for Academic Purposes (EAP)

The term usually refers to language instruction offered to assist international students in learning English for study, research, and teaching purposes (Flowerdew & Peacock, 2001). Used for the first time in 1974 by Tim Johns and widely promoted later by the British Council, EAP evolved into a branch of English for Specific Purposes (ESP) (Jordan, 2002). The emergence of teaching EAP has been prompted by the students' needs to acquire English for their study success. EAP generally addresses academic language skills such as listening, speaking, reading, writing, grammar, vocabulary development at the same time improving general study skills like note- and test-taking, critical thinking, and research. The increased number of international students at the tertiary level has enhanced EFL instructional practices and research. Many college-level classrooms in non-English speaking countries today offer EAP as a compulsory course to prepare students, particularly to read English references. In Indonesian contexts, most

EAP programs offered to non-English department students at the undergraduate level usually focus on reading EAP.

Research Questions

A synthesis of theories and research findings on the use of corpus-based DDL in second language classrooms suggested a sizeable overall effect of corpus-based DDL, pointing to its potential pedagogical value (Boulton & Cobb, 2017). Another controversial issue concerns with the use of the approach with lower proficiency levels (Boulton, 2017). While there seems to be an established belief that DDL is more appropriate for higher proficiency learners (Hadley, 2002; Liu & Lie, 2017), studies found that the approach could also be useful for lower proficiency learners (Boulton, 2010a; Yoon & Hirvela, 2004).

This study aimed at examining the effectiveness of corpus-based DDL instruction on the students' vocabulary and syntax knowledge as well as their comprehension of academic texts. The questions raised were:

1. Do students receiving corpus-based DDL instruction differ significantly from those having the regular instruction on measures of
    a. vocabulary knowledge?
    b. syntax knowledge?
    c. listening comprehension?
    d. reading comprehension?
2. Does the effect of corpus-based DDL instruction vary for students in different English proficiency levels?

Hypotheses

Based on reviews of the literature and prior studies on the effects of vocabulary instruction, the following hypotheses were tested.

1. At posttest, students receiving DDL instruction (experimental group) would score statistically significantly higher than those having regular instruction (control group) after controlling for their pretest difference on measures of:
    a. vocabulary knowledge
    b. syntax knowledge
    c. listening comprehension
    d. reading comprehension
2. The difference between the experimental and control groups would be statistically significantly greater for the pre-intermediate English proficiency group than for the basic proficiency group.

Significance of the Study

This study intended to build on the existing research on the use of corpora in L2 classrooms. A growing body of research has reported how corpus-based instruction can be useful in developing students' writing skills. However, there has been little quantitative data to confirm whether instruction using the same approach can improve reading. A meta-analysis examining the use of DDL for L2 learning has shown that while studies investigating the impact of DDL on students' writing skills are the most prevalent, other skills such as reading and speaking remain under-researched (Boulton & Cobb, 2017). This study intended to fill the gap and shed some light on the potential effect of corpus-based DDL to develop students' lexical and syntactic knowledge that could

facilitate their understanding of academic texts. Given its design, this study was among a few studies to undertake a large sample size in a randomized experimental design. Studies analyzing the efficacy of DDL commonly rely on quite small sample sizes and intact groups. Boulton and Cobb (2017) stated that 42 out of 88 studies did not report how groups were formed, and those that mentioned the group constitution showed that intact groups were more common that random assignments.

The results of this study should also contribute to the knowledge base and best practice in EAP instruction, particularly in Indonesian contexts. The English First English Proficiency Index for schools (EF EPI-s) measured the English proficiency of secondary and tertiary students in 26 countries (English First, 2017). The results of this assessment suggest that students in all age groups made slower progress in reading than in listening, and their overall English skills did not progress steadily throughout the secondary and university levels. Students appeared to have more exposure to spoken than written English outside the classroom, which might explain the marked disparity between students' reading and listening proficiency. This EF EPI provides evidence for the importance of increasing students' ability to read academic texts in English to reduce the skill gap and prepare them for their tertiary study success.

In Indonesian universities, many of the reading references assigned to students are in English (Nurweni & Read, 1999). Although students have taken academic reading as a compulsory course, comprehension of academic texts remains challenging for many undergraduate students. In addition to the perceived ineffective teaching, a large number of lexical items to learn, and the relatively short time allocated for instruction seem to explain the little instructional gain (Cobb, 1999). The current study findings may offer

recommendations for EAP classrooms on instructional strategies that promote the development of vocabulary and reading comprehension of EFL undergraduate students.

Content of the Subsequent Chapters

The four chapters that follow are Review of Literature, Method, Results, and Discussion. The Review of Literature provides an overview of the theoretical constructs and empirical findings that rationalize the practice of corpus-based DDL instruction. In addition to reviewing the learning theories which explain the philosophical construct of the DDL approach, this chapter discusses DDL from the point of view of the lexico-grammatical approach to L2 instruction and previous studies on the use of corpus-based DDL in L2 classrooms. The Method covers the research design, setting and participants, measures, procedures, data analysis, and instrument validity and reliability. The Results report the research findings that correspond to the research questions and hypotheses. Finally, the Discussion chapter combines interpretations, suggestions, implications of the study findings as well as recommendations for future research.

Chapter Two

Review of Literature

The primary objective of this study was to assess the effect of corpus-based data-driven learning (DDL) to improve undergraduate students' knowledge of English vocabulary and syntax, as well as listening and reading comprehension in different English proficiency levels. This chapter discusses related literature that offers theoretical accounts for the use of corpus-based learning and the current view of inquiry-based learning (IBL) as the philosophical underpinning of the DDL approach. It additionally reviews the efficacy of the corpus-based DDL strategies from the vantage points of L2 learning theories and research, and finally, analyzes the gaps in research and practices that the current study aims to fill. In light of the review of theories and previous research findings, a framework for treatment to augment students' vocabulary knowledge in an EAP Reading program is proposed.

Learning Theories

Cognitivist-Constructivist Theory

From the cognitive psychology point of view, learning is a mental process that involves thinking, knowing, and problem-solving. Using the computer as a metaphor of the human brain cognitivists believe that learners process information using input, storage, and retrieval functions (Brown, 2006; Levitin, 2002). This theory of learning similarly applies to language learning in which learners undergo the process of noticing input, practicing it repeatedly, until the input becomes intake and automatized. Automatization occurs when a language skill can be performed effortlessly. Bruner's constructivist notion is parallel to this cognitivist theory in that learners process, store,

and encode information in their memory. They construct knowledge by discovering, organizing, and classifying information using a system that they develop during the process of learning (Bruner, 1977). In this process, teachers play an essential role in facilitating the inquiry, such as through scaffolding to help learners discover knowledge for themselves.

Form-Meaning Connections in L2 Learning

While by no means exhaustive, this section discusses the concepts related to input processing that underlies the importance of form-meaning focus in L2 learning. Without discounting the role of subconscious or unconscious processes in L2 learning, the notions presented here are premised on the assumptions that language acquisition is input-dependent and requires learners' conscious attention to language forms in the input.

Consciousness in L2 Learning. Grounded in cognitive psychology and constructivist theory, Schmidt (1990) perceived consciousness as the necessary L2 learning condition which embraces the notions of intentionality, attention, and awareness. This claim, known as the "Noticing Hypothesis", distinguishes learning as both incidental and intentional, which has important implications for language teaching. It can be argued that lexical acquisition usually comes before grammatical acquisition (VanPatten et al., 2004). Incidental learning occurs when learners actually focus their attention on meaning (lexis) but unconsciously learn language forms (grammar), whereas intentional learning is goal-oriented and takes place when learners deliberately study language forms (Schmidt, 1990, 2010). Schmidt's proposal has included noticing as the necessary condition for L2 acquisition in that learners need to notice or pay attention to specific language input. Schmidt (2010) also argued that certain types of learning may need more

attention and awareness. The degree of attention and awareness may differ in different types of learning; some require more attention and awareness than the others.

To this end, learning can be perceived as taking place intentionally and incidentally but both processes require consciousness at the level of attention. For learners to acquire a particular language form, they need a task that demands them to pay attention to specific information related to the target language form (Schmidt, 1990). However, it is also important to note that noticing language forms in the input does not necessarily result in learning. VanPattern (2002b) considered form and meaning connection in language instruction as the necessary condition for learners to derive intake from input. A brief review on intake and input of VanPatten can help explain the role of consciousness in input processing.

Input Processing. VanPatten (2002a, 2002b, 2004) discussed the processes involved in second language acquisition (SLA) from the perspective of input processing (IP). IP concerns how input can turn to intake regardless of whether or not the language be instructed (VanPatten, 2002a). VanPatten (2002b) believes that processing a language form does not necessarily mean learning it. Learners may notice many language forms but only process some of them. Two IP principles maintain that learners usually process input for meaning before form. That processing form that is not meaningful requires learners' focused attention to process communicative content (VanPatten, 2002a). VanPatten stresses the importance of communicative value for IP. Learners are more likely to process input and turn it to intake when a language form has communicative value. Previous research has also shown that form instruction has little long-term effects on developing L2 learners' linguistic system (Lightbown, 1983; VanPatten, 1988). Based

on these two theories of consciousness and IP, it can be inferred that effective instruction needs to create conditions in which learners can make form-meaning connections.

Looking at L2 acquisition from the point of view of form and meaning connection (FMC), VanPatten et al. (2004) asserted that L2 learners underwent the processes of "making the initial connection, subsequent processing of the connection, and accessing the connection for use" (pp. 5–10). The first process refers to the period when L2 learners make connection between new information and their prior knowledge, including their L1. The second process occurs when learners receive repeated exposures to the forms to strengthen form and meaning connection. Also known as interlanguage, this process includes learners' restructuring their existing knowledge. Finally, when the form and meaning connection has been established, learners arrive at a stage where they can access the new information for comprehension and production. The pedagogical implication of this theory is that it is essential to expose language learners to the specific input and have them practice it repetitively to enable them to reconstruct new information and to recall it for production.

Inquiry-Based Learning Revisited

The term inquiry learning is often used interchangeably with discovery learning to refer to an instructional approach which can be traced back to the works of the constructivists such as John Dewey and Jerome Bruner. Herbert Spencer's (1820–1903) view of teaching students "how to think" instead of "what to think" seems to have significantly influenced Dewey (1910) in his publication of *How We Think* and Bruner (1961) in his notions of "learning how to learn" and "inquiry discovery" (Ornstein & Hunkins, 2016). Dewey (1910) asserted that students' experience and prior knowledge

are valuable resources that students draw upon to make sense of new information, identify connections between past and present learning experiences, and construct solutions to solve problems. Bruner (1961) similarly believed that learning brings about powerful effects when students can discover new facts and relationships of those facts for themselves and which experiences are built up from their past learning. Dewey's and Bruner's ideas of how knowledge is constructed became the foundation of discovery learning in that the approach engages students in pursuing their interests and questioning existing beliefs and assumptions.

Today, discovery learning appears to exist on a continuum from pure inquiry to guided inquiry. Kirschner et al. (2006) consider the pedagogy in this discovery learning umbrella as the minimally guided method in contrast to direct instruction, which provides students with both concepts and learning strategies explicitly. In addition to inquiry learning, a variety of other pedagogical methods beneath the umbrella of discovery learning are problem-based learning, experiential learning, and constructivist learning (Kirschner et al., 2006). Although inquiry-based learning (IBL) can take many definitions and forms, the shared features of IBL involve student-centeredness, good questioning about the world, higher-level thinking, and problem-solving approaches. Student learning should be guided by questions to investigate phenomenon from different perspectives (Coffman, 2017). In this paper, the term IBL refers to the "inquiry-oriented approach to learning that puts more control for learning with the learner" (Blessinger & Carfora, 2014) but at the same time recognizes the teachers' role to scaffold the process of inquiry to achieve curricular goals (Coffman, 2017). Although the implementation of IBL strategies can be context-bound depending on the students' needs and their learning

goals, teachers play an essential role in designing structured activities that promote higher-level thinking, also known as high-order thinking (HOT). According to Coffman (2017), inquiry-oriented activities enable students to use HOT skills such as analysis, evaluating, and creating.

Hattie (2012) discusses the controversy over the level of directness necessary in instruction, suggesting that the explicit approach better promotes learning and requires teachers' responsibility to enhance students' active participation. Two meta-analyses of Alfieri et al. (2011) examined the effects of 1) unassisted discovery learning versus explicit instruction and 2) enhanced/assisted discovery learning versus other types of instruction. The results of the first meta-analysis showed that explicit instruction was more superior than unassisted discovery learning. The second meta-analysis revealed favorable outcomes for enhanced discovery learning compared to other instructional types. The benefits of enhanced discovery were found greater for adult participants. It can be inferred from the analyses that students benefit more from instructional approaches that allow scaffolded tasks and feedback for them to construct a new understanding that builds on their existing knowledge. Blessinger and Carfora (2014) additionally suggest that a significant number of studies have persuasively argued for IBL as a promising instructional strategy when adequately designed and implemented. IBL can promote student engagement, motivation, autonomy, and problem-solving skills when the teacher plans the course and facilitates the learning effectively (Blessinger & Carfora, 2014, p. 5). The authors recommend that the teacher offers active and caring support to ensure a conducive learning environment and sufficient guidance for the students.

Despite the different perspectives, the core elements of IBL continue to be teaching and learning strategies that are self-directed, question-driven, and problem relevant (Levy et al., 2010). In achieving the expected learning outcomes, instructional goals, content, and practices must correspond to the learning assessment (Blessinger & Carfora, 2014). Although students are held accountable for their learning, teachers, as the subject matter experts, need to provide ample support for them to engage in authentic and meaningful activities (Blessinger & Carfora, 2014; Coffman, 2017). As teachers engage students through the scaffolded learning process, the integration of digital technologies potentially enhances their learning. Coffman (2017) purports that the interaction between digital technologies and information improves inquiry-oriented learning. The critical elements of IBL, as stated by Blessinger and Carfora (2014) – exploration and investigation; authentic inquiries using contextual and situated learning; and research-based approach – are in line with the principles of data-driven learning that are described in the subsequent section. The principles of discovery learning that apply to DDL include the authenticity of the learning materials and students' engagement to discover the language rules and patterns from the concordance lines stored in a corpus.

Corpus-Based Data-Driven Learning

John Sinclair initially advocated the use of corpus linguistics – the compilation and analysis of corpora (Johns, 1994; Moon, 2007). Tim Johns (1991) later popularized the term data-driven learning (DDL), which refers to the language learning strategy that allows students to be "language detectives" or "researchers" to explore language data. Johns (1991) claimed that this inductive approach benefits students more than the traditional grammar-based approach in that it allows students the opportunity to examine

the linguistic patterns and generalize the rules from the language examples. Johns' argument is congruent with the idea that the L2 acquisition process can be more analytic than L1 since L2 learners have acquired a language system and received instruction in morphosyntactic rules which enable them to analyze a large unit of meanings into smaller segments (Wang, 2016). Some theoretical constructs of L2 instruction that are relevant to corpus-based DDL concern the teaching of grammar in discourse contexts. The learning approaches are known as the lexical approach to language teaching and lexico-grammatical instruction.

Teaching Grammar in Contexts

Lexical Approach. As a part of a reaction against the traditional grammar approach in language teaching, L2 instructional practices have been much influenced by the lexical and lexico-grammatical approaches today. Instead of seeing vocabulary learning separately from grammar, both approaches tend to agree on the notion that learning multi-word units or language chunks – words that frequently appear together – better facilitate language acquisition. Lewis (1997) argues against the dichotomy of lexis and grammar, suggesting that language is primarily made up of chunks – collocations, idioms, and fixed phrases. He perceives the acquisition of extensive knowledge of fixed and semi-fixed prefabricated items as the core of language learning (Lewis, 1993).

Lexico-grammatical Approach. Lexico-grammar, which refers to the unity of lexis and grammar, also consider lexicon and grammar as two integral parts of a language (Carter, 2004; Sinclair, 1991). Since vocabulary and grammar learning often takes place simultaneously, instruction of the two domains should be done jointly (Liu & Jiang, 2009). The acquisition of common lexico-grammatical patterns has been perceived to

improve students' language ability, including reading as it enables students to process receptive vocabulary faster (Conklin & Schmitt, 2008). Since using a word appropriately depends on more than just knowing its definition, students, therefore, must know how to use it in relation to other words. These constructs have become the foundation for teaching vocabulary and grammar in discourse contexts. Based on this lexical and grammatical connection point of view, learning lexico-grammatical patterns from authentic language data stored in corpora may increase students' language noticing and motivation to learn.

Research has shown that, like language use in general, academic English is composed of many fixed or semi-fixed lexico-grammatical patterns (Liu & Lei, 2017). Lexico-grammatical patterns have been discussed using different terms, such as multi-word sequences such as lexical phrases, formulas, fixed expressions, and prefabricated patterns (Biber, 2006, p. 133). Schmitt (2010) uses another term, formulaic language, to suggest that multi-word sequences/units should receive more attention in vocabulary learning. The frequent occurrences of multi-word units in both written and spoken texts and their usefulness for communicative purposes account for the recommendation. Proficient language users generally know a large number of formulaic expressions and possibly recognize as many formulaic sequences as individual words (Schmitt, 2010, pp. 9–10). Naturally occurring expressions are collocations such as "revised edition," "major turning point," "set yourself a realistic objective" (Lewis, 2001, p. 16).

Benefits of Corpus-Based DDL

Research in L2 learning has examined the direct applications of corpus linguistics in language pedagogy to teach natural language. The efforts stemmed from the projects

of Collins COBUILD English Language Dictionary 1987, which language data was based on the analyses of electronic corpora (Biber & Reppen, 2015; McEnery & Xiao, 2010; Szudarski, 2018). Most studies within applied linguistics after this period, especially in the subfields of English for Specific Purposes (ESP) and English for Academic Purposes (EAP), have benefited from the corpus research and analysis data (Biber & Reppen, 2015). Keck (2004) states that the use of corpora in language teaching includes the domains of corpus-based language descriptions, corpus-based language analysis in the classroom, and learner corpus analysis. Many L2 course materials today have integrated language patterns and word frequency information derived from corpora. Dictionaries additionally have used language samples from authentic corpus data. Appropriate tasks for L2 learning typically include analyses of authentic language samples retrieved from corpora.

The most recent, and the first meta-analysis on the use of corpus in language learning is that of Boulton and Cobb (2017). The study offers compelling evidence supporting the use of corpus linguistics for L2 development programs. The result of 64 meta-analyzable studies from a pool of 205 studies showed large overall effects for control/experimental group comparisons (d = 0.95) and for pre/posttest designs (d = 1.50) (Boulton & Cobb, 2017). Although it is rather early to claim that the approach may yield as strong results in real classrooms, which conditions are more complex than those in the experimental studies, the high d values observed in various studies involving over 3,000 participants are quite encouraging. In answering their research questions, Boulton and Cobb (2017) made three main conclusions. First, DDL research is “a flourishing field” with at least 205 publications reporting quantitative study findings since 2014. Second,

both the effectiveness and efficiency studies on the use of DDL to increase learners' L2 skills and knowledge yielded large effect sizes. Third, DDL showed consistent large effects in situations where (1) the presence of native English instructors was limited; (2) courses targeted undergraduate and graduate learners as well as those of intermediate and advanced English levels; (3) computer- and paper-based concordancing were used; and (4) corpora were used either for a reference resource or learning vocabulary and lexico-grammar (Boulton & Cobb, 2017, pp. 383–385). While Boulton and Cobb's meta-analysis has offered a useful estimate of DDL instruction's effect on students' learning, a further look into the results of each study will provide a more explicit account of which language development area DDL may work most effectively.

EFL learners are often disadvantaged by limited exposure to authentic language input compared to L2 learners. The non-native English teachers and grammar-based instructional methods in a way constrain learners' access to the naturally occurring English, such as the appropriate use of collocations (frequent word combinations) and colligations (common grammatical patterns of words). Although they may be able to produce grammatically correct sentences, the patterns are often uncommon. The benefit of corpus-based DDL lies in the authenticity of the language to be analyzed by students (Clifton & Phillips, 2006; Romer, 2008).

Using corpora in language classrooms provides learners with nuanced language samples which usage of vocabulary, grammar, and functions are similar to those in natural settings (McEnery & Xiao, 2010). For instance, Chan and Liou (2005) found that 30 college students who used web-based exercises on verb-noun collocations made significant improvements following the practice. In another study involving 40 Chinese

students majoring in English for Business Purposes, Huang (2014) reported that students noticed the lexical collocations and prepositional colligations of the target words; produced fewer errors in the target abstract nouns after getting engaged in paper-based concordance activities. Findings of these empirical studies examining the use of corpus-based DDL at the university level suggest that concordance lines and other corpus query results provide learners with authentic samples of texts and vocabulary needed for language analysis and reference. That said, exposing students with how words are used in real texts rather than simplified materials tailored for L2 learning purposes may result in a more significant increase in their ability to comprehend and produce authentic language.

More literature and research to date have supported the efficacy of corpus-based DDL to promote specific areas of language development. Students enhance their language noticing and autonomy by engaging in inquiry-based activities (Boulton, 2017; Chambers, 2007; Godwin-Jones, 2017; Yoon & Hirvela, 2004). The approach also facilitates the acquisition of English vocabulary (Karras, 2016), lexico-grammatical patterns (Huang, 2014; Liu & Jiang, 2009), and speaking fluency (Geluso & Yamaguchi, 2014). Students additionally improve their ability to use familiar words in new ways (Frankenberg-Garcia, 2012). Being engaged in corpus-based queries and analyses helps students develop their knowledge of linking adverbials in English (Boulton, 2009a) and English verb-noun collocations (Chan & Liou, 2005) as well as strengthen their ability to use the passive voice (Smart, 2014). Other benefits concern the development of students' metacognitive and cognitive skills through inductive and deductive reasoning activities (Boulton, 2009c).

Previous studies have documented student positive perceptions of a corpus-based DDL approach (Huang, 2014; Sun, 2007; Varley, 2009; Yoon & Hirvela, 2004; Yusu, 2014) and its feasibility for students of multidisciplinary groups in EAP contexts (Charles, 2012). Considering the favorable study findings in different settings, corpus-based DDL seems to be an approach that embraces a broader range of opportunities for students to develop both their cognitive and metacognitive skills to acquire academic language. Despite the positive response and research attempts, there have been some concerns to consider and gaps to fill.

Limitations of DDL

Computer-based corpora offer a more controlled "massive contextual exposure" to the target language compared to a regular reading or listening program (Boulton, 2017, p. 483). While generally, computer-based corpora are preferred due to the ease of access and extensive data for analysis, fears and lack of technology in the classroom can hinder the implementation of corpus-based DDL. Liu and Lei (2017) record a wide range of limitations and challenges of DDL, as identified in various studies. The issues to address include the difficulty of corpus query analysis (Boulton, 2009b; Liu & Jiang, 2009), the need for intensive training for corpus analysis (Boulton, 2009a; Karras, 2016; Liu & Jiang, 2009; O'Keeffe & Farr, 2003), and the paucity and/or difficulty of access to corpus search engines (Kennedy & Miceli, 2001; Kosem, 2008; Liu & Jiang, 2009). The consequences that follow, students may be reluctant to conduct their corpus-based search due to the difficulty of running the query in addition to analyzing and interpreting the query results. The DDL approach also seems to favor more the higher-level proficiency learners than the lower ones (Liu & Lei, 2017; Boulton, 2009a) as sufficient analytical

and linguistic skills are necessary to cope with the complexity of the authentic data presented in the corpus query results (Boulton, 2009a).

Although corpus-based DDL may be most appropriate for university students having intermediate to advanced English proficiency, Boulton and Cobb (2017) consider this claim arguable since limited studies have examined the use of DDL at the secondary level. Karras (2016) found that allowing sufficient training time led to better results in the vocabulary acquisition programs targeting secondary school students. Recent study findings have offered salient recommendations to address the perceived challenges of using corpus-based DDL effectively and improve students' comprehension of academic texts.

In addressing the challenge of analyzing massive data using online corpora, previous studies recommended the use of paper-based concordancing to supplement or replace the web- or computer-based version. Paper-based concordance promises similar advantages for language pattern analysis. Low-proficiency learners can benefit from corpus-based learning by using prepared paper materials. Paper-based concordance promises similar advantages for language pattern analysis. Low-proficiency learners can benefit from corpus-based learning by using prepared paper materials (Boulton, 2010b). Chan and Liou (2005) similarly suggested that the use of concordances scaffolded collocation learning and students with low proficiency levels can perform better with collocation instruction. Ashouri et al. (2014), who studied the impact of corpus-based collocation instruction, found that students who learned lexical collocations – chunks of words that often appear together – improved their collocational knowledge better than those learning individual words. The authors claimed that corpus-based collocation

learning “increases the quantity of leaners’ mental interaction” and facilitate comprehension improvement (Ashouri et al., 2014, p. 478).

A corpus-based instructional framework needs to consider these constraints and previous research recommendations to anticipate problems and countermeasures before adopting DDL in the classroom. Given the evidence gathered, adequate training, scaffolded support, paper-based concordances, and collocation instruction are necessary for corpus-based DDL to work effectively.

Corpus-Based DDL Framework: Bridging Research and Practice

The organizing framework to guide the development of corpus-based DDL took into account the discovery learning philosophy, benefits, and limitations of DDL, instructional needs of the target population, and best practices in L2 vocabulary instruction. While the first two points have been discussed earlier, this section draws on findings of a case study conducted in the target institution and related literature to make informed decisions about instructional practices. The proposed instructional framework reflects the learning philosophy, theories, and concept underlying lexico-grammatical instruction in a corpus-based DDL classroom.

Target Population Needs

A case study examining the reading comprehension problems of undergraduate medical students in an urban university in Indonesia found that the students had both limited reading skills and poor comprehension of academic texts although they were familiar with the texts’ topics; the causes of which were the intertwined problems of lexicon and syntax (Rasikawati, 2012). The students processed reading passages in a word-by-word manner and were unfamiliar with complex sentence structures.

Despite their familiarity with the content knowledge, the students interpreted incorrectly both general academic and content specific words. They failed to decode the meanings of complex sentences and chunk ideas into meaningful units (Rasikawati, 2012). The study recommended that reading classrooms need to aim at increasing students' vocabulary size and the teaching of complex syntax, which could be achieved through "extensive practice for the students to chunk ideas at the sentence level" (Rasikawati, 2012, p. 19).

Lexical and Syntactic Knowledge: Strategy and Content

Findings from research in L2 vocabulary instruction appear to show consistent results with that of L1. Considering the significant relationship between vocabulary knowledge and reading comprehension, students would likely benefit from instruction that addresses their vocabulary development and understanding of texts. A considerable challenge involved in determining the content of vocabulary instruction for reading comprehension is to decide the relative emphasis to place on breadth versus depth of knowledge (Cobb, 1999). Students tend to increase the breadth of vocabulary substantially from reading texts above their independent level, referred to as "matched reading" (Carver, 1994, p. 436) and gain more from classroom instruction targeted within their zone of proximal development, i + 1, and meaningful high exposure to and use of academic language (Nagy & Townsend, 2012). That said, vocabulary instruction should be scaffolded, and its content needs to target one level above the students' English proficiency to enable them to achieve the learning goal independently. Graves et al. (2013), who conclude various research results in L1 and L2, state that robust vocabulary instruction can be associated with explicit instruction. This instruction should include

both definitional and contextual information, repeated exposures to target words in various contexts, and opportunities to deep processing of words meanings (pp. 22–23).

High-frequency Words. Increasing students' awareness of high-frequency academic words would be useful to help them cope with other academic texts (Stahl, 1990, p. 17). Empirical findings on the effect of word-frequency indicate that repeated exposures to a word have a long-term influence and enable students to recall a frequent word more quickly than the infrequent one (Adelman et al., 2006; Balota et al., 2004). Providing students with high-frequency word list and example sentences in which the target word occur could lead to improved comprehension of written texts (Tozcu & Coady, 2004). Considering the interdependence of vocabulary and grammar (Lewis, 2001; Pearce, 2007), expanding students' vocabulary may be best approached by the teaching of individual words and the context for the targeted words.

Nagy and Townsend (2012) recommend the use of 'words as tools' to help students acquire academic language in that instructional practices should allow repeated encounters to words in various sentences and increase the chances for students to learn not only word meaning but also its lexical combination. Learning vocabulary as a part of a larger system refers to an understanding of words relative to other words of the same concept and those that co-occur (Nagy & Townsend, 2012, p. 96). Vocabulary instruction should target not only single-word items but also chunks of lexis through incidental vocabulary learning (Webb et al., 2013).

Multi-word Units. Since written and spoken texts are mainly composed of multi-word units (Biber, 2006; Schmitt, 2010), instruction of these word chunks should receive more attention. Learning these naturally occurring expressions can be advantageous for

comprehension and communicative purposes. The finding of a previous study asserted that learning formulaic sequences could facilitate efficient language processing as students tended to read formulaic sequences faster than other types of phrase (Conklin & Schmitt, 2008).

Contextual Diversity

More recent findings of memory research have shown that contextual diversity – the number of different contexts in which a word appears – also increases students' ability to recognize words (Adelman et al., 2006; Jones et al., 2012; Perea et al., 2013). In addition to using the word list as a reference, ensuring students' repeated encounters with the target words in different contexts and at various times is essential. The repetition of words in varied contexts would benefit students when the redundancy is distributed over time (Verkoeijen et al., 2004).

Corpus-based DDL offers plentiful opportunities for students to examine the use of an individual word and compare its meaning in multiple distinctive contexts. Students can observe patterns across spoken and written registers as well as contexts in which the word is used (Liu & Lei, 2017). Examining samples of how the word is used in concordance lines can help students notice differences in word meanings and forms across contexts and may increase the chance to retain the word. Graves et al. (2013) recommend half an hour a day to be spent on engaging students with various activities that allow them to learn shades of meanings and use them in multiple contexts.

Corpus Queries

Students can retrieve different types of language usage information through corpora, such as frequency of words, collocations, and other types of multi-word units

(Liu & Lei, 2017). Corpus queries allow students to have repeated exposures to high-frequency words in diverse texts. The recommended practices include making use of the Corpus of Contemporary American English (COCA) (Davies, 2008–) and the i-Web corpus (Davies, 2018–). COCA is preferred to other corpora due to its free online accessibility, interface user-friendliness, search variability, link to other web pages, and large size. While COCA contains more than 560 million words of text, i-Web corpus contains about 14 billion words found in 22 million web pages and is supported by a wide range of features and information like definition, pronunciation, synonyms, phrasal verbs, clusters, and collocates. Both corpora can be accessed through the COCA site.

COCA, however, has an advantage that i-Web Corpus cannot offer. COCA allows queries in a restricted year, text type, and genre. For activities that require students to see the occurrences of words in a specific discipline, students can run the queries through COCA, for instance, to learn how a specific word has been used in the field of humanities or science and technology. Students can also observe the different contexts in which specific words have been used in different years. To help determine whether certain words or phrases may be more appropriate for a specific register such as academic or spoken, students can run queries to obtain a result in the target register.

Figure 1 illustrates a COCA search for any “verbs” before the word “medicine”. This query can be run to help students determine the appropriate idiomatic collocation “take medicine”. Similar to Japanese students who often say “drink medicine” and Chinese students “eat medicine” (Liu & Lei, 2017), Indonesian also tends to use incorrect verbs before the noun “medicine”.

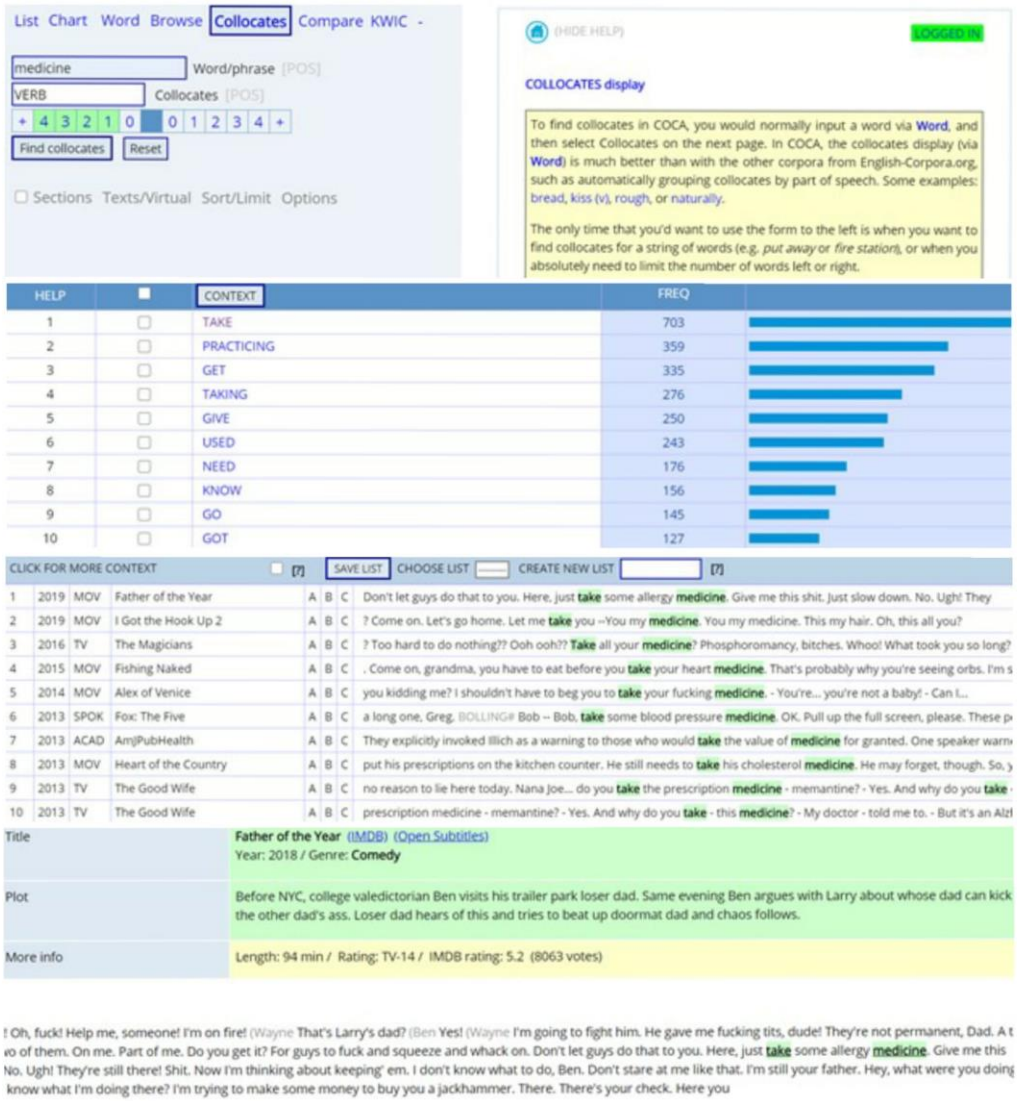

Figure 1. COCA Query Results for "VERBs" before "medicine".

Another tool that is connected to the academic sub-register of COCA is WordAndPhrase (2012). Using the form provided in WordAndPhrase, more proficient students can search for information such as what academic words are used and their frequency of occurrences in the text they read or write. The "word sketches" feature allows students to see definitions of words and other detailed information generated from COCA.

Reviews of the related literature and research suggest that instructional practices need to go beyond traditional vocabulary instruction to enhance the breadth and depth of students' lexico-grammatical knowledge and subsequently improve their reading comprehension. Combined explicit lexico-grammatical instruction, scaffolded support, and corpus-based queries are likely to enhance students' understanding of individual words and multi-word units in various contexts.

Assessments. Research examining the efficacy of vocabulary instruction on measures of comprehension in different groups of L1 and L2 learners yields inconsistent findings. While Tozcu and Coady (2004) reported significant gains in vocabulary and reading comprehension from direct vocabulary instruction, Proctor et al. (2011), who studied both native English speaking and bilingual students, found no significant effects on measures of comprehension and vocabulary breadth. Students, however, showed substantial gains on a standardized measure of vocabulary and researcher-developed measures of vocabulary depth. To gain a better understanding of the effects of instruction on vocabulary development and reading comprehension, measures of the target vocabulary knowledge and comprehension are necessary. In the case of this study, tests to measure understanding of vocabulary and word occurrences in context and comprehension of texts were considered.

Corpus-Based DDL Framework. A review of inquiry-based learning theories and previous empirical research examining the use of DDL in L2 classrooms have revealed essential implications for treatment. In achieving the goal of increasing students' vocabulary size and understanding of word nuances in a Reading EAP program, the student learning experience should comprise students' use of authentic materials and

high-order thinking skills; students' engagement in problem-solving; and scaffolded inquiries. Figure 2 illustrates the proposed framework of an intervention aiming to enhance students' lexical and syntactic knowledge. This inquiry-based Reading EAP intervention is comprised of four curriculum elements –course content, instructional approach, activities, and assessment.

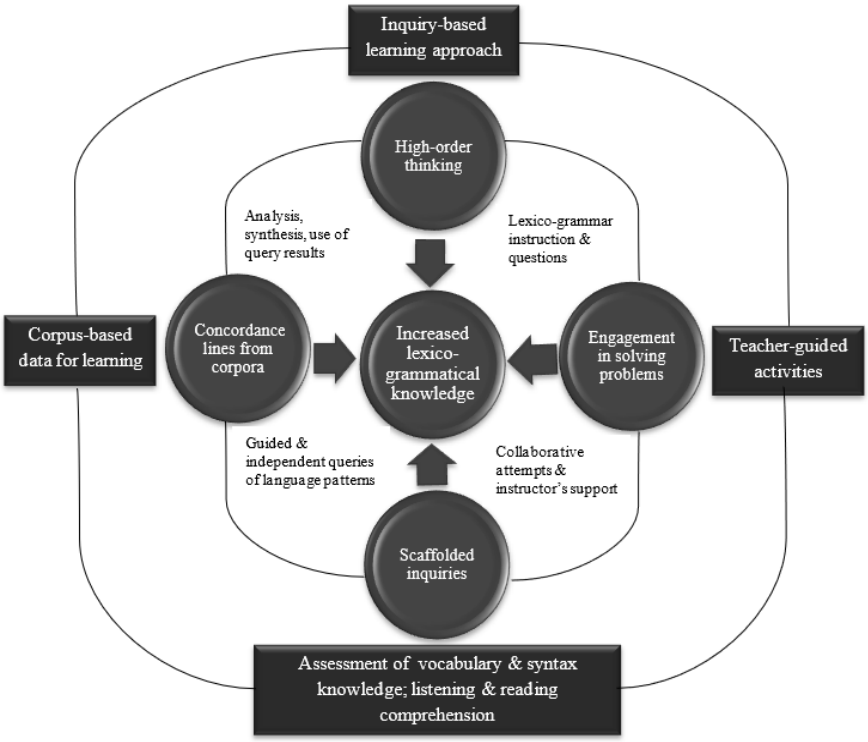

Figure 2. Framework for Augmenting Students' Lexico-grammatical Knowledge.

The framework includes critical variables of learning that are structured in a recurring cycle of activities, and which interrelationships of the variables are identifying. The cycle begins with lexico-grammar instruction and sets of questions prepared by the instructor. The instructor reviews grammar rules and patterns in which the target vocabulary occurs. The questions serve to model purposeful inquiries, promote analytical thinking, encourage intelligent guesses, and increase students' awareness of lexical items and grammatical features used in the language samples. The questions may initially

address common lexical and grammatical errors but gradually shift to students' invented problems as they progress in their learning. Through collaborative work and with the instructor's support, students investigate their problems, collect data from corpus search, discuss how they may analyze the concordance lines, and come up with a synthesis of the lexico-grammatical patterns that emerge from the data.

As students develop more confidence and better ability to run the corpus-based queries, they learn to solve their problems independently, share their findings in a group or before the class, and practice using their new knowledge in reading and writing passages. Academic texts for reading activities may include texts in the students' discipline and various teacher-selected texts, which type and topics often appear in standardized English proficiency assessments such as the paper-based TOEFL. Including the two types of texts potentially could increase students' motivation to read as they are relevant to their study major and need to perform well on a standardized English test. Having students use their knowledge of words in writing would help them not only write in response to the reading input but also retain the lexico-grammatical patterns learned.

Various strategies are critical throughout this cycle of activities to facilitate a better understanding of word nuances and syntactical patterns. Paper-based concordance activities can promote the early learning stage before students use more substantial web-based corpus data. Adequate training would likely take several first few meetings to ensure students understand different types of queries and results to expect from the queries. The guided inquiries must also include both instruction and modeling of how students can comprehend text by making appropriate chunking of ideas at the sentence

level. Ongoing assessments of students' understanding and use of vocabulary are useful feedback to make any necessary adjustments throughout the program.

Summary

Understanding the benefits and constraints of corpus-based DDL help determine appropriate strategies and anticipate problems before adopting DLL in the classroom. Corpus-based DDL can devise a scheme to improve undergraduate students' comprehension of academic texts through lexico-grammatical instruction and intensive practice of identifying vocabulary and grammatical structures. The fact that college students have acquired a language before learning L2, thus possessing prior knowledge, can be especially beneficial for the inquiry-based classroom. Using corpus-based DDL for this group of students might be impactful as they could activate relevant schemata to analyze L2 corpus data and make inferences about the L2 patterns found in the data. The authentic learning materials and their relevance to students' study discipline are other contributing factors to the efficacy of the approach.

Although a growing number of studies have found the use of corpus-based DDL beneficial for L2 students' language development, more research is still needed to provide evidence for the efficacy of the approach in various contexts. In many Asian classrooms, including Indonesian, the paucity of progress in research and the use of corpora for instructional purposes call for more empirical studies. This empirical research was expected to fill the gap between research and instruction so that instructors would be motivated to apply the corpus-based DDL approach to enhance students' vocabulary and syntax knowledge and, subsequently, their comprehension of academic texts.

Chapter Three

Method

This study explored whether corpus-based data-driven learning (DDL) would significantly contribute to developing undergraduate students' knowledge of vocabulary and syntax, as well as their listening and reading comprehension. Conducted in an English for Academic Purposes (EAP) program offered in a country where English was a foreign language, the study raised two questions: 1) Do students receiving corpus-based DDL instruction differ significantly from those having the regular instruction on measures of vocabulary knowledge, syntax knowledge, listening comprehension, and reading comprehension?, and 2) Does the effect of corpus-based DDL instruction vary for students at different English proficiency levels? This chapter describes the research design, setting, and participants, measures, procedure, data analyses, instrument validity, and reliability.

Research Design

The study employed a randomized pretest-posttest experimental design. Students were assigned randomly to two groups, the experimental and control groups. While students in the experimental group received corpus-based DDL instruction, those in the control group had regular vocabulary and grammar instruction. Although pretests may not be essential in research using a randomized experimental design, this study included pretests as covariates to remove variability or noise and examine the actual effect of the treatment.

The two independent variables (IVs) in this study were the level of English proficiency and the method of instruction. The two levels of English proficiency – basic

and pre-intermediate – were based on the results of the paper-based TOEFL. Assigned to six individual classes, each of which consisting of mixed proficiency levels, students received two types of instruction. Three groups had corpus-based DDL instruction, whereas the other three followed the regular vocabulary and grammar instruction. The dependent variables (DVs) were the measures of vocabulary knowledge, syntax knowledge, listening, and reading comprehension. Table 1 illustrates the study design.

Table 1

Research Design

Assignment	Pretest	Treatment	English Proficiency Level	Posttest
R	O	X	BA	O
	O	X	PI	O
R	O		BA	O
	O		PI	O

Note. BA = Basic; PI = Pre-Intermediate.

Since the study incorporated two IVs, multiple DVs, and pretests as covariates, two-way or factorial multivariate analysis of covariance (two-way MANCOVA) was the statistical test employed. Two-way MANCOVA allows the analyses of group differences in a set of DVs and the interaction between the IVs on the combined DVs while controlling for the covariates (Mertler & Reinhart, 2017; Tabachnick & Fidell, 2013). Details on the statistical analyses are available in the procedure section of this chapter.

Setting and Participants

The study participants were undergraduate students in a private urban university in Indonesia. The students took a 5-semester credit of English for Academic Purposes (EAP) as a required course, two of which credits were assigned for the enrichment program and taught by teaching assistants (TAs). For this study purpose, the data was

collected in the classrooms taught by the TAs. The target participants were about 30% of the entire freshmen majoring in accounting, psychology, information system, information technology, electrical engineering, industrial engineering, and civil engineering. These students were all the students who took the Reading EAP course in the first semester.

Each participant took a paper-based TOEFL test during the new student orientation, approximately two weeks before the study began. The participants' scores on the paper-based TOEFL determined their English proficiency levels, which were based on the categories of the Common European Framework of Reference (CEFR). The three broad categories of CEFR consist of six reference levels: Basic User (A1 and A2), Independent User (B1 and B2), and Proficient User (C1 and C2) (Council of Europe, 2018). Using CEFR as the benchmark, Educational Testing Service (ETS) recommends minimum cut scores of 337, 460, and 627 on the paper-based TOEFL to differentiate the reference levels of A2, B1, and C1 respectively (ETS, 2012). The CEFR proficiency categories served as the standard for student exemption from or placement into the required English program.

The university policy set that students at the B2, C1, and C2 levels, who scored higher than 543 on the paper-based TOEFL, were exempted from taking the required 5-credit English program. Those at the B1 level were required to take the 3-credit EAP program but exempted from the EAP enrichment program. Despite the exemption, B1 students could opt to participate in the enrichment if they wished to. The study participants were students at the A1, A2, B1 levels who were enrolled in the 2-credit EAP enrichment program. Table 2 illustrates the participants' English proficiency profile

with correspondence to CEFR level and paper-based TOEFL score and their participation in the EAP program status.

Table 2

Students' English Proficiency Profile and Program Participation Status

CEFR Level	Paper-based TOEFL Score	Program Participation Status
B2, C1, & C2	> 543	Exempted from all program; Non-research participant
B1	460 – 543	Exempted from enrichment; May be research participants
A2	337 – 459	Required to take enrichment
A1	< 337	Research participants

A total of 231 students were recruited for this study. They were assigned randomly to six classes, three of which were allocated randomly as the experimental group and another three as the control group. All the six classes had their instruction in separate parallel classrooms. Each class initially consisted of about 38 students of mixed English proficiency levels and study majors. While the experimental groups studied in computer laboratories to ensure that students receiving corpus-based DDL instruction have access to the internet and a web-based corpus, the control groups used regular classrooms. The class met 100 minutes a week for fourteen weeks, from August to December 2019. All the participants signed a consent form before the study began.

Two teaching assistants (TAs) were also assigned randomly to co-teach in each of the classes. They were the fifth-semester English department students who were taking the ESL teacher knowledge course when the study took place. Their assignment to teach

the EAP enrichment program was part of the ESL-TK course practicum. The TAs developed a weekly lesson plan and prepared course materials based on the curriculum expectation set by the English Department. The researcher provided a model lesson plan that the TAs could adopt. All TAs met with the researcher on a weekly basis via Zoom to consult about their lesson plan, course materials, and any other issues they encountered in the classroom. The TAs designated to teach the experimental classes included an approximately 30-minute corpus-based activity into their weekly lesson plan in place of the regular vocabulary and grammar instruction. Both the experimental and control groups used the same readings passages and word lists for instruction. Samples of the lesson plan for the experimental and control groups are available in Appendices E and F. The word list can be found in Appendix G.

Measures

The study employed five measures to assess students' achievement and proficiency at the end of the program. They were two measures of vocabulary knowledge, and a measure each for syntax knowledge, listening comprehension, and reading comprehension. While the vocabulary test was an instrument developed by the researcher, the syntax knowledge, listening, and reading comprehension tests were adopted from the standardized test practice for the paper-based TOEFL. The participants in the treatment and control groups did all the assessments as pretest and posttest.

Vocabulary Knowledge Test

Since the vocabulary knowledge test (VKT) was to measure students' knowledge of the specific vocabulary covered by the instruction in this study, no preexisting instruments could well serve the purpose. The researcher developed new assessment

instruments to include all the target vocabulary words. The VKT consisted of two parts to measure two constructs, knowledge of word meaning and multi-word units. The test of word meaning contained 52 multiple-choice items, of which score was referred to as "vocabulary 1" variable in the analysis. It measured students' understanding of the instructed words independent of their contexts of use. The test of multi-word units included 52 multiple-choice questions, referred to as "vocabulary 2" variable. The test required students to choose the target academic collocations and formulas that sound most natural within their given contexts of use. The students had about 90 minutes to complete the test. The VKT paper can be found in Appendix A.

Syntax Knowledge Test

The syntax knowledge test (SKT) was adopted from the structure and written expression section of the Longman preparation course for the paper-based TOEFL test of Phillips (2005). Containing 40 multiple-choice items, the test measures students' knowledge of English structure and written expressions. SKT, which was referred to as "structure" variable in the analysis, consisted of two parts. The first part contained 15 items assessing students' ability to select the appropriate words or phrases to complete a sentence. The second part was comprised of 25 items assessing students' ability to identify a syntactic error in each sentence. SKT test-takers were required to complete the test in 25 minutes. Appendix B includes the SKT.

Listening Comprehension Test

The listening comprehension test (LCT) was also a test section of Phillips (2005) containing a total of 50 multiple-choice items. Divided into three parts, LCT assessed students' ability to comprehend conversations and talks in English. There were 30 items

in the first part assessing students' ability to understand statements in short conversations. The second part was comprised of eight items, testing students' ability to understand longer conversations and recall specific information mentioned in the conversations. The last part contained 12 items to evaluate students' ability to understand several talks and recall specific information stated in the talks. Test takers had approximately 35 minutes to complete the entire test. They listened to the audio recording of test prompts and material that were played using room audio speakers. The acoustic suitability of each test room and the audio system were tested prior to the test day to minimize technical issues and ensure good sound quality. The LCT score was referred to as "listening" variable in the analysis. The items are illustrated in Appendix C.

Reading Comprehension Test

The reading comprehension test (RCT) was the last section of Phillips' paper-based TOEFL practice test. RCT consisted of 50 multiple-choice items measuring students' ability to read and understand short passages. There were a total of five passages selected on the topics relevant to North American universities and colleges. Each passage was followed by nine to twelve items testing students' ability to understand the stated information and make inferences. Every test-taker must complete the test within 55 minutes. The RCT score was the "reading" variable in this study.

Instrument Validity and Reliability

Two pilot tests took place at two different times to refine the newly developed instrument, the Vocabulary Knowledge Test (VKT), so that it would meet satisfactory measurement properties. They additionally served to try out the test administration procedures. The pilot involved 22 and 23 students having similar characteristics to the

study participants at the target university. In between the two tests, three pilot participants were interviewed to provide additional feedback for item revisions.

The first pilot result was unsatisfactory for vocabulary 1 (Cronbach's α = .67) but satisfactory for vocabulary 2 (Cronbach's α = .80). Six items of the 52 items in vocabulary 1 test having zero variance were removed from the scale. The other ten items with negative item-total correlations were examined to determine whether the items would be subject to revision or removal. The interview of pilot participants revealed which sets of alternatives in the suspected poor items were problematic. Following a series of consultation with a linguist, six new items were created to replace the items removed in the vocabulary 1 test. The other ten poor items were revised. As for the vocabulary 2 test, distractors of four items with negative item-total correlations were also revised to improve the internal consistency of the test. The second pilot test conducted showed increased reliability of both tests. The test of word meaning (vocabulary 1) reached a Cronbach's α = .83, while the test of multi-word units (vocabulary 2) had a Cronbach's α = .89.

For the other three instruments, the SKT, LCT, and RCT, reliability tests were also observed. With a sample size of 50 students for each of the test instruments, the reliability test result was satisfactory for all three instruments: SKT (Cronbach's α = .86), LCT (Cronbach's α = .95), and RCT (Cronbach's α = .91).

Procedure

The administration of Syntax Knowledge, Listening Comprehension, and Reading Comprehension pretests was part of the new student orientation program that took place two weeks before the instruction started. The research participants received information

about the EAP course and the study, signed the consent form, and did the Vocabulary Knowledge pretest on the first week of classes. Beginning in the second week through the fourteenth week, students in the experimental groups received corpus-based DDL instruction, whereas students in the control groups had regular vocabulary and grammar instruction. The participants did the posttest during the final exam week.

The instructional cycle from week 2 to week 14 began with the course introduction and a review of English grammar to activate students' prior knowledge. The TAs provided students in both the experimental and control groups with a handout containing grammar rules and word lists and went through the handout in the second week. In the remaining 12 instructional weeks, students in the control groups had regular vocabulary and grammar instruction and practices. Students in the treatment groups received training on how to run queries using Corpus of Contemporary American English (COCA), discussed grammatical patterns observed in the pre-selected reading texts and the concordance lines. They had paper-based concordance activities at the beginning of the training process of analyzing corpus data. Formative assessments of the students' vocabulary knowledge focused on examining students' recognition of the target vocabulary and grammar patterns in different texts.

For the study analysis purpose, students whose data was analyzed met the criteria of attending at least 80% of the class sessions, participating in the posttest, and attempting at least 50% items in one or more of the five sections of the pretest or posttest. The study participants' membership in the English proficiency groups – basic and pre-intermediate – was based on the median split on their paper-based TOEFL scores.

Data Analyses

This study investigated, first, whether there was a significant difference in vocabulary knowledge, syntax knowledge, listening comprehension, and reading comprehension between students in the experimental groups and control groups. The second question asked whether the effect of instruction varied for students depending on their English proficiency levels. The statistical factorial or two-way multivariate analysis of covariance (MANCOVA) served as the test to answer the two research questions. The two-way MANCOVA allows the analysis of group differences within a set of DVs as well as the interaction effects between the independent variables on the continuous DVs after controlling for continuous covariates (Mertler & Reinhart, 2017; Tabachnick & Fidell, 2013). Although factorial ANCOVA might also work, two-way MANCOVA would likely be more appropriate to increase the statistical power considering the perceived moderate correlations of the dependent variables in this study (Tabachnick & Fidell, 2013).

Prior to conducting two-way MANCOVA, the data was screened for missing values, outliers, and tests of assumptions, which include normality, homogeneity of variance-covariance, homogeneity of regression slopes, and linearity of DVs and covariates (Mertler & Reinhart, 2017, pp. 164–166). After confirming that two-way MANCOVA assumptions had been fulfilled, the analyses proceeded with the full MANCOVA. The analyses looked at the main effects and interaction effects of the IVs on the combined DVs after covariate adjustment.

The analysis results included a summary of the two-way MANCOVA with the main effects for each IV and covariate on the combined DVs and an interaction effect for

the IVs (test statistic, *F* ratio, *p*-value, and effect size) (Mertler & Reinhart, 2017; Tabachnick & Fidell, 2013). The univariate ANCOVA results were also observed; the report of which contained the simple effects for each IV and DV (*F* ratio, *p*-value, and effect size). The table of descriptive statistics illustrating the comparisons of group means, standard deviation, adjusted mean, and standard error for each DV and each combination of groups of the IVs served to reveal which groups differ on each DV.

Chapter Four

Results

Chapter four reports findings of the effect of the treatment condition on five measures of undergraduate students' academic English – knowledge of single word meaning and multi-word units, knowledge of syntax, listening comprehension, and reading comprehension – after their pretest difference has been controlled for. It additionally describes whether the condition effect varies for students in the basic and pre-intermediate groups of English proficiency. There were five dependent variables (DVs) in this study. They are the posttests of single word knowledge (vocabulary 1), multi-word unit knowledge (vocabulary 2), syntax knowledge (structure), listening comprehension (listening), and reading comprehension (reading). The two independent variables (IVs) are, first, condition with two groups – experimental (1) and control (2); second, English proficiency with two groups – basic (1) and pre-intermediate (2). In addition, the pretests were the covariates. The experimental and control conditions differed on the basis of their instructional method. While the experimental condition received corpus-based DDL instruction in addition to the grammar instruction, the control condition received regular instruction of vocabulary and grammar. The division of basic and pre-intermediate English proficiency groups was based on a median split on the TOEFL-paper based scores. The two IVs in a factorial arrangement produced four cells.

This chapter comprises two major analyses, preliminary and two-way MANCOVA. The preliminary analyses cover the data screening description, result of exploratory data analysis, descriptive statistics, and testing of assumptions. After

assessing the overall impression of the data and confirming the assumptions of MANCOVA, the chapter proceeds to the final two-way MANCOVA result, the presentation of which follows the research questions order. All analyses were performed using IBM SPSS Statistics version 26.

Preliminary Analyses

The number of participants whose data were retained for the analysis was 153 out of the total 231 freshmen who initially participated in the study. The exclusion criteria were less than 80% of class attendance, nonparticipation in the posttest, and less than 50% items attempted in any of the five sections of the pretest or posttest. Since participation in the program was not compulsory, 64 students – 33 in the experimental and 31 in the control group – withdrew after attending a few sessions. Fourteen students – eight in the experimental and six in the control group – did not participate in the final exam, the study posttest. Table 3 shows the division of basic and pre-intermediate English proficiency groups based on the median split on the TOEFL-paper based scores.

Table 3

Number of Participants by Condition and Proficiency Level

Proficiency Level	TOEFL Score	Condition	
		Experimental	Control
Basic	293 – 397	40	35
Pre-Intermediate	398 – 497	35	43
Total participant in each group		75	78
Total research participants		153	

Data screening was conducted to assess the accuracy of data entry, missing values, and fit between their distribution and the assumptions of multivariate analysis. The result of the exploratory data analysis and descriptive statistics confirmed that the data was clean, with no missing values, and the assumptions of multivariate analysis were adequately met. All students included in the analyses answered at least 50% of the items in each of the test sections. Assessment of the scatterplot showed an approximately linear relationship between the dependent variables – vocabulary 1, vocabulary 2, structure, listening, and reading. There was no evidence of multicollinearity as assessed by Pearson's correlation ($|r| < 0.9$). Inspection of the boxplot and standardized residuals revealed no extreme univariate outliers. With five dependent variables, $\alpha = .001$, critical $\chi^2 = 20.52$, Mahalanobis distance ($p > .001$) indicated no multivariate outliers in the data. Almost all of the group combinations were normally distributed (Shapiro-Wilk's test, $p > .05$) except the listening posttest of condition 2 and English proficiency 1 (Shapiro-Wilk's test, $p < .05$). Multivariate Analysis was still run since MANOVA is fairly robust to deviations from normality in that Type I error rate was unlikely affected by skewed distribution, especially when the group distribution is balanced (Bray & Maxwell, 1985; Weinfurt, 1995). The Box's M Test was interpreted first to help identify the appropriate statistical test to be used in testing the homogeneity of regression. Box's M test was not significant, $p = .14$, suggesting that equal variances could assumed. Therefore, Wilks' Λ would be used as the multivariate test statistic. There was non-significant interaction term between the IVs and pretests, $F(5, 137) = 1.15$, $p = .34$. Considering that the IV-covariate interaction was not significant, the analysis proceeded with the two-way MANCOVA of which purpose was to assess whether the IVs had a statistically significant effect on the

dependent variables after controlling for the covariates, the pretests. Table 4 shows the means and standard deviations for the five covariates over all combinations of the condition and English proficiency. The group sizes were approximately equal at the pretest. The results of the assumption tests in tables, charts, scatterplots, and boxplots can be found in Appendix H.

Table 4

Pretest Means and Standard Deviations of the Five Measures of Academic English for Each of the Condition and English Proficiency Groups

Measure	Experimental		Control	
	Basic (*N*=40)	Pre-Intermediate (*N*=35)	Basic (*N*=35)	Pre-Intermediate (*N*=43)
Vocab. 1	19.48 (6.16)	25.89 (5.27)	20.20 (3.87)	26.91 (5.13)
Vocab. 2	15.50 (5.23)	21.43 (5.08)	15.91 (3.94)	21.93 (4.21)
Structure	11.05 (2.65)	15.80 (2.95)	10.46 (2.47)	15.47 (3.03)
Listening	13.35 (4.96)	26.23 (6.41)	14.46 (3.92)	27.91 (6.94)
Reading	15.00 (4.12)	22.66 (4.64)	16.71 (3.67)	22.40 (4.17)

Note. Standard deviations are in parentheses.

Two-way MANCOVA Analyses

A two-way MANCOVA was run to answer the two research questions. Following the MANCOVA, multiple ANCOVAs determined the univariate main effects of condition, whether the adjusted mean difference between the groups of the independent variable in terms of each dependent variable was statistically significant. This study examined, first, whether students receiving corpus-based DDL instruction (experimental

condition) differ significantly from those having the regular instruction (control condition) on measures of vocabulary knowledge (vocabulary 1 and 2), syntax knowledge (structure), listening comprehension (listening), and reading comprehension (reading). Second, it additionally explored whether the effect of corpus-based DDL instruction varies for students in different English proficiency groups.

As shown in Table 5, there was a statistically significant instruction effect on the combined measures of academic English after controlling for the pretest, $F(5, 140) = 5.48$, $p < .001$, Wilks' $\Lambda = .84$, partial $\eta^2 = .16$. The main effect of the English proficiency on the combined measures of academic English after controlling for the covariates was not statistically significant, $F(5, 140) = 0.57$, $p = .72$, Wilks' $\Lambda = .98$, partial $\eta^2 = .020$. The interaction effect between condition and English proficiency on the combined measures of academic English was not statistically significant $F(5, 140) = 1.87$, $p = .10$, Wilks' $\Lambda = .94$, partial $\eta^2 = .06$. The two-way MANCOVA table also showed the covariates had statistically significant relationships with the dependent variables and therefore qualified as potential covariates ($p < .05$), except the vocabulary 2 pretest ($p = .084$).

Table 5

Two-way MANCOVA

Effect	Wilks' Λ	F	p	η_p^2
Vocab. 1 Pretest	.88	3.93	.002	.12
Vocab. 2 Pretest	.93	1.99	.084	.07
Structure Pretest	.87	4.32	.001	.13
Listening Pretest	.87	4.06	.002	.13

Effect	Wilks' Λ	F	p	η_p^2
Reading Pretest	.88	3.68	.004	.12
Condition	.84	5.48	<.001	.16
English Proficiency	.98	0.57	.723	.02
Condition*English Proficiency	.94	1.87	.104	.06

The follow-up multiple two-way ANCOVAs were conducted to find out whether there was also a statistically significant adjusted mean difference between the groups of the IVs in terms of each DV. Table 6 illustrates the results of multiple ANCOVAs indicating that condition differences were statistically significant for vocabulary 1 ($F(1, 144) = 16.235$, $p < .001$, partial $\eta^2 = .10$); vocabulary 2 ($F(1, 144) = 7.327$, $p < .05$, partial $\eta^2 = .05$); and structure ($F(1, 144) = 4.16$, $p < .05$, partial $\eta^2 = .03$). Differences for listening and reading were not statistically significant.

Table 6

Univariate Main Effects

Independent Variable	Dependent Variable	$F_{(1, 144)}$	p	η_p^2
Condition	Vocab. 1	16.24	.000	.10
	Vocab. 2	7.33	.008	.05
	Structure	4.16	.043	.03
	Listening	0.03	.868	.00
	Reading	0.07	.787	.00
English	Vocab. 1	0.01	.930	.00
Proficiency	Vocab. 2	0.60	.441	.00

Independent Variable	Dependent Variable	$F_{(1, 144)}$	p	η_p^2
	Structure	1.35	.247	.01
	Listening	0.30	.585	.00
	Reading	1.17	.282	.01
Condition*English	Vocab. 1	0.98	.323	.01
Proficiency	Vocab. 2	0.05	.820	.00
	Structure	5.33	.022	.04
	Listening	1.19	.276	.01
	Reading	4.76	.031	.03

Hypotheses

Hypothesis 1. At posttest, students receiving DDL instruction (experimental group) would score statistically significantly higher than those having regular instruction (control group) after controlling for their pretest difference on measures of a) vocabulary knowledge, b) syntax knowledge, c) listening comprehension, d) reading comprehension.

Comparisons between condition groups revealed data against the hypothesis 1a in that the effect of condition was statistically significant in favor of the control condition for vocabulary 1 and vocabulary 2 posttests. As seen in Table 7, students receiving regular instruction had a greater adjusted mean for vocabulary 1 in both the basic and pre-intermediate English proficiency groups (M = 28.22, SE = 0.85, and M = 27.45, SE = 0.80 respectively) compared to the students having corpus-based DDL in both English proficiency groups, basic and pre-intermediate (M = 24.83, SE = 0.84, and M = 25.39, SE = 0.84 respectively). Students in the regular instruction group also had a greater adjusted mean for vocabulary 2 in both the basic and pre-intermediate English proficiency groups

(*M* = 23.46, *SE* = 0.86, and *M* = 24.54, *SE* = 0.81 respectively) compared to the students having corpus-based DDL in both English proficiency groups (*M* = 21.76, *SE* = 0.85, and *M* = 22.53, *SE* = 0.85 respectively).

Table 7

Means, Adjusted Means, Standard Deviations and Standard Errors of Academic English Measures for Each Condition and English Proficiency Group

Measure	Experimental				Control			
	Basic (***N***=40)		Pre-Intermediate (***N***=35)		Basic (***N***=35)		Pre-Intermediate (***N***=43)	
	M *(SD)*	M_{adj} *(SE)*	*M* *(SD)*	M_{adj} *(SE)*	*M* *(SD)*	M_{adj} *(SE)*	*M* *(SD)*	M_{adj} *(SE)*
Vocab. 1	20.45 (4.34)	24.83 (0.84)	29.09 (4.76)	25.39 (0.84)	24.57 (5.45)	28.22 (0.85)	31.49 (5.81)	27.45 (0.80)
Vocab. 2	18.55 (4.64)	21.76 (0.85)	25.11 (5.14)	22.53 (0.85)	20.89 (4.45)	23.46 (0.86)	27.51 (4.83)	24.54 (0.81)
Structure	14.40 (4.04)	16.66 (0.74)	21.40 (4.33)	19.27 (0.74)	14.71 (3.30)	16.82 (0.75)	18.74 (4.61)	16.66 (0.71)
Listening	16.50 (6.14)	21.53 (1.29)	27.74 (8.02)	23.66 (1.29)	18.17 (7.07)	22.49 (1.31)	27.23 (7.52)	22.36 (1.24)
Reading	19.30 (5.34)	22.31 (0.89)	27.63 (4.70)	25.23 (0.89)	21.71 (5.33)	24.07 (0.90)	26.63 (5.00)	23.86 (0.85)

The finding for structure was in the direction expected in support of the hypothesis 1b in that students receiving corpus-based DDL instruction differed significantly from those having the regular instruction. The adjusted mean structure in the

pre-intermediate English proficiency group (M = 19.27, SE = 0.74) was higher than the basic group (M = 16.66, SE = 0.74) when receiving corpus-based DDL instruction. Multiple ANCOVAs additionally revealed that the interaction between condition and English proficiency was statistically significant for structure ($F(1, 144) = 5.33$, $p < .05$, partial $\eta^2 = .04$) and for reading ($F(1, 144) = 4.76$, $p < .05$, partial $\eta^2 = .03$). The findings for hypotheses 1c and 1d were not supported. There was no statistically significant instruction effect on listening and reading measures. The presence of an interaction between condition and English proficiency called for the interpretation of simple main effects or known as simple (Maxwell et al., 2018).

Hypothesis 2. The difference between the experimental and control groups would be statistically significantly greater for the pre-intermediate English proficiency group than for the basic proficiency group.

As illustrated in Table 6, the univariate main effect analysis indicated that the adjusted mean differences for vocabulary 1 and vocabulary 2 were statistically significant. Inspection of the univariate test result in Table 8 showed that the simple effect of condition for vocabulary 1 was statistically significant in the basic English proficiency group ($F(1, 144) = 12.35$, $p = .001$, partial $\eta^2 = .08$) and in the pre-intermediate group ($F(1, 144) = 4.75$, $p = .031$, partial $\eta^2 = .03$). While the simple effect of condition for vocabulary 2 was statistically significant in the pre-intermediate English proficiency group ($F(1, 144) = 4.42$, $p = .037$, partial $\eta^2 = .03$), the effect was not statistically significant in the basic group ($F(1, 144) = 3.03$, $p = .084$, partial $\eta^2 = .02$).

Since the multiple ANCOVAs showed interaction effects between condition and English proficiency that were statistically significant for structure and reading in favor of

the experimental condition, the simple effects of each independent variable in each group/level were also observed. The simple effect of condition for structure in the pre-intermediate English proficiency group was statistically significant, ($F(1, 144) = 9.68$, $p < .05$, partial $\eta^2 = .06$), but the effect was not statistically significant in the basic group ($F(1, 144) = 0.03$, $p > .05$, partial $\eta^2 = .00$). The simple effect of condition for reading in both English proficiency groups was not statistically significant.

Table 8

Effects of Condition in Each English Proficiency Group

Dependent Variable	English Proficiency	*F*	*p*	η_p^2
Vocab. 1	Basic	12.35	.001	.08
	Pre-Intermediate	4.75	.031	.03
Vocab. 2	Basic	3.03	.084	.02
	Pre-Intermediate	4.42	.037	.03
Structure	Basic	0.03	.855	.00
	Pre-Intermediate	9.68	.002	.06
Listening	Basic	0.42	.519	.00
	Pre-Intermediate	0.81	.370	.01
Reading	Basic	2.93	.089	.02
	Pre-Intermediate	1.86	.175	.01

Summary

The two-way MANCOVA showed that there was no statistically significant interaction between condition and English proficiency on the combined measures of academic English. While the effect of condition was statistically significant on the

combined measures of academic English after controlling for the pretest, the effect of English proficiency was not. Multiple ANCOVAs indicated that condition was statistically significantly different on three measures: vocabulary 1, vocabulary 2, and structure. The effect of condition on listening and reading was not statistically significant.

Univariate analysis results indicated that the effect of condition on vocabulary 1 and vocabulary 2 measures was in favor of the control group, in the opposite direction of hypothesis 1. While differences for vocabulary 1 were all significant in both English proficiency levels, the difference for vocabulary 2 was only significant in the pre-intermediate English proficiency group. The interaction effects between condition and English proficiency level were in the direction expected in favor of the experimental group. However, only the effect for structure in the pre-intermediate English proficiency level was statistically significant. The finding on structure provides partial support for the study hypothesis 2 in that the difference for structure resulting from the corpus-based DDL instruction depends on the students' English proficiency level.

Given the random assignment and sufficiently large sample size, the observed differences were less likely due to chance. However, any significant effects should be regarded as extremely tentative considering the small effect sizes.

Chapter 5

Discussion

This study explored the use of corpus-based data-driven learning (DDL) in an undergraduate English for Academic Purposes program in an urban private university in Indonesia. Randomly assigned into three experimental groups and three control groups, 153 first-year students of seven study programs received fourteen 100-minute lessons from teaching assistants. While the control group had regular vocabulary and grammar instruction, the experimental group allocated approximately 30 minutes in each instructional day to explore an English corpus and work on corpus-based tasks. Students' performance was assessed using five academic English measures – single-word meaning, multi-word units, and syntax knowledge, as well as listening and reading comprehension. The question raised in this study was whether there were differences in students' academic English posttests associated with the instructional method and English proficiency level after adjustment for differences in pretests. This discussion is organized in four major parts, including discussion of the effects of instruction and proficiency level on five measures of academic English, limitations of study, implications for research and practice, and conclusions.

Effects of Instruction and English Proficiency

While the study hypothesized that the effect of corpus-based DDL instruction would be statistically significant on the combined measures of academic English, the results only partially supported the hypothesis. Only for the structure measure did the group receiving corpus-based DDL instruction perform significantly better than the control group, supporting hypothesis 1 for this dependent variable. The control group,

which received regular vocabulary and grammar instruction, performed significantly better than the experimental group on the measures of vocabulary 1 and vocabulary 2, refuting hypothesis 1.

A look into the result of univariate analyses revealed mixed results. The significant condition and proficiency level interaction reported in Table 7 indicates that the difference between the control and experimental groups for the basic proficiency level was significantly different from the difference between the control and experimental groups for the pre-intermediate level. The interaction between condition and English proficiency was statistically significant on the structure measure in favor of the experimental group for the pre-intermediate level, partially confirming hypothesis 2. However, on the reading measure, the control group scored slightly but not significantly higher than the experimental group for the basic level of proficiency. On the same reading measure, the experimental group scored slightly but not significantly higher than the control group for the pre-intermediate proficiency level.

Table 9

Means and Standard Errors Obtained by the Four Condition Groups;

Effect Size for Each Level of English Proficiency

Measure	Proficiency	Experimental	Control	Statistical Significance		
		M_{adj} *(SE)*	M_{adj} *(SE)*	$F_{(1, 144)}$	p	η_p^2
Vocab. 1	Basic	24.83 (0.84)	28.22 (0.85)	12.35	.001	.08
	Pre-Intermediate	25.39 (0.84)	27.45 (0.80)	4.75	.031	.03
Vocab. 2	Basic	21.76 (0.85)	23.46 (0.86)	3.03	.084	.02
	Pre-Intermediate	22.53 (0.85)	24.54 (0.81)	4.42	.037	.03

Measure	Proficiency	Experimental	Control	Statistical Significance		
		M_{adj} (SE)	M_{adj} (SE)	$F_{(1, 144)}$	p	η_p^2
Structure	Basic	16.66 (0.74)	16.82 (0.75)	0.03	.855	.00
	Pre-Intermediate	19.27 (0.74)	16.66 (0.71)	9.68	.002	.06
Listening	Basic	21.53 (1.29)	22.49 (1.31)	0.42	.519	.00
	Pre-Intermediate	23.66 (1.29)	22.36 (1.24)	0.81	.370	.01
Reading	Basic	22.31 (0.89)	24.07 (0.90)	2.93	.089	.02
	Pre-Intermediate	25.23 (0.89)	23.86 (0.85)	1.86	.175	.01

Table 9 illustrates the interactions of condition and English proficiency on each of the academic English measures. The following discussion focuses on the study findings, first, from the vantage point of the main effects, second, interaction effects observed. A mention of previous research and relevant language learning theories would enhance the interpretation of the findings.

Effects of Vocabulary and Grammar Instruction

Vocabulary Knowledge. This study finds tentatively that explicit vocabulary learning is more effective than corpus-based DDL to improve students' vocabulary knowledge as measured by single-word meaning and multi-word unit test instruments in this study. Teaching students the meaning of words explicitly seems to have increased their understanding of the target words at the end of the program. Students' focused attention to the specific words in the list and vocabulary exercises containing the instructed words appear to have contributed to the gains for both vocabulary measures. However, the difference in multi-word unit knowledge was especially true in the pre-intermediate proficiency group. At least within the context of this study, it can be inferred

that the explicit instruction approach was effective for the retention of a small proportion of words within a given time and the specific test context.

The general picture emerging from this finding is, to some extent, relevant to previous research both in L1 and L2. Teaching word meanings can improve students' vocabulary knowledge and their comprehension of texts containing the target words (McKeown et al., 1985; Stahl & Fairbanks, 1986). In L2 learning contexts, research has supported that explicit vocabulary instruction facilitates L2 learners' vocabulary development (Nation, 2008; Schmitt, 2008; Zimmerman, 2009). L2 research also indicated that retention rates tend to be higher under intentional learning than incidental learning (Hulstijn, 2003; Schmitt, 2008).

Regarding the non-significant small gains that the corpus-based DDL group had for vocabulary measures, they might be accounted for by the degree of explicitness of the instruction. Although students were given a word list to guide their corpus queries, teaching assistants in the experimental condition did not deliberately teach the students the words nor provide them with word definitions. Since the main objective of the course was to increase students' reading comprehension through corpus data exploration, direct instruction of the word meanings was not the priority. Instead of having vocabulary exercises containing the taught words, students used the words to run the corpus queries and analyze the words and grammatical patterns in which the words occur.

This phenomenon that needs further research indicates that the absence of explicit definitional information seems to explain the small gains. Although the students had frequent exposures to the target vocabulary in various contexts, they might not consider memorizing word meanings as a prominent goal. This finding supports the conception

that robust vocabulary instruction should include explicit instruction of definitional and contextual information, repeated exposures to target vocabulary in various contexts, and deep processing of word meanings (Graves et al., 2013, pp. 22–23). The absence of one of the conditions can affect its instructional robustness.

Interaction Effects of Corpus-Based DDL and English Proficiency

Structure Knowledge. At least within the scope of this study, corpus-based DDL was more beneficial than the regular vocabulary and grammar instruction to improve the syntax knowledge of the pre-intermediate students. In part, this finding corresponds with previous research results suggesting that corpus-based DDL contribution was most evident in a language area that falls between lexis and grammar (Johns, 2002; Mizumoto & Chujo, 2015). Johns (2002) used an example of "preposition usage that is on the collocational border between syntax and lexis (p. 109). With reference to the result of this study, a possible explanation to this claim is that corpus-based DDL is less helpful for improving students' understanding of target word definitions than identifying word patterns in a sentence. The abundant input to various lexico-grammar patterns in the corpus seems to have helped students make a connection between the reviewed grammar points and the patterns observed in concordance lines. While the control groups had grammar rule instruction, the DDL group identified the target patterns and discovered the grammar rules from the corpus examples. Since students also had the opportunity to use the observed patterns in their paragraph writing practice and presentation task, form and meaning connection might as well be established. This study finding lends its support to previous research assessing students' reactions to a corpus-based lesson indicating that students believe corpus-based lesson

has developed their usage knowledge of individual words and phrases. A closer look into quite recent research specifies that the use of corpus-based DDL has benefitted students in specific areas such as collocations or lexical combinations (Gilmore, 2009; Lai & Chen, 2015; Luo, 2016; Smirnova, 2017); colligations or syntactic patterns (Yunus & Awab, 2014), appropriate register or word usage (Bridle, 2019; Lai & Chen, 2015), linking adverbials (Larsen-Walker, 2017), prepositions (Tono et al., 2014), and passive voice (Smart, 2014).

The current study finding also provides partial, tentative evidence to clarify the muddy discussion of whether DDL is only suitable for students with advanced English proficiency. While it may be true that the cost of DDL potentially outweighs its benefit for the lower proficiency group, this study suggests that a slightly higher English proficiency may be sufficient for students to derive more benefits from DDL. The lower proficiency students may be capable of detecting simple language patterns such as subject and verb agreement. However, examining more complex language patterns will likely require instruction of complex language rules for students to make meaning from the patterns emerging from concordance lines. Unless students have some prior knowledge of these rules, such as that reflected in their proficiency level or input resulting from instruction, the difficulty of analyzing corpus data can hinder learning. Further clarification needed concerns the training required, types of moderation, and language proficiency threshold, if any of these factors might contribute to increasing learning gains.

The experimental intervention in this study might have been lacking sufficient use of corpus-based exercises that accompany productive activities such as paragraph writing

and presentation. Since the time allotted for corpus-based activities was only about 30 minutes in each class session, TAs could only plan for corpus queries that targeted the students' needs to write a paragraph or written texts of their presentation. The students' improvement in syntax knowledge could have been greater if there were more time spent in writing and corpus-based exercises.

Reading Comprehension. Although there is no significant difference in reading comprehension between the control and experimental groups, the interaction is consistent with the idea that the effects of DDL depends on the student's proficiency level. A tentative inference that can be made is that reading comprehension improvement of the pre-intermediate English proficiency students appears to be the byproduct of combined lexico-grammatical and corpus-based DDL instruction. The subtle interaction effects of DDL and proficiency level found in this study resonates with earlier research of Boulton (2012) conducted among relatively low English proficiency groups in which result also fell short of the accepted significant levels ($p < .05$).

In this study, both condition groups used the same reading passages and word lists for their reading comprehension activities. While the comprehension tasks given in the classroom may appear the same, students in the corpus-based DDL group have more exposure to various texts when they are exploring corpus data. The study could have yielded definitive results should the students have longer time exploring corpus data.

Other Findings in Light of L2 Acquisition Theories

This section attempts to synthesize the underlying concepts in second language acquisition perceived to be most directly connected to the phenomena observed in this study.

Listening Comprehension. The lack of statistically significant effect of the two instructional methods and proficiency levels for listening comprehension is somewhat predictable. Students had very little exposure to English orally in most of the class activities. This limited exposure is especially true for the experimental group. Although the main medium of instruction was English, students mostly used their L1 during the classroom discussion with peers. TAs often switched from English to L1 in situations where content delivery was urgent. Additionally, listening comprehension instruction was very minimal as the main learning outcome was students' comprehension of written academic texts. Although students received deliberate instruction of listening skills, the insufficient meaning-focus input that Nation and Newton (2009) consider as one of the essential elements in a well-balanced listening course may explain the non-significant finding. Overall, since corpus-based DDL had not been shown to have a significant positive impact on vocabulary and reading comprehension, an effect on listening comprehension would not be expected.

Attention. As previously discussed in the review of literature, students need appropriate tasks and instruction to increase consciousness in learning and acquisition of knowledge. In this study, different types of activities and instruction appear to have activated different types of knowledge. Although both condition groups received instruction aiming at the acquisition of language form (grammar) and meaning (lexis), direct vocabulary instruction seems to determine what students pay attention to in the target vocabulary input. This finding is congruent with the argument of Schmidt (2001) that allocating attention to input results in better learning. Direct vocabulary and

grammar instruction has increased students' knowledge of meanings both for the single word meanings and multi-unit word meanings.

Corpus-based data-driven learning, on the other hand, has offered rich exposure to and focused students' attention on a different language element, which is the lexico-grammatical element of English. The grammar review and corpus-based tasks have activated students' awareness of English grammar rules and direct their selective attention to the associated patterns in their reading and possibly writing. The massive corpus data offers repeated exposure to these patterns, which appears to facilitate retention.

Limitations of the Study

While the theories and previous research were sound, and the research design was rigorous, the fidelity of implementation might be flawed. Some areas for improvement concern the assignment of TAs, corpus training, attrition bias, and vocabulary test instrument.

It may have been too challenging for the TAs to perform an intervention involving a new instructional approach while they were still learning to master instructional content and cope with classroom management issues. At the same time, this assignment also reveals the reality in which L2 classrooms are often constrained by the instructors' limited training and readiness to maximize student learning. Considering the novelty of corpus-based DDL for both the TAs and students, more intensive instruction on running corpus queries and interpreting the concordance lines might yield different results.

Although data inspection showed approximately normal distribution, the substantial loss of participants during the intervention can cause attrition bias. The significant decrease in participants might reduce the statistical power of the study. Concerning the result generalizability, although this study involves a sufficiently large sample size, the findings apply only to the narrow population of the research and are limited by the characteristics of the study participants.

Implications for Practice and Research

This study has provided additional evidence to support previous research that corpus-based DDL potentially improve L2 learners' knowledge of English syntax. However, considering that the effect size was small, development is necessary to assess further the efficacy of the DDL approach. Some instructional practices to consider can include providing students with individual examples of frequent lexico-grammar patterns to increase their awareness of the patterns. Another possible improvement is to give students a corpus query guide written in L1. Echoing previous research recommendations, improving the quantity and quality of training both for the instructors and students can better facilitate learning. The support offered to students should extend beyond the introductory level to allow students to run more complex queries. While criticisms point out DDL's limitation in that the approach should be restricted to advanced proficiency learners, this study finding moderates the criticisms as it discovers the potential of corpus-based learning for pre-intermediate proficiency students. However, it is essential to highlight that structured instruction containing target vocabulary and definitional information, adequate samples of queries, and continuous support are crucial elements to have the desired results.

Future research should consider investigating the efficacy of corpus-based DDL treatment using larger sample size and in a longitudinal study. Since this study only used paper concordance lines at the beginning of the course, future research might want to explore whether using more paper-based materials throughout the program can increase the gains. This study provides subtle evidence for instruction that promotes students' reading comprehension. Follow-up questions to investigate can include which instructional strategies specifically improve learning outcomes, what constraints are most detrimental for student learning, and which language area is most affected. The interaction effects between corpus-based DDL instruction and English proficiency level hold a promise for future research endeavor. Future research can explore further to confirm whether DDL is more useful to improve students' knowledge of syntax than other language areas; and whether positive gains in reading comprehension would follow the increase in syntax knowledge if students have more time exploring corpus data.

Conclusions

This study started with hypotheses that corpus-based DDL instruction would improve students' ability on five measures of academic English and that the instruction effects would be significant for those in the higher proficiency group. The findings are not as straightforward as it might first appear. The mixed results provide tentative evidence in favor of the regular vocabulary-grammar instruction for vocabulary knowledge measures but more inclined toward DDL instruction for the structure measure.

The statistically significant interaction effect of corpus-based DDL and English proficiency for structure and reading comprehension offers tentative clarification of the ongoing debate over the minimum English proficiency level to allow L2 learners to gain

more benefits from the approach. The combined lexico-grammar instruction and DDL approach are essential to provide L2 learners with comprehensible input. This is especially true for learners below the pre-intermediate level of English. The study finding on reading gains is rather difficult to interpret accurately and concisely considering the non-significant effect size, which calls for follow-up investigation.

Despite the potential theoretical advantages of DDL to promote L2 learner autonomy, induction, and discovery learning, any follow-up research particularly needs to pay close attention to the balance between explicit and implicit instruction, sufficient training and support for corpus analysis, and use of L1 to facilitate learning. Although slightly lacking in light and shade in supporting the study hypotheses, the study suggests that the benefit of DDL would be measurable for the long-term learning outcomes rather than short-term instruction. Finally, considering the exploratory nature of this study, the results reported are to be considered tentative instead of conclusive evidence to the questions raised.

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Appendix A

Vocabulary Knowledge Test

Name: _____

Student ID No.: _____

Date: _____

I. Word Meaning Test

This section of the test contains 52 questions. Choose the meaning that most closely matches the meaning of the highlighted words in the example sentence. Circle (◯) the letter that corresponds to your answer.

1. It was ***indeed*** a very good movie.
   A. in contrast
   B. in fact
   C. later
   D. therefore

2. The project took ***nearly*** five years to complete.
   A. about
   B. almost
   C. barely
   D. only just

3. The system would ***benefit*** people with low income.
   A. advance
   B. improve
   C. profit
   D. promote

4. Taxpayers can ***monitor*** their tax records online.
   A. examine
   B. determine
   C. increase
   D. regulate

5. The volume of sales this year is ***roughly*** equal to that last year.
   A. approximately
   B. coarsely
   C. harshly
   D. precisely

6. The movement was ***established*** last summer.
   A. built
   B. demonstrated
   C. started
   D. suggested

7. The profit margin has been ***fixed*** at 20%.
   A. discovered
   B. repaired
   C. set
   D. valued

8. Unresolved issues ***lie*** in the relationship between the two partners.
   A. begin
   B. exist
   C. originate
   D. stay

9. The relationship was ***beneficial*** to everyone.
   A. agreeable
   B. equal
   C. helpful
   D. important

10. They ***approached*** the problem in different ways.
    A. drew attention to
    B. learned more about
    C. provided information about
    D. took action concerning

11. The event ***occurs*** in the summer.
    A. begins
    B. continues
    C. develops
    D. happens

12. The ***veracity*** of his statement has been questioned.
    A. accuracy
    B. clarity
    C. fairness
    D. importance

13. The approaches were ***interwoven*** successfully.
    A. connected
    B. covered
    C. fixed
    D. formed

14. We will ***issue*** the findings of this investigation.
    A. announce
    B. challenge
    C. discuss
    D. study

15. The device is used to ***store*** customer information and billing records.
    A. acquire
    B. keep
    C. provide
    D. release

16. She received ***countless*** responses to her blog.
    A. many
    B. few
    C. negative
    D. positive

17. It occupied a large ***proportion*** of his time.
    A. accumulation
    B. amount
    C. majority
    D. sum

18. It received ***lavish*** media attention.
    A. extensive
    B. moderate
    C. frequent
    D. negative

19. All tools are ***distributed*** freely.
    A. allowed
    B. included
    C. selected
    D. supplied

20. Three ***major*** themes can be found in the paper.
    A. different
    B. main
    C. valuable
    D. superior

21. They were unable to ***remedy*** the situation.
    A. fix
    B. overcome
    C. prevent
    D. understand

22. At the ***close*** of the study, the participants' input was collected using the interview.
    A. beginning
    B. end
    C. limit
    D. time

23. The President has the ***authority*** to appoint ministers.
    A. freedom
    B. opportunity
    C. permission
    D. right

24. Many places ***are left*** unexplored.
    A. are gone
    B. have turned
    C. remain
    D. seem

25. Students use digital tools to ***collaborate***.
    A. come together
    B. get together
    C. put together
    D. work together

26. They ***contracted*** the disease.
    A. became infected with
    B. cured
    C. discovered
    D. infected others with

27. The ***intense*** discussion occurred at the end of the meeting.
    A. brief
    B. deep
    C. exclusive
    D. extensive

28. They ***create*** multipurpose tools.
    A. bring about
    B. initiate
    C. invent
    D. start

29. A fact that cannot be ***contested***.
    A. challenged
    B. communicated
    C. proved
    D. suggested

30. The procedure ***involves*** some risks.
    A. includes
    B. prevents
    C. predicts
    D. decreases

31. Public ***areas*** are maintained by the city council.
    A. fields
    B. parts
    C. spaces
    D. supplies

32. The company ***obtains*** rights to use water.
    A. acquires
    B. desires
    C. takes
    D. wants

33. This can be used to ***estimate*** a potential return for the firm.
    A. count
    B. increase
    C. multiply
    D. predict

34. The ***fissure*** was due to the earthquake.
    A. aftershock
    B. crack
    C. eruption
    D. warning

35. We now consider this ***pathway*** in more detail.
    A. access
    B. proposal
    C. route
    D. street

36. I was struck by the ***frigid*** air.
    A. extremely cold
    B. extremely hot
    C. extremely dry
    D. extremely damp

37. The interior has no ***function***.
    A. occasion
    B. purpose
    C. utility
    D. value

38. They could not ***identify*** the victim.
    A. capture
    B. name
    C. Overlook
    D. see

39. This is a popular ***venue***.
    A. event in a competition
    B. exhibit of various products
    C. item on the menu
    D. place where people come together

40. The award consists of a few hundred ***pounds***.
    A. types of grant
    B. types of scholarship
    C. units of money
    D. units of weight

41. He ***somewhat*** disagreed with her argument.
    A. completely
    B. comparatively
    C. surprisingly
    D. to some degree

42. He is working in the ***fledgling*** entertainment industry.
    A. competitive
    B. developing
    C. existing
    D. leading

43. There are three ***unlike*** styles for private real estate.
    A. different
    B. popular
    C. potential
    D. unfriendly

44. The ***edifice*** served as the signpost.
    A. association
    B. building
    C. element
    D. progress

45. Culture is one of the essential ***factors***.
    A. aspects
    B. effect
    C. facets
    D. marks

46. The use of technology in the classroom can ***enhance*** teaching and learning.
    A. affect
    B. change
    C. improve
    D. simplify

47. This number is ***considerably*** low.
    A. obviously
    B. seriously
    C. significantly
    D. slightly

48. The mechanisms ***underlying*** such cycles are likely to be similar.
    A. according to
    B. resulting from
    C. serving as the basis for
    D. slowing down

49. They could not ***distinguish*** between the two groups.
    A. be forced to choose
    B. bridge the gap
    C. make a choice
    D. tell the difference

50. They ***publish*** the paper.
    A. advertise
    B. announce
    C. issue
    D. present

51. Such a change has no ***downside***.
    A. difficulty
    B. disadvantage
    C. influence
    D. value

52. Literature has ***indicated*** many factors influencing language acquisition.
    A. communicated
    B. connected
    C. predicted
    D. suggested

II. Multi-Word Unit Test

This section of the test contains 52 questions. Look at the context and choose which word or phrase sounds most natural in the blank. Circle ( ) the letter that corresponds to your answer.

1. The aim of this project is to _____ a theory.
   A. advance
   B. develop
   C. grow
   D. improve

2. The return of investment cannot be expected in a _____ period of time.
   A. little
   B. quick
   C. rapid
   D. short

3. The researcher _____ the role of the observer.
   A. assumed
   B. made
   C. received
   D. undertook

4. The quality control of the product has been ____ established.
   A. firmly
   B. intensely
   C. securely
   D. strongly

5. They are ____ aware of their heritage.
   A. broadly
   B. increasingly
   C. passionately
   D. repeatedly

6. It is hard to _____ a confident prediction
   A. build
   B. create
   C. formulate
   D. make

7. The novel presents a _____ of events that are predictable.
   A. chain
   B. cycle
   C. package
   D. series

8. Factors preventing the _____ implementation of the project had been anticipated.
   A. fruitful
   B. positive
   C. productive
   D. successful

9. Grading policies _____ considerably across teachers.
   A. changed
   B. contrasted
   C. differed
   D. diverged

10. Determining a target market is a major _____ of a marketing strategy.
    A. chunk
    B. function
    C. part
    D. measure

11. It is important to handle the conflicts, as _____ as other challenges tactfully.
    A. good
    B. fit
    C. sound
    D. well

12. _____ sources allow researchers to gain insights into historical events.
    A. critical
    B. elemental
    C. foremost
    D. primary

13. We can find some examples in the _____ section.
    A. conclusive
    B. final
    C. finishing
    D. ultimate

14. As a _____ , it is difficult to differentiate between factors.
    A. cause
    B. product
    C. result
    D. solution

15. All computers operate on the same _____ principle.
    A. essential
    B. fundamental
    C. important
    D. vital

16. They are _____ research by using mixed methods.
    A. conducting
    B. operating
    C. performing
    D. running
    E.

17. People must learn to listen actively in _____ to communicate.
    A. association
    B. demand
    C. order
    D. sequence

18. The students' performance on the test was roughly _____ across group.
    A. alike
    B. comparable
    C. equivalent
    D. parallel

19. Engaging in _____ communication in the workplace can be challenging.
    A. active
    B. effective
    C. good
    D. real

20. Students were grouped into four categories _____ on their study interests.
    A. based
    B. decided
    C. founded
    D. rooted

21. They might _____ low on cash during the trip .
    A. continue
    B. move
    C. pass
    D. run

22. The program increases opportunity and responsibility at the _____ time.
    A. equivalent
    B. identical
    C. same
    D. similar

23. You will _____ information about the results of this survey by email.
    A. accept
    B. hear
    C. receive
    D. understand

24. There are several _____ concepts discussed in the literature review.
    A. crucial
    B. key
    C. major
    D. vital

25. There is no guarantee that this plan will come to _____ .
    A. happen
    B. pass
    C. spread
    D. success

26. _____ of these solutions have merits and drawbacks.
    A. Both
    B. Types
    C. Together
    D. Every

27. They never seem to _____ through the mountains of work.
    A. cause
    B. change
    C. get
    D. make

28. The project received _____ assistance from an international organization.
    A. commercial
    B. financial
    C. fiscal
    D. monetary

29. Access to education varies _____ across the country.
    A. considerably
    B. highly
    C. largely
    D. sizably

30. Research results are to be shared in the scientific _____ for evaluation.
    A. community
    B. group
    C. organization
    D. society

31. The authority must receive the annual _____ .
    A. declaration
    B. information
    C. report
    D. testimony

32. We need to make the best use of the available _____ .
    A. incomes
    B. means
    C. resources
    D. supplies

33. The way the human brain _____ information has been an evolving area of research.
    A. consider
    B. processes
    C. treats
    D. uses

34. They cannot make changes to the content of the document at _____ .
    A. force
    B. guts
    C. strength
    D. will

35. The researcher employs a very _____ used model of intervention.
    A. commonly
    B. considerably
    C. ordinarily
    D. roughly

36. News about this controversial political figure keeps _____ up in the media.
    A. arising
    B. bursting
    C. cracking
    D. popping

37. You have to look at each individual .
    A. case
    B. incident
    C. instance
    D. situation

38. The detective _____ evidence of a mechanical malfunction.
    A. attained
    B. found
    C. got
    D. identified

39. Do all people benefit from the same educational _____ ?
    A. chances
    B. choices
    C. opportunities
    D. possibilities

40. The researchers operated according to the _____ method for establishing knowledge.
    A. logical
    B. scientific
    C. systematic
    D. technical

41. Posters can be a _____ of education, business, and propaganda.
    A. channel
    B. means
    C. method
    D. way

42. Things changed abruptly as a _____ of the Asian financial crisis.
    A. conclusion
    B. finding
    C. mark
    D. result

43. Sports can be _____ effectively to unify a nation.
    A. considered
    B. performed
    C. treated
    D. used

44. There have been a _____ of factors that explain the problem.
    A. choice
    B. selection
    C. variation
    D. variety

45. A _____ advantage of the new system is its flexibility.
    A. foremost
    B. general
    C. major
    D. top

46. _____ data can be useful to make informed decisions.
    A. experiential
    B. empirical
    C. pragmatic
    D. practical

47. A _____ of factors may have influenced this outcome.
    A. number
    B. quantity
    C. sum
    D. total

48. Writing can be a form of _____ communication.
    A. individual
    B. particular
    C. personal
    D. private

49. The most _____ response often depends on the local context.
    A. appropriate
    B. fine
    C. proper
    D. superior

50. The employees took legal _____ against the company.
    A. action
    B. conflict
    C. fighting
    D. suit

51. The government controls educational policies, even in the _____ of private institutions.
    A. affair
    B. case
    C. happening
    D. incident

52. Many questions _____ from the ongoing data analysis.
    A. appeared
    B. arose
    C. happened
    D. occurred

Appendix B

Syntax Knowledge Test

STRUCTURE AND WRITTEN EXPRESSION

Time – 25 minutes

(including the reading of the directions)

Now set your clock for 25 minutes

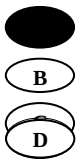
This section is designed to measure your ability to recognize language that is appropriate for
standard written English. There are two types of questions in this section, with special directions for each type.

Structure

Directions: These questions are incomplete sentences. Beneath each sentence you will see four words or phrases, marked (A), (B), (C), and (D). Choose the **one** word or phrase that best completes the sentence. Then, on your answer sheet, find the number of the question and fill in the space that corresponds to the letter of the answer you have chosen.
Look at the following examples.

Example I **Sample Answer**

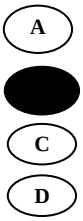
The president _____ the election by a landslide.
(A) won
(B) he won
(C) yesterday
(D) fortunately



The sentence should read, "The president won the election by a landslide." Therefore, you should choose answer (A).

Example II **Sample Answer**

When _____the conference?
(A) the doctor attended
(B) did the doctor attend
(C) the doctor will attend
(D) the doctor's attendance



The sentence should read, "When did the doctor attend the conference?" Therefore you should choose answer (B). .

1. ____ range in color from pale yellow to bright orange.

(A) Canaries which
(B) Canaries
(C) That canaries
(D) Canaries that are

2. ____ of precious gems is determined by their hardness, color, and brilliance.

(A) The valuable
(B) It is the value
(C) It is valuable
(D) The value

3. ___ a tornado spins in a counterclockwise direction in the northern hemisphere, it spins in the opposite direction in the southern hemisphere.

(A) However
(B) Because of
(C) Although
(D) That

4. The Caldecott Medal, _____ for the best children's picture book, is awarded each January.

(A) a prize
(B) which prize
(C) is a prize which
(D) is a prize

5. The horn of the rhinoceros consists of a cone of tight bundles of keratin from the epidermis.

(A) grow
(B) grows
(C) growing
(D) they grow

6. Most species of heliotropes are weeds, ____ of them are cultivated.

(A) some
(B) but some
(C) for some species
(D) some species

7. Thunder occurs as ____through air, causing the heated air to expand and collide with layers of cooler air.

(A) an electrical charge
(B) passes an electrical charge
(C) the passing of an electrical charge
(D) an electrical charge passes

8. Researchers have long debated ____ Saturn's moon Titan contains hydrocarbon oceans and lakes.

(A) over it
(B) whether it
(C) whether
(D) whether over

9. Nimbostratus clouds are thick, dark grey clouds ____ forebode rain.

(A) what
(B) which
(C) what they
(D) which they

10. _____ in several early civilizations, a cubit was based on the length of the forearm from the tip of the middle finger to the elbow.

(A) It was used as a measurement
(B) A measurement was used
(C) The use of a measurement
(D) Used as a measurement

11. Only when air and water seep through its outer coat _____

(A) does a seed germinate
(B) to the germination of a seed
(C) a seed germinates
(D) for a seed to germinate

12. _____ seasonal rainfall, especially in region near the tropics, is winds that blow in an opposite direction in winter than in summer.

(A) Causing
(B) That cause
(C) To cause
(D) What causes

13. The extinct Martian volcano Olympus Mons is approximately three times as ____ Mount Everest

(A) high
(B) high as is
(C) higher than
(D) the highest of

14. The flight instructor, _____ at the air base, said that orders not to fight had been given.

(A) when interviewed
(B) when he interviewed
(C) when his interview
(D) when interviewing

15. In the northern and central parts of the state of Idaho ____ and churning rivers.

(A) majestic mountains are found
(B) found majestic mountains
(C) are found majestic mountains
(D) finding majestic mountains

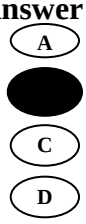
Written Expression

Directions: In these questions, each sentence has four underlined words or phrases. The four underlined parts of the sentence are marked (A), (B), (C), and (D). Identify the **one** underlined word or phrase that must be changed in order for the sentence to be correct. Then, on your answer sheet, find the number of the question and fill in the space that corresponds to the letter of the answer you have chosen.

Look at the following examples.

Example I **Sample Answer**

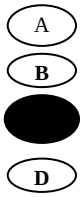
The four string on a violin are tuned
A B C D
in firths.



The sentence should read, "The four strings on a violin are tuned in fifths." Therefore, you should choose answer (B).

Example II **Sample Answer**

The research for the book Roots taking
A B C
Alex Haley twelve years.
D



The sentence should read, "The research for the book *Roots* took Alex Haley twelve years." Therefore, you should choose answer (C)

16. Light can travels from the Sun to the Earth in eight minutes and twenty seconds.
A B C D

17. Every human typically have twenty-three pairs of chromosomes in most cells.
A B C D

18. Most sedimentary rocks start forming when grains of clay, silt, or sandy settle in
A B C
river valleys or on the bottoms of lakes and oceans
D

19.The total thickness of the ventricular walls of the heart are about three times that of
A B C D
the atria.

20. The type of jazz known as "swing" was introduced by Duke Ellington when he
A B C
wrote and records "It Don't Mean a Thing If It Ain't Got That Swing."
D

21. The bones of mammals, not alike those of other vertebrates, show a high degree of
A B C
differentiation.
D

22. The neocortex has evolved more recently then other layers of the brain.
A B C D

23. The United States receives a large amount of revenue from taxation of a tobacco
A B C D
products.

24. Much fats are composed of one molecule of glycerin combined with three
A B
molecules of fatty acids.
C D

25. The capital of the Confederacy was originally in Mobile, but they were moved to
A B C D
Richmond.

26. A pearl develops when a tiny grain of sand or stone or some another irritant
A B C
accidentally enters into the shell of a pearl oyster.
D

27. The English horn is an alto oboe with a pitch one-fifth lower than the soprano oboe.
A B C D

28. In the Milky Way galaxy, the most recent observed supernova appeared in 1604.
A B C D

29. Never in the history of humanity has there been more people living on this
A B C
relatively small planet.
D

30. Because of the mobility of Americans today, it is difficult for they to put down
A B C
real roots.
D

31. For five years alter the Civil War, Robert E. Lee served to president of Washington
A B
College, which was later called Washington and Lee.
C D

32. The number of wild horses on Assateague is increasing lately, resulting in
A B C
overgrazed marsh and dune grasses.
D

33. Hypnoses was successfully used during World War II to treat battle fatigue.
A B C D

34. The lobster, like many crustaceans, can cast off a damaging appendage and
A B C
regenerate a new appendage to nearly normal size.
D

35. Humans develop normally twenty primary, or deciduous, teeth and thirty-two
A B C
permanent ones.
D

36. The curricula of American public schools are set in individual states: they
A B
do not determine by the federal government.
C D

37. The fact that the sophisticated technology has become part of revolution in travel
A B
delivery systems has not made travel schedules less hectic.
C D

38. Balanchine's plotless ballets, such *Jewels* and *The Four Temperaments*, present
A B C
dance purely as a celebration of the movement of the human body.
D

39. In a solar battery, a photosensitive semiconducting substance such as silicon
A B C
crystal is the source of electrician.
D

40. In early days, hydrochloric acid was done by heating a mixture of sodium
A B C
chloride with iron sulfate.
D

Appendix C

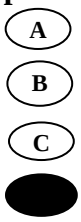
Listening Comprehension Test

SECTION 1
LISTENING COMPREHENSION
Time – approximately 35 minutes
(including the reading of the directions for each part)

In this section of the test, you will have an opportunity to demonstrate your ability to understand conversations and talks in English. There are three parts to this section, with special directions for each part. Answer all the questions on the basis of what is **stated** or **implied** by the speakers you hear. Do **not** take notes or write in your test book at any time. Do **not** turn the pages until you are told to do so.

Part A

Directions: In Part A you will hear short conversations between two people. After each conversation, you will hear a question about the conversation. The conversations and questions will not be repeated. After you hear a question, read the four possible answers in your test book and choose the best answer. Then, on your answer sheet, find the number of the question and fill in the space that corresponds to the letter of the answer you have chosen.

Listen to an example.		**Sample Answer**
On the recording, you will hear:		
(man)	*That exam was just awful.*	
(woman)	*Oh, it could have been worse.*	
(narrator)	*What does the woman, mean?*	

In your test book, you will read:

(A) The exam was really awful.

(B) It was the worst exam she had ever seen.

(C) It couldn't have been more difficult.

(D) It wasn't that hard.

You learn from the conversation that the man thought the exam was very difficult and that the woman disagreed with the man. The best answer to the question, "What does the woman mean?" is (D), "It wasn't that hard." Therefore, the correct choice is (D).

1. (A) Carla does not live very far away.
   (B) What Carla said was unjust.
   (C) He does not fear what anyone says.
   (D) Carla is fairly rude to others.

2. (A) She thinks it's an improvement.
   (B) The fir trees in it are better.
   (C) It resembles the last one.
   (D) It is the best the man has ever done.

3. (A) He graduated last in his class.
   (B) He is the last person in his family to graduate.
   (C) He doesn't believe he can improve gradually.
   (D) He has finally finished his studies.

4. (A) He thought the dress was so chic.
   (B) He was surprised the dress was not expensive.
   (C) He would like to know what color dress it was.
   (D) The dress was not cheap.

5. (A) Leave the car somewhere else.
   (B) Ignore the parking tickets.
   (C) Add more money to the meter.
   (D) Pay the parking attendant.

6. (A) He does not like to hold too many books at one time.
   (B) There is no bookstore in his neighborhood.
   (C) It's not possible to obtain the book yet.
   (D) He needs to talk to someone at the bookstore.

7. (A) It was incomplete.
   (B) It finished on time.
   (C) It was about honor.
   (D) It was too long.

8. (A) She needs to use the man's notes.
   (B) Yesterday's physics class was quite boring.
   (C) She took some ery good notes in physics class.
   (D) She would like to lend the man her notes.

9. (A) It's her birthday today.
   (B) She's looking for a birthday gift.
   (C) She wants to go shopping with her dad.
   (D) She wants a new wallet for herself.

10. (A) He took a quick trip.
    (B) The big boat was towed through the water.
    (C) There was coal in the water.
    (D) He didn't go for a swim.

11. (A) She just left her sister's house.
    (B) Her sister left the sweater behind.
    (C) She believes her sweater was left at her sister's house.
    (D) She doesn't know where her sister lives.

12. (A) She doesn't have time to complete additional reports.
    (B) She cannot finish the reports that she is already working on.
    (C) She is scared of having responsibility for the reports.
    (D) It is not time for the accounting reports to be compiled.

13. (A) He's had enough exercise.
    (B) He's going to give himself a reward for the hard work.
    (C) He's going to stay on for quite some time.
    (D) He would like to give the woman an exercise machine as a gift.

14. (A) He cannot see the huge waves.
    (B) The waves are not coming in.
    (C) He would like the woman to repeat what she said.
    (D) He agrees with the woman.

15. (A) The exam was postponed.
    (B) The man should have studied harder.
    (C) Night is the best time to study for exams.
    (D) She is completely prepared for the exam.

16. (A) Students who want to change schedules should form a line.
    (B) It is only possible to make four changes in the schedule.
    (C) It is necessary to submit the form quickly.
    (D) Problems occur when people don't wait their turn.

17. (A) In a mine.
    (B) In a jewelry store.
    (C) In a clothing store.
    (D) In a bank.

18. (A) A visit to the woman's family.
    (B) The telephone bill.
    (C) The cost of a new telephone.
    (D) How far away the woman's family lives.

19. (A) She hasn't met her new boss yet.
    (B) She has a good opinion of her boss.
    (C) Her boss has asked her about her impressions of the company.
    (D) Her boss has been putting a lot of pressure on her.

20. (A) The recital starts in three hours.
    (B) He intends to recite three different poems.
    (C) He received a citation on the third of the month.
    (D) He thinks the performance begins at three.

21. (A) Choose a new dentist.
    (B) Cure the pain himself.
    (C) Make an appointment with his dentist.
    (D) Ask his dentist about the right way to brush.

22. (A) It is almost five o'clock.
    (B) The man doesn't really need the stamps.
    (C) It is a long way to the post office.
    (D) It would be better to go after five o'clock.

23. (A) The article was placed on reserve.
    (B) The woman must ask the professor for a copy.
    (C) The woman should look through a number of journals in the library.
    (D) He has reservations about the information in the article.

24. (A) He needs to take a nap.
    (B) He hopes the woman will help him to calm down.
    (C) The woman just woke him up.
    (D) He is extremely relaxed.

25. (A) She doesn't think the news report is false.
    (B) She has never before reported on the news.
    (C) She never watches the news on television.
    (D) She shares the man's opinion about the report.

26. (A) Management will offer pay raises on Friday.
    (B) The policy has not yet been decided.
    (C) The manager is full of hot air.
    (D) The plane has not yet landed.

27. (A) He doesn't believe that it is really snowing.
    (B) The snow had been predicted.
    (C) The exact amount of snow is unclear.
    (D) He expected the woman to go out in the snow.

28. (A) She's going to take the test over again
    (B) She thinks she did a good job on the exam.
    (C) She has not yet taken the literature exam.
    (D) She's unhappy with how she did.

29. (A) The door was unlocked.
    (B) It was better to wait outside.
    (C) He could not open the door.
    (D) He needed to take a walk.

30. (A) He nailed the door shut.
    (B) He is heading home.
    (C) He hit himself in the head.
    (D) He is absolutely correct.

Part B

Directions: In this part of the test, you will hear longer conversations. After each conversation, you will hear several questions. The conversations and questions will not be repeated.

After you hear a question, read the four possible answers in your test book and choose the best answer. Then, on your answer sheet, find the number of the question and fill in the space that corresponds to the letter of the answer you have chosen.

Remember, you are **not** allowed to take notes or write in your test book.

31. (A) The haircut is unusually short.
    (B) This is Bob's first haircut.
    (C) Bob doesn't know who gave him the haircut.
    (D) After the haircut. Bob's hair still touches the floor.

32. (A) It is just what he wanted.
    (B) He enjoys having the latest style.
    (C) He dislikes it immensely.
    (D) He thinks it will be cool in the summer.

33. (A) A broken mirror.
    (B) The hairstylist.
    (C) The scissors used to cut his hair.
    (D) Piles of his hair.

34. (A) "You should become a hairstylist."
    (B) "Please put it back on."
    (C) "It'll grow back."
    (D) "It won't grow fast enough."

35. (A) Every evening.
    (B) Every week.
    (C) Every Sunday.
    (D) Every month.

36. (A) That she was eighty-five years old.
    (B) That a storm was coming.
    (C) That she was under a great deal of pressure.
    (D) That she wanted to become a weather forecaster.

37. (A) In her bones.
    (B) In her ears.
    (C) In her legs.
    (D) In her head.

38. (A) Call his great-grandmother less often.
    (B) Watch the weather forecasts with his great-grandmother.
    (C) Help his great-grandmother relieve some of her pressures.
    (D) Believe his great-grandmother's predictions about the weather.

Part C

Directions: In this part of the test, you will hear several talks. After each talk, you will hear some questions. The talks and questions will not be repeated.

After you hear a question, you will read the four possible answers in your test book and choose the best answer. Then, on your answer sheet, find the number of the question and fill in the space that corresponds to the letter of the answer you have chosen.

Here is an example.

On the recording, you will hear:

(narrator) *Listen to an instructor talk to his class about painting,*

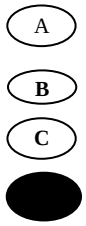
(man) *Artist Grant Wood was a guiding force in the school of painting known as American regionalist, a style reflecting the distinctive characteristics of art from rural areas of the United States. Wood began drawing animals on the family farm at the age of three, and when he was thirty-eight one of his paintings received a remarkable amount of public notice and acclaim. This painting, called "American Gothic," is a starkly simple depiction of a serious couple staring directly out at the viewer.*

Now listen to a sample question. **Sample Answer**

(narrator) *What style of painting is known as American regionalist?*

In your test book, you will read:

(A) Art from America's inner cities.
(B) Art from the central region of the United States.
(C) Art from various urban areas in the United States.
(D) Art from rural sections of America.

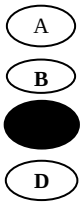


The best answer to the question, "What style of painting is known as American regionalist?" is (D), "Art from rural sections of America." Therefore, the correct choice is (D).

Now listen to another sample question. **Sample Answer**

(narrator) What is the name of Wood's most successful painting?

In your test book, you will read:(A) "American Regionalist."
(B) "The Family Farm in Iowa."
(C) "American Gothic."
(D) "A Serious Couple."



The best answer to the question, "What is the name of Wood's most successful painting?" is (C), "American Gothic." Therefore, the correct choice is (C).
Remember, you are **not** allowed to take notes or write in your test book.

39. (A) In a car.
    (B) On a hike.
    (C) On a tram.
    (D) In a lecture hall.

40. (A) It means they have big tears.
    (B) It means they like to swim.
    (C) It means they look like crocodiles.
    (D) It means they are pretending to be sad.

41. (A) They are sad.
    (B) They are warming themselves.
    (C) They are getting rid of salt.
    (D) They regret their actions.

42. (A) Taking photographs.
    (B) Getting closer to the crocodiles.
    (C) Exploring the water's edge.
    (D) Getting off the tram.

43. (A) Water Sports.
    (B) Physics.
    (C) American History.
    (D) Psychology.

44. (A) To cut.
    (B) To move fast.
    (C) To steer a boat.
    (D) To build a ship.

45. (A) To bring tea from China.
    (B) To transport gold to California.
    (C) To trade with the British.
    (D) To sail the American river system.

46. (A) A reading assignment.
    (B) A quiz on Friday.
    (C) A research paper for the end of the semester.
    (D) Some written homework.

47. (A) Writers.
    (B) Actors.
    (C) Athletes.
    (D) Musicians.

48. (A) He or she would see butterflies.
    (B) He or she would break a leg.
    (C) He or she would have shaky knees.
    (D) He or she would stop breathing.

49. (A) By staring at the audience.
    (B) By breathing shallowly.
    (C) By thinking about possible negative outcomes.
    (D) By focusing on what needs to be done.

50. (A) At two o'clock.
    (B) At four o'clock.
    (C) At six o'clock.
    (D) At eight o'clock.

Appendix D

Reading Comprehension Test

READING COMPREHENSION
Time – 55 minutes
(including the reading of the directions)
Now set your clock for 55 minutes.

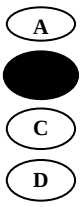
This section is designed to measure your ability to read and understand short passages similar in topic and style to those that students are likely to encounter in North American universities and colleges. This section contains reading passages and questions about the passages.
Directions: In this section you will read several passages. Each one is followed by a number of questions about it. You are to choose the **one** best answer, (A), (B), (C), or (D), to each question. Then, on your answer sheet, find the number of the question and fill in the space that corresponds to the letter of the answer you have chosen.
Answer all questions about the information in a passage on the basis of what is **stated** or **implied** in that passage.

Read the following passage:

John Quincy Adams, who served as the sixth president of the United States from 1825 to 1829, is today recognized for his masterful statesmanship and
Line diplomacy. He dedicated his life to public service, both in the presidency and in
(5) the various other political offices that he held. Throughout his political career he demonstrated his unswerving belief in freedom of speech, the antislavery cause, and the right of Americans to be free from European and Asian domination.

Example I **Sample Answer**

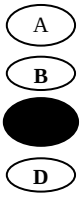
To what did John Quincy Adams devote his life?
(A) Improving his personal life
(B) Serving the public
(C) Increasing his fortune
(D) Working on his private business



According to the passage, John Quincy Adams "dedicated his life to public service." Therefore, you should choose answer (B).

Example II **Sample Answer**

In line 5, the word "unswerving" is closest in meaning to
(A) moveable
(B) insignificant
(C) unchanging
(D) diplomatic



The passage states that John Quincy Adams demonstrated his unswerving belief "throughout his career." This implies that the belief did not change. Therefore, you should choose answer (C).

Questions 1-9

John James Audubon, nineteenth-century artist and naturalist is known as one of the **foremost** authorities on North American birds. Born in Les Cayes, Haiti, in 1785, Audubon was raised in France and studied art under French artist Jacques-Louis David. After settling on his father's Pennsylvania estate at the age of eighteen, he first began to study and paint birds.

In his young adulthood, Audubon undertook numerous enterprises, generally without a tremendous amount of success; at various times during his life he was involved in a mercantile business, a lumber and grist mill, a taxidermy business, and a school. His general **mode** of operating a business was to leave it either unattended or in the hands of a partner and take off on excursions through the wilds to paint the natural life that he saw. His business career came to an end in 1819 when he was jailed for debt and forced to file for bankruptcy.

It was at that time that Audubon began to seriously **pursue** the dream of publishing a collection of his paintings of birds. For the next six years he painted birds in their natural habitats while his wife worked as a teacher to **support** the family. His *Birds of America*, which included engravings of 435 of his colorful and lifelike watercolors, was published in parts during the period from 1826 to 1838 in England. After the success of the English editions, American editions of his work were published in 1839, and his fame and fortune were ensured.

1. This passage is mainly about

   (A) North American birds
   (B) Audubon's route to success as a painter of birds
   (C) The works that Audubon published
   (D) Audubon's preference for travel in natural habitats

2. The word "foremost" in line 2 is closest in meaning to

   (A) prior
   (B) leading
   (C) first
   (D) largest

3. In the second paragraph, the author mainly discusses

   (A) how Audubon developed his painting style
   (B) Audubon's involvement in a mercantile business
   (C) where Audubon went on his excursions
   (D) Audubon's unsuccessful business Practices

4. The word "mode" in line 9 could best be replaced by

   (A) method
   (B) vogue
   (C) average
   (D) trend

5. Audubon decided not to continue to pursue business when

(A) he was injured in an accident at a grist mill
(B) he decided to study art in France
(C) he was put in prison because he owed money
(D) he made enough money from his paintings

6. The word "pursue" in line 13 is closest in meaning to

(A) imagine
(B) share
(C) follow
(D) deny

7. According to the passage, Audubon's paintings

(A) were realistic portrayals
(B) used only black, white, and gray
(C) were done in oils
(D) depicted birds in cages

8. The word "support" in line 15 could best be replaced by

(A) tolerate
(B) provide for
(C) side with
(D) fight for

9. It can be inferred from the passage that after 1839 Audubon

(A) unsuccessfully tried to develop new businesses
(B) continued to be supported by his wife
(C) traveled to Europe
(D) became wealthy

Questions 10-19

These stories of killer bees in the news in recent years have attracted a lot of attention as the bees have made their way from South America to North America. Killer bees are reputed to be extremely aggressive in nature, although experts say that their aggression may have been somewhat **inflated**.

Line

(5) The killer bee is **a hybrid** – or combination – of the very mild European strain of honeybee and the considerably more aggressive African bee, which was created when the African strain was imported into Brazil in 1955. The African bees were brought into Brazil because their aggression was considered an advantage: they were far more productive than their European counterparts in that they spent a higher percentage of

(10) their time working and continued working longer in inclement weather than did the European bees.

These killer bees have been known to attack humans and animals, and some fatalities have occurred. Experts point out, however, that the mixed breed known as the killer bee is actually not at all as aggressive as the pure African bee. **They** also point out

(15) that the attacks have chemical cause. A killer bee stings only when it has been disturbed; it is not aggressive by nature. However, after a disturbed bee stings and flies away, it leaves its stinger embedded in the victim. In the vicera attached to embedded stinger is the chemical isoamyl acetate, which has an odor that attracts other bees. As other bees approach the victim of the original sting, the victim tends to panic, thus disturbing other

(20) bees and causing them to sting. The new stings create more of chemical isoamyl acetate, which attracts more bees and increases the panic level of the victim. Killer bees tend to travel in large clusters or swarms and thus respond in large numbers to production of isoamyl acetate.

10. The subject of the preceding paragraph was most likely

(A) ways of producing honey
(B) stories in the media about killer bees
(C) the chemical nature of killer bee attacks
(D) the creation of the killer bee

11. The main idea of this passage is that killer bees

(A) have been in the news a lot recently
(B) have been moving unexpectedly rapidly through the Americas
(C) are not as aggressive as their reputation suggests
(D) are a hybrid rather than a pure breed

12. The word “inflated” in line 4 could best be replaced by

(A) exaggerated
(B) blown
(C) aired
(D) burst

13. It can be inferred from the passage that the killer bee

(A) traveled from Brazil to Africa in 1955
(B) was a predecessor of the African bee
(C) was carried from Africa to Brazil in 1955
(D) did not exist early in the twentieth century

14. Why were African bees considered beneficial?
    (A) They produced an unusual type of honey
    (B) They spent their time traveling
    (C) They were very aggressive
    (D) They hid from inclement weather

15. A “hybrid” in line 5 is

    (A) a mixture
    (B) a relative
    (C) a predecessor
    (D) an enemy

16. It is stated in the passage that killer bees

    (A) are more deadly than African bees
    (B) are less aggressive than African bees
    (C) never attack animals
    (D) always attack African bees

17. The pronoun "They" in line 14 refers to

    (A) killer bees
    (B) humans and animals
    (C) fatalities
    (D) experts

18. What is NOT mentioned in the passage as a contributing factor in an attack by killer bees?

    (A) Panic by the victim
    (B) An odorous chemical
    (C) Disturbance of the bees
    (D) Inclement weather

19. Where in the passage does the author describe the size of the groups in which killer bees move?

    (A) Lines 2-4
    (B) Lines 5-7
    (C) Lines 16-18
    (D) Lines 21-23

Questions 20-28

There is a common expression in the English language referring to a blue moon. When people say that something happens "only once in a blue moon," they mean that it happens only very rarely, once in a great while. This expression has been around for at least a century and a half; there are references to this expression that date from the second half of the nineteenth century.

The expression "a blue moon" has come to refer to the second full moon occurring in any given calendar month. A second full moon is not called a blue moon because it is particularly blue or is any different in **hue** from the first full moon of the month. Instead, it is called a blue moon because it is so rare. The moon needs a little more than 29 days to complete the cycle from full moon to full moon. Because every month except February has more than 29 days, every month will have at least one full moon (except February, which will have a full moon unless there is a full moon at the very end of January and another full moon at the very beginning of March). It is on the occasion when a given calendar month has a second full moon that a blue moon occurs. This does not happen very often, only three or four times in a decade.

The blue moons of today are called blue moons because of their rarity and not because of their color; however, the expression "blue moon" may have come into existence in reference to unusual circumstances in which the moon actually appeared blue. Certain natural phenomena of gigantic proportions can actually change the appearance of the moon from Earth. The eruption of the Krakatao volcano in 1883 left dust particles in the atmosphere, which clouded the sun and gave the moon a bluish tint. This particular occurrence of the blue moon may have **given rise to** the expression that we use today. Another example occurred more than a century later. When Mount Pinatubo erupted in the Philippines in 1991, the moon again took on a blue tint.

20. This passage is about

(A) an idiomatic expression
(B) an unusual color
(C) a month on the calendar
(D) a phase of the moon

21. How long has the expression "once in a blue moon" been around?

(A) For around 50 years
(B) For less than 100 years
(C) For more than 100 years
(D) For 200 years

22. A blue moon could best be described as

(A) a full moon that is not blue in color
(B) a new moon that is blue in color
(C) a full moon that is blue in color
(D) a new moon that is not blue in color

23. The word "hue" in line 8 is closest in meaning to

(A) shape
(B) date
(C) color
(D) size

24. Which of the following might be the date of a "blue moon"?

(A) January 1
(B) February 28
(C) April 15
(D) December 31

25. How many blue moons would there most likely be in a century?

(A) 4
(B) 35
(C) 70
(D) 100

26. According to the passage, the moon actually looked blue

(A) after large volcanic eruptions
(B) when it occurred late in the month
(C) several times a year
(D) during the month of February

27. The expression "given rise to" in line 23 could best be replaced by

(A) created a need for
(B) elevated the level of
(C) spurred the creation of
(D) brightened the color of

28.Where in the passage does the author describe the duration of a lunar cycle?

(A) Lines 1-3
(B) Lines 5-6
(C) Line 9-10
(D) Lines 12-13

Questions 29-40

The organization that today is known as the Bank of America did start out in America, but under quite a different name. Italian American A.P. Giannini established this bank on October 17, 1904, in a renovated saloon in San Francisco's Italian community of North Beach under the name Bank of Italy, with immigrants and first-time bank customers comprising the majority of his first customers. During its development, Giannini's bank survived major crises in the form of a natural disaster and a major economic upheaval that not all other banks were able to overcome.

One major test for Giannini's bank occurred on April 18, 1906, when a massive earthquake struck San Francisco, followed by a **raging** fire that destroyed much of the city. Giannini obtained two wagons and teams of horses, filled the wagons with the bank's reserves, mostly in the form of gold, covered the reserves with crates of oranges, and escaped from the **chaos** of the city with his clients' funds protected. In the aftermath of the disaster, Giannini's bank was the first to resume operations. Unable to install the bank in a proper office setting, Giannini opened up shop on the Washington Street Wharf on a makeshift desk created from boards and barrels.

In the period following the 1906 fire, the Bank of Italy continued to prosper and expand. By 1918 there were twenty-four branches of the Bank of Italy, and by 1928 Giannini had acquired numerous other banks, including a Bank of America located in New York City. In 1930, he **consolidated** all the branches of the Bank of Italy, the Bank of America in New York City, and another Bank of America that he had formed in California into the Bank of America National Trust and Savings Association.

A second major crisis for the bank occurred during the Great Depression of the 1930s. Although Giannini had already retired prior to the darkest days of the Depression, he became incensed when his successor began selling off banks during the bad economic times. Giannini resumed leadership of the bank at the age of sixty-two. Under Giannini's leadership, the bank **weathered the storm of** the Depression and subsequently moved into a phase of overseas development.

29. According to the passage, Giannini

(A) opened the Bank of America in 1904
(B) worked in a bank in Italy
(C) set up the Bank of America prior to setting up the Bank of Italy
(D) later changed the name of the Bank of Italy

30. Where did Giannini open his first bank?

(A) In New York City
(B) In what used to be a bar
(C) On Washington Street Wharf
(D) On a makeshift desk

31. According to the passage, which of the following is NOT true about the San Francisco earthquake?

(A) It happened in 1906.
(B) It occurred in the aftermath of a fire.
(C) It caused problems for Giannini's bank.
(D) It was a tremendous earthquake.

32. The word "raging" in line 9 could best be replaced by

(A) angered
(B) localized
(C) intense
(D) feeble

33. It can be inferred from the passage that Giannini used crates of oranges after the earthquake

(A) to hide the gold
(B) to fill up the wagons
(C) to provide nourishment for his customers
(D) to protect the gold from the fire

34. The word "chaos" in line 12 is closest in meaning to

(A) legal system
(B) extreme heat
(C) overdevelopment
(D) total confusion

35. The word "consolidated" in line 19 is closest in meaning to

(A) hardened
(B) merged
(C) moved
(D) sold

36. The passage states that after his retirement, Giannini

(A) began selling off banks
(B) caused economic misfortune to occur
(C) supported the bank's new management
(D) returned to work

37. The expression "weathered the storm of" in line 26 could best be replaced by

(A) found a cure for
(B) rained on the parade of
(C) survived the ordeal of
(D) blew its stack at

38. Where in the passage does the author describe Giannini's first banking clients?

(A) Lines 2-5
(B) Lines 7-8
(C) Lines 12-13
(D) Lines 14-16

39. How is the information in the passage presented?

(A) In chronological order
(B) In order of importance
(C) A cause followed by an effect
(D) Classifications with examples

40. The paragraph following the passage most likely discusses

(A) bank failures during the Great Depression
(B) a third major crisis of the Bank of America
(C) the international development of the Bank of America
(D) how Giannini spent his retirement

Questions 41-50

Thunderstorms, with their jagged bursts of lightning and roaring thunder, are actually one of nature's primary **mechanisms** for transferring heat from the surface of the earth into the atmosphere. A thunderstorm starts when low-lying pockets of warm air from the surface of the earth begin to rise. The pockets of warm air float upward through the air above that is both cooler and heavier. The rising pockets cool as their pressure decreases, and their latent heat is released above the condensation line through the formation of cumulus clouds.

What will happen with these clouds depends on the temperature of the atmosphere. In winter, the air temperature differential between higher and lower altitudes is not extremely great, and the temperature of the rising air mass drops more slowly. During these colder months, the atmosphere, therefore, tends to remain rather stable. In summer, however, when there is a high accumulation of heat near the earth's surface, in direct contrast to the considerably colder air higher up, the temperature differential between higher and lower altitudes is much more pronounced. As warm air rises in this type of environment, the temperature drops much more rapidly than it does in winter; when the temperature drops more than four degrees Fahrenheit per thousand feet of altitude, cumulus clouds aggregate into a single massive cumulonimbus cloud, or thunderhead.

In isolation, a single thunderstorm is an impressive but fairly **benign** way for Mother Earth to defuse trapped heat from her surface; thunderstorms, however, can appear **in concert**, and the resulting show, while extremely impressive, can also prove extraordinarily destructive. When there is a large-scale collision between cold air and warm air masses during the summer months, a squall line, or series of thunderheads, may develop. It is common for **a squall line** to begin when an advancing cold front meets up with and forces **itself** under a layer of warm and moist air, creating a line of thunderstorms that races forward at speeds of approximately forty miles per hour. A squall line, which can be hundreds of miles long and can contain fifty distinct thunderheads, is a magnificent force of nature with incredible potential for destruction. Within the squall line, often near its southern end, can be found supercells, long-lived rotating storms of exceptional strength that serve as the source of tornadoes.

41. The topic of the passage is

(A) the development of thunderstorms and squall lines
(B) the devastating effects of tornadoes
(C) cumulus and cumulonimbus clouds
(D) the power of tornadoes

42. "Mechanisms" in line 2 are most likely

(A) machines
(B) motions
(C) methods
(D) materials

43. It can be inferred from the passage that, in summer,
    (A) there is not a great temperature differential between higher and lower altitudes
    (B) the greater temperature differential between higher and lower altitudes makes thunderstorms more likely to occur
    (C) there is not much cold air higher up in the atmosphere
    (D) the temperature of rising air drops more slowly than it does in winter

44. The word "benign" in line 19 is closest in meaning to
    (A) harmless
    (B) beneficial
    (C) ferocious
    (D) spectacular

45. The expression "in concert" in line 21 could best be replaced by

    (A) as a chorus
    (B) with other musicians
    (C) as a cluster
    (D) in a performance

46. According to the passage, a "squall line" in line 24 is

    (A) a lengthy cold front
    (B) a serious thunderstorm
    (C) a line of supercells
    (D) a string of thunderheads

47. The pronoun "itself" in line 25 refers to

    (A) a large-scale collision
    (B) a squall line
    (C) an advancing cold front
    (D) a layer of warm and moist air

48. All of the following are mentioned in the passage about supercells EXCEPT that they

    (A) are of short duration
    (B) have circling winds
    (C) have extraordinary power
    (D) can give birth to tornadoes

49. This reading would most probably be assigned in which of the following courses?

    (A) Geology
    (B) Meteorology
    (C) Marine Biology
    (D) Chemistry

50. The paragraph following the passage most likely discusses

    (A) the lightning and thunder associated with thunderstorms
    (B) various types of cloud formations
    (C) the forces that contribute to the formation of squall lines
    (D) the development of tornadoes within supercells

Appendix E

Sample of Experimental Group Lesson Plan

Week Date	Learning Objectives – Topics	Activities for All Groups	COCA Group
3 09/06	1. Locate topics, main ideas, and supporting details of academic texts 2. Subjects and verbs, objects of prepositions (Grammar Points/GPs 1-2) 3. Reading Comprehension Passages 3.1, 3.2 4. Word List 3.1-3.5	50 minutes 1. Lecture: reading skills 2. Lecture: grammar points 1-2 Subjects + Verbs, Objects of Prepositions 3. Read passages 4. Identify vocabulary & grammar points 1-2 in passages 3.1-3.5	40 minutes 1. Review: Intro to Corpus 2. Think like a detective: See *CS2. Grammar Points* Model and guide students to consult COCA for next week's retelling 3. Preparation: retelling of a passage 1. students self-select a passage 2. identify main idea, supporting details 3. use words in word list, & grammar points 1-2 to retell
9 10/25	1. Predict the meaning of an academic text (2) 2. Select appropriate vocabulary words to express an idea (7) 3. Summarize information from the text 4. Grammar points (1-18) 5. Passages 5.1 – 5.3 6. Word List: 5.1 – 5.3	60 minutes 1.In pair, read a passage 1. Write a summary of the passage 2. Use words from wordlist and grammar points 1-18 (min. 6) (40 min) 2.Time permitting, in group of 4, prepare a presentation including 1.Summary 2.Main & supporting ideas 3.Words from wordlist & meanings 4.Grammar points used (20 min)	30 minutes: Introduce collocates 1. What nouns come after *education, legal, scientific* 2. What adjectives come before *advantage, data, method, resources, report, assistance* 3. What verbs come before *evidence, through, low* 4. Explore using WordandPhrase.Info and/or COCA. Use collocates in sentences in summary

Appendix F

Sample of Control Group Lesson Plan

Week Date	Learning Objectives – Topics	Activities for All Groups	Regular Group
3 09/06	1. Locate topics, main ideas, and supporting details of academic texts 2. Subjects and verbs, objects of prepositions (Grammar Points/GPs 1-2) 3. Reading Passages 3.1, 3.2 4. Word List 3.1-3.5	50 minutes 1. Lecture on reading 2. Lecture: grammar points 1-2 Subjects + Verbs, Objects of Prepositions 3. Read passages 4. Identify vocabulary & grammar patterns in passages 3.1-3.5	40 minutes 1. Lecture on vocabulary skills (10 min) 2. Answer reading comprehension & grammar practice
9 10/25	1. Predict the meaning of an academic text (2) 2. Select appropriate vocabulary words to express an idea (7) 3. Summarize information from the text 4. Grammar points (1-18) 5. Passages 5.1 – 5.3 6. Word List: 5.1 – 5.3	60 minutes 1.In pair, read a passage 1.Write a summary of the passage 2.Use words from wordlist and grammar points 1-18 (min. 6) 2.Time permitting, in group of 4, prepare a presentation including 1.Summary 2.Main & supporting ideas 3.Words from wordlist & meanings 4.Grammar points used	30 minutes 1. Worksheets: Vocabulary and grammar practice

Appendix G

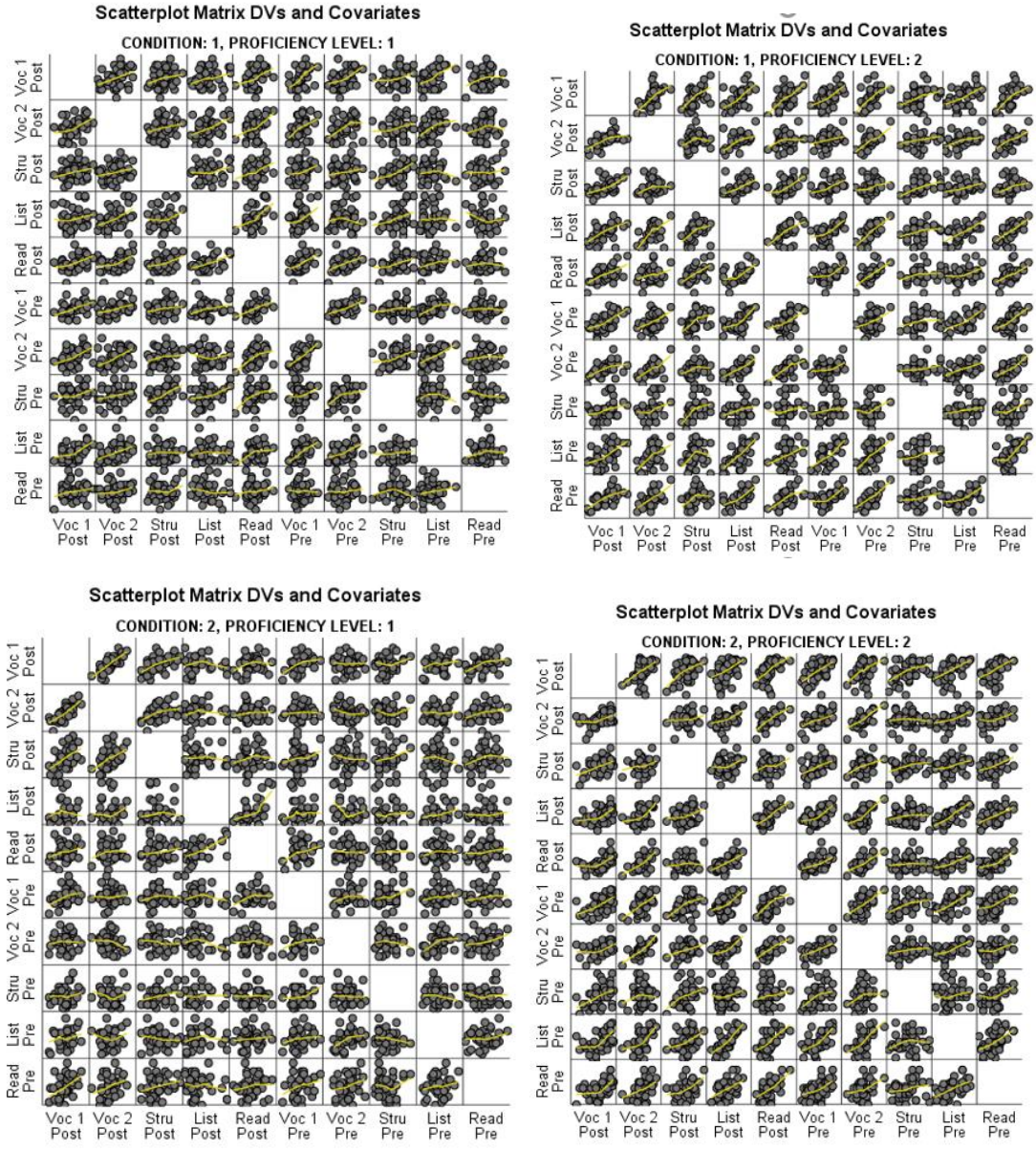
Word List

1	annual	29	effectively	58	method
2	approach	30	empirical	59	monitor
3	appropriate	31	enhance	60	nearly
4	area	32	establish	61	obtain
5	arise	33	estimate	62	occur
6	assistance	34	evidence	63	opportunity
7	assume	35	factor	64	pathway
8	authority	36	final	65	period
9	available	37	fissure	66	pound
10	aware	38	fix	67	prediction
11	be left	39	fledgling	68	primary
12	beneficial	40	frigid	69	process
13	benefit	41	function	70	proportion
14	close	42	fundamental	71	publish
15	collaborate	43	identify	72	remedy
16	communication	44	implementation	73	result
17	community	45	indeed	74	roughly
18	concept	46	indicate	75	series
19	conduct	47	individual	76	somewhat
20	considerably	48	intense	77	store
21	contest	49	interweave	78	theory
22	contract	50	involve	79	underlie
23	countless	51	issue	80	unlike
24	create	52	lavish	81	vary
25	distinguish	53	legal	82	venue
26	distribute	54	lie	83	veracity
27	downside	55	major	58	method
28	edifice	56	means	59	monitor

Appendix H

Results of MANCOVA Assumption Tests

1. An approximately linear relationship between each pair of dependent variables within each group of the independent variables; and linearity between each covariate and each dependent variable within each of the independent variable.

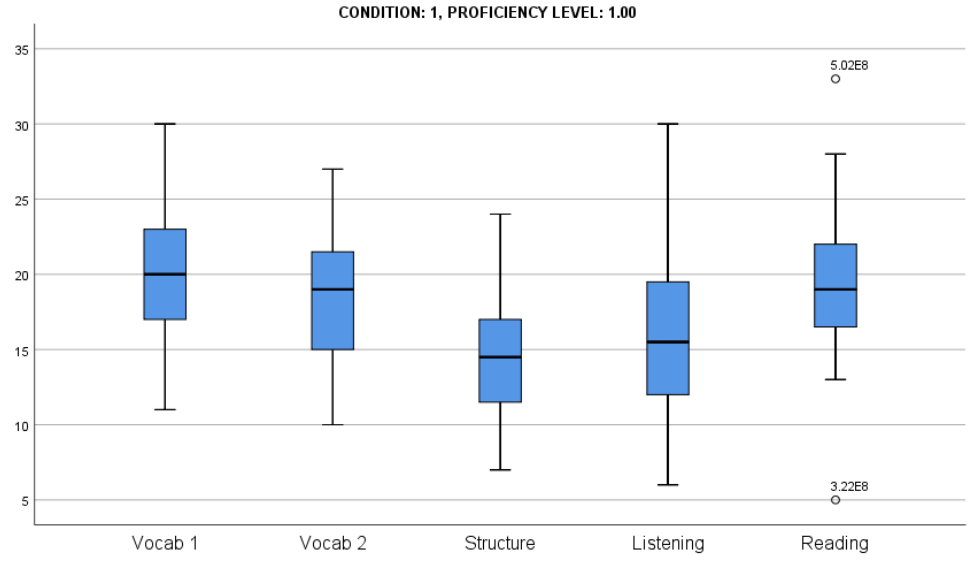


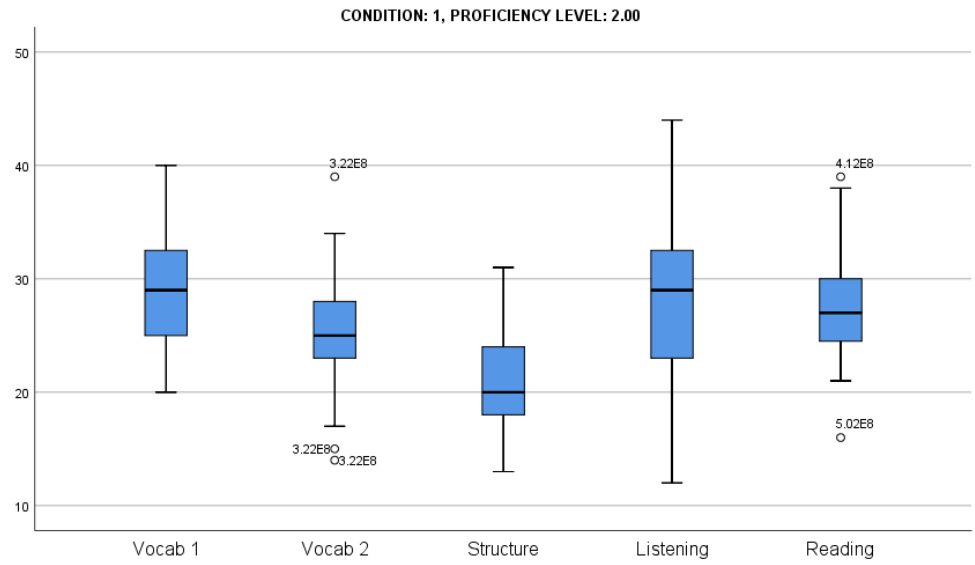
2. No evidence of multicollinearity as assessed by Pearson correlation ($|r| < 0.9$)

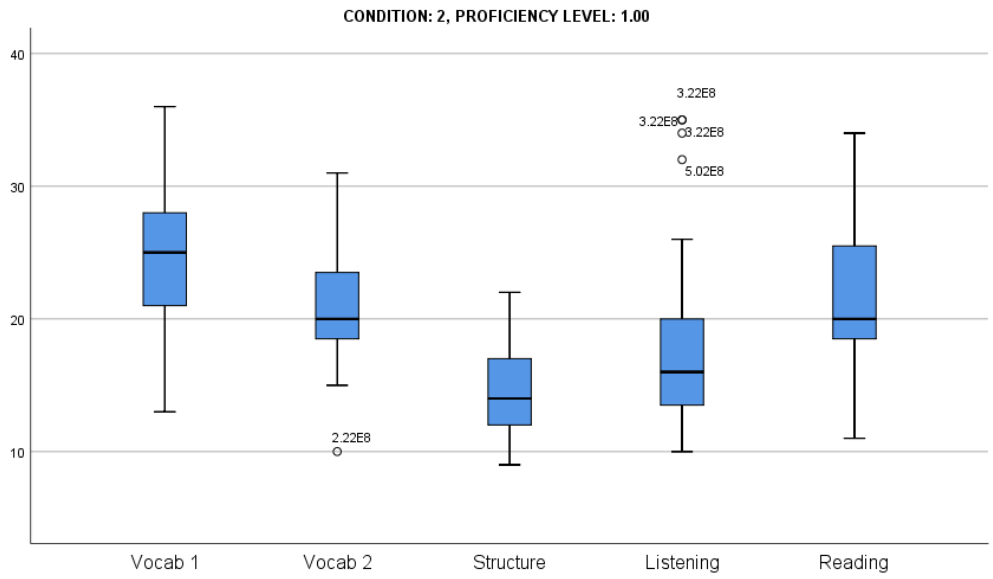
	Vocab 1	Vocab 2	Structure	Listening	Reading
Vocab 1	1	.706**	.575**	.536**	.610**
Vocab 2	.706**	1	.452**	.584**	.578**
Structure	.575**	.452**	1	.466**	.528**
Listening	.536**	.584**	.466**	1	.684**
Reading	.610**	.578**	.528**	.684**	1

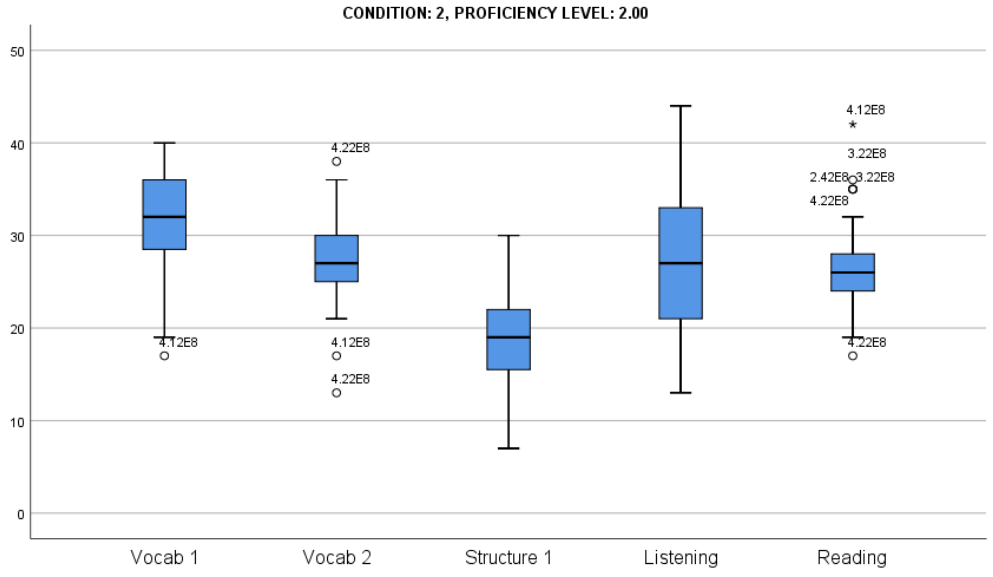
Note. N = 153. **. Correlation is significant at the 0.01 level (2-tailed).

3. No extreme univariate outliers in the data as assessed by inspection of a boxplot.






CONDITION: 2, PROFICIENCY LEVEL: 1.00
40
30
20
10
3.22E8
3.22E8
3.22E8
5.02E8
2.22E8
Vocab 1
Vocab 2
Structure
Listening
Reading


CONDITION: 2, PROFICIENCY LEVEL: 2.00
50
40
30
20
10
0
4.12E8
4.22E8
4.12E8
4.22E8
4.12E8
3.22E8
2.42E8
3.22E8
4.22E8
4.22E8
Vocab 1
Vocab 2
Structure 1
Listening
Reading

4. No multivariate outliers in the data, as assessed by Mahalanobis distance ($p > .001$).

	ZRE_8	ZRE_9	ZRE_10	MAH_1
1	-.49	-1.85	.11	15.19737
2	2.38	.77	2.52	14.99447
3	2.86	-1.23	1.68	14.92655
4	.43	-1.02	.35	12.90842
5	-1.06	.66	-.99	12.72053
6	-.18	.10	3.27	12.05538
7	-.83	.76	-.83	11.32338
8	-1.04	1.00	-.33	11.16486
9	.87	.07	-.79	9.96555
10	-2.26	.03	.86	9.61590

5. Almost all of group combinations were normally distributed (Shapiro-Wilk's test, $p > .013$), except the Listening Posttest of Condition 2 and Proficiency Level 1 (Shapiro-Wilk's test, $p > .013$).

Condition 1 and Proficiency Level 1

	Shapiro-Wilk		
	Statistic	df	Sig.
Vocab 1	.970	40	.369
Vocab 2	.971	40	.401
Structure	.982	40	.766
Listening	.953	40	.098
Reading	.968	40	.310

Condition 1 and Proficiency Level 2

	Shapiro-Wilk		
	Statistic	df	Sig.
Vocab 1	.979	35	.740
Vocab 2	.970	35	.434
Structure	.946	35	.088
Listening	.965	35	.318
Reading	.974	35	.561

Condition 2 and Proficiency Level 1

	Shapiro-Wilk		
	Statistic	df	Sig.
Vocab 1	.979	35	.733
Vocab 2	.984	35	.873
Structure	.964	35	.305
Listening	.846	35	.000
Reading	.971	35	.464

Condition 2 and Proficiency Level 2

	Shapiro-Wilk		
	Statistic	df	Sig.
Vocab 1	.952	43	.072
Vocab 2	.955	43	.095
Structure	.988	43	.928
Listening	.959	43	.123
Reading	.947	43	.045

6. There was homogeneity of variances and covariances, as assessed by Box's M Test, $p = .137$

Box's Test of Equality of Covariance Matrices[a]	
Box's M	59.032
F	1.232
df1	45
df2	52020.484
Sig.	.137

7. There was homogeneity of regression slopes, as assessed by the interaction term between the covariates and independent variables, $F(5, 137) = 1.15$, $p = .34$.

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
CONDITION*	Pillai's Trace	.040	1.152[b]	5.000	137.000	.336	.040
PROFICIENCY	Wilks' Lambda	.960	1.152[b]	5.000	137.000	.336	.040
LEVEL*Voc1	Hotelling's	.042	1.152[b]	5.000	137.000	.336	.040
Pre*Voc2Pre*	Trace						
Stru Pre*List Pre	Roy's Largest	.042	1.152[b]	5.000	137.000	.336	.040
*Read Pre	Root						